Self–Study 2010-2016
Atmospheric Sciences, College of Geosciences
Texas A&M University

Photo: Ben Cole
2017 Academic Program Review

Department of Atmospheric Sciences
Texas A&M University

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Executive Summary

The Department of Meteorology at Texas A&M University (TAMU) was established as a separate department in 1965 and was renamed the Department of Atmospheric Sciences (ATMO) in 1998. As part of an AAGU member institution with Land, Sea, and Space Grant status, ATMO is deeply committed to 1) advancing scientific understanding of the atmosphere and imparting that knowledge for the benefit of society, 2) preparing the next generation of atmospheric scientists to acquire and develop scientific knowledge, critical thinking skills, lifelong learning practices, and the potential to contribute to society, and 3) using our expertise to serve the broader scientific, government, and industry communities.

The department’s most fundamental mission is to educate students at all levels. To that end we offer comprehensive undergraduate and graduate degree programs. We have awarded 144 B.S. degrees in meteorology and 47 M.S. and 24 Ph.D. degrees in atmospheric science in the past five years. Teaching resources include a 10-cm Doppler radar, two computer laboratories, and various student-centered weather observing programs. We have recently expanded our high-impact learning opportunities, including regular study-abroad programs, and are entering our fourth year as an NSF-funded Research Experiences for Undergraduates site. We also serve students in other disciplines through survey courses, which give students a better understanding of nature and of scientific methods, through specialized courses for students in fields that require applied knowledge of meteorology, and through participation in interdisciplinary degree programs.

ATMO aims at expanding the frontiers of atmospheric science through research and giving students experience and training in conducting research. Most research falls into four broad areas: weather and forecasting, dynamical meteorology and climate dynamics, atmospheric chemistry, and physical meteorology. Since 2008, ATMO has received over $40 million in research funding and produced over 600 peer-reviewed publications. The intellectual quality of ATMO is frequently recognized externally, placing it in the top ten among atmospheric science programs nationally for awards per faculty member.

ATMO includes over twenty faculty members, a dozen research staff members, and six academic and business support staff members. As one of the best and largest academic programs in atmospheric science in the United States, ATMO has a work environment that allows the department to carry out its mission effectively, whether it is learning, teaching, research, or service, and the Atmospheric Sciences Department is performing well. While there are challenges, the state of the department is good, and the department is well positioned to continue its advancement.
Chapter 1 - Introduction

1.1 Welcome from the Department Head

On behalf of the Department of Atmospheric Sciences at Texas A&M University (TAMU), thank you for your service as external reviewers of our academic program. Our previous external review was conducted in 2009. Under current university policies, external program reviews are conducted every seven years to evaluate all aspects of a department, including teaching, research and service. We appreciate this opportunity for a comprehensive evaluation of this department and its activities, including identifying the department’s achievements and challenges.

This self-study report includes a brief history of TAMU and an introduction to the origin and evolution of the Department of Atmospheric Sciences. This report also contains a detailed comparison of current department conditions with the counterparts when the 2009 external review was conducted. It includes a summary of current departmental personnel and the administrative organization of the department. Additional sections provide details on the undergraduate program, the graduate program, and research and service activities in the department. The concluding section contains our internal assessment of the state of the department and plans for the future. The appendices include details of the undergraduate and graduate curricula; program assessment components and key findings; curricula vitae for faculty and research staff; and lists of scholarly publications and extramurally funded grants/contracts.

Your evaluation and recommendations will be critical to the improvement of our department. In particular, your review of the department’s performance will support our development toward the next stage of excellence in teaching, research and service. This review effort is a time-consuming activity, and we thank you again for your service. We will be happy to answer any questions you may have.

Ping Yang
Professor and Department Head

1.2 Charge to the Review Committee

Prepared February 19, 2016 by the TAMU Academic Review Committee

The Academic Program Review (APR) process at TAMU provides the occasion for academic units to plan strategically, assess the quality and efficacy of their programs, and determine the best courses of action for ongoing improvement. APR is at the heart of our institutional commitment to excellence, and we sincerely thank you for assisting us. Described below is the charge to the committee.

Please examine the department and its programs and make recommendations that will help in planning improvements. Your resources are a self-study report prepared by the department, copies of materials from the program’s last review, information you gain through personal interactions while visiting TAMU, copies of strategic plans and goal-setting documents at the department, college, and/or university level, and any additional information requested by you or by the department. Within the broad charge of recommending ways the department can continue to improve are some specific questions that we would like you to address:
Based on the data / information provided in the self-study report or gathered by the review team, what are the department’s overall strengths and weaknesses?

How well do the department’s strategic goals align with those of its college and with those of Texas A&M University?

How would you compare this department with its peers (teaching, research, service and national leadership)?

What improvements (including student learning and faculty development) has the department made since the previous program review?

With only current resources or a modest infusion of new ones, what specific recommendations could improve the department’s performance, marginally or significantly?

We look forward to meeting with you during your time on campus. If you have any questions or require additional information prior to your visit, please contact Ms. Bettyann Zito, APR Program Coordinator, at apr@tamu.edu, or Dr. Ping Yang, Department Head, at pyang@tamu.edu.
Chapter 2 – Departmental Overview

2.1 Overview of the Program and Department’s Mission and Goals

Program Overview

Atmospheric Sciences (formerly Meteorology) has been an independent department at Texas A&M since 1965. The department has progressed well beyond its earlier reputation as a synoptic training school. Indeed, in terms of faculty size, the department is currently one of the largest in the nation, with research activities covering virtually all branches of the discipline. At this time we have 19 tenured and tenure-track faculty (one as joint appointment), one instructional professor, two instructional assistant professors, and two research professors. In addition, the department is currently seeking administrative approval to conduct a faculty search to fill an assistant professor position.

We have research strengths in four main areas:

- **Weather and Forecasting** (numerical weather prediction, data assimilation, synoptic meteorology, severe weather)
- **Dynamical Meteorology and Climate Dynamics** (geophysical fluid dynamics, climate prediction, climate change, radar meteorology, tropical meteorology)
- **Atmospheric Chemistry** (fundamental chemistry, air quality, aerosol physics, biogeochemical cycles)
- **Physical Meteorology** (radiative transfer, remote sensing, cloud physics, lightning)

In addition, one of our faculty members is actively engaged in planetary exploration and conducts relevant theoretical study and data analysis with a focus on Mars and Saturn’s moon, Titan.

The staff consists of six full-time positions, including four business staff members, one technical staff member, and one academic advisor. Our academic advisor is responsible for academic advising for both the Department of Atmospheric Sciences and the Department of Oceanography.

The Department of Atmospheric Sciences occupies part of the 9th floor, all of the 10th and 11th floors, all of the 12th floor except for the Oceanography Department offices, and the 14th floor (in the building superstructure) of the Eller Oceanography and Meteorology Building. This space includes offices for faculty, students, and staff; research laboratories; two computer teaching laboratories; a combined radar operations room and broadcast studio; a weather center for real-time observations and forecasting; a seminar room; two small meeting rooms; and the department administrative offices. In the college server room (Eller B04), the department occupies approximately one row of rack space for departmental and principal investigators’ (PI) computers. The department maintains the Aggie Doppler Radar (ADRAD) on the roof of the Eller Building. A number of individual professors deploy instruments in the field for research projects using trailers, fixed sites, and aircraft. This includes the Houston Lightning Detection and Ranging network. Furthermore, the TAMU Supercomputing Center is a university facility, but it is also an important resource for a number of faculty members in the department.

Table 2.1 lists the degrees awarded by the department from 2009 to 2016 academic years. The Department of Atmospheric Sciences offers the B.S. degree in Meteorology and the M.S. and
Ph.D. degrees in Atmospheric Sciences.

Enrollment in our undergraduate program has been between 110 and 150 students over the last several years. Most who receive the B.S. degree intend to follow one of four different career paths: operational work including forecasting (with either the National Weather Service or a private company), broadcast meteorology, graduate school in atmospheric sciences, or work in air quality. A fraction of our students leave the field of atmospheric sciences entirely, in which case we believe that the general science education that they receive here will serve them well. In the past we have not made a strong attempt to track our students after graduation. However, as part of an ongoing assessment effort under the university’s accreditation process, we are putting in place new mechanisms to evaluate the long-term success of our program and to better understand both students’ goals and their paths after leaving TAMU.

<table>
<thead>
<tr>
<th>Degree Offered</th>
<th>Degrees Awarded Annually</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>09-10</td>
</tr>
<tr>
<td>B.S.</td>
<td>26</td>
</tr>
<tr>
<td>M.S.</td>
<td>8</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
</tr>
</tbody>
</table>

Our undergraduate curriculum is designed to train students for the four broad career paths listed above. Because the different paths necessitate some variability in appropriate courses, we offer students a range of upper-level electives so they can tailor course selections to their personal career goals. Students who wish to work for the National Weather Service, for example, should choose technical electives that will fulfill the U.S. Civil Service employment requirements for meteorologists.

Atmospheric Sciences faculty also participate in two college-wide undergraduate degree programs: the B.S. in Environmental Geosciences and the B.S. in Environmental Studies.

The graduate student body is roughly evenly split between M.S. and Ph.D. students, with a total of 63 enrolled in academic year 2015-2016. The M.S. degree includes both thesis and non-thesis options, although the vast majority of M.S. students choose the thesis option. More than half our M.S. students continue their studies in the Ph.D. program after completing their M.S. degree. Our graduate students come from diverse academic backgrounds, including physics, chemistry, mathematics, several fields of engineering, as well as meteorology and atmospheric sciences.

Statement of Department Mission and Goals
Texas A&M University is a comprehensive teaching and research university of the State of Texas and is the flagship institution of the Texas A&M University System. The overarching goal of the university is to serve the public good through teaching, research, and service to society.

Teaching: The Department of Atmospheric Sciences is dedicated to advancing scientific understanding of the atmosphere and imparting that knowledge for the benefit of society. Our most fundamental mission is to help students at all levels – from undergraduate to postdoctoral – acquire and develop scientific knowledge, critical thinking skills, the ability to continue to learn,
and the potential to contribute to society. We also serve students in other disciplines through survey courses, which give students a better understanding of nature and of scientific methods, and through specialized courses for students in fields that require applied knowledge of meteorology.

**Research:** Our research efforts serve two purposes: to expand the frontiers of atmospheric science, and to give students experience and training in conducting research. The knowledge gained from research may be fundamental, or applicable to a particular societal need. Research results are communicated through journals or other appropriate media to other scientists and the public. As a department, we seek to maintain the highest standards of excellence in research.

**Service:** We have a duty to contribute to society through our educational and research activities. This public service includes administrative and educational efforts both inside and outside the university proper, such as (1) Assisting in university governance (such as developing and disseminating teaching materials and improving pre-college education, and (2) Research-related efforts (such as serving on committees of scientific societies, providing advice to state and federal governments, acting as reviewers and editors, organizing meetings, and assisting industry). Research and service activities go hand-in-hand with teaching in that they are critically important components of improving the quality of our teaching and of the scientists we train. We are committed to assisting Texas A&M University and the State of Texas to carry out their broader missions.

### 2.2 History of the Department

**Texas A&M University in Brief**

The school now named Texas A&M University was established in 1876 as the Agricultural and Mechanical College of Texas. The Texas A&M College was the first public institution of higher education in the state. For nearly the first century of its existence, the school was an all-male college with mandatory participation in military training within the Corps of Cadets. By the late 1950s, however, the school had begun to broaden its educational and research missions. In 1963, the college was renamed Texas A&M University (TAMU) and shortly thereafter became coeducational. Subsequent years saw a period of rapid growth, with total enrollment increasing nearly six-fold between 1960 and 2000.

Today Texas A&M is one of the largest universities in the nation. Fall 2015 enrollment on the College Station campus exceeded 58,000, with 12,000 graduate and professional degree students and 46,000 undergraduates. The university has more than 3,500 faculty members. TAMU is among a select handful of universities to be triply designated as a land grant, sea grant, and space grant institution. Annual research expenditures in 2014 were $866M, which ranked 17th nationally.

**The Department’s Early Years: 1950–1986**

Meteorology at Texas A&M has its roots in the Department of Oceanography, established in 1949 as the first university oceanography department in the country. Meteorological instruction began shortly thereafter with the additions of Professors Robert Reid and John Freeman, each of whom brought several soft-money meteorologists to the department. In 1953 the United States Air Force began to send officers to TAMU for one year of intensive meteorology education, and the number of courses taught in the subject increased rapidly. To reflect this growth, the department was renamed the Department of Oceanography and Meteorology in 1956.
Earth sciences at Texas A&M underwent a major reorganization in the mid-1960s with the formation of the College of Geosciences. Part of this reorganization was the creation of an independent Department of Meteorology with nine initial faculty members. Planning was begun for a new 125,000 square foot Oceanography and Meteorology (O&M) building, and by 1973 the department had taken up permanent residence in its current location.

Throughout its history the department has offered both undergraduate and graduate degrees. The focus of the undergraduate program is on weather forecasting and air quality. The main research areas of the faculty during the early years were synoptic meteorology, climatology, and the development of radar as an operational tool. The department also played a role in cloud seeding and weather modification programs through much of the 1970s.

Texas A&M is one of the fourteen founding members of the University Corporation for Atmospheric Research (UCAR), which has operated the National Center for Atmospheric Research (NCAR) in Boulder, CO for more than 50 years. NCAR is a federally funded research and development center (FFRDC) and the largest single item in the National Science Foundation budget. NCAR provides research facilities to the atmospheric sciences, such as supercomputers and research aircraft that are beyond the capabilities of individual universities. UCAR now has more than 100 member universities in North America.

Until the mid-1980s, most of the graduate students in the department were Air Force officers supported by the military to complete M.S. and Ph.D. degrees under strict time constraints. External research funding during this period was low, and most graduate degree recipients returned to their military careers.

The decade following the mid-1980s brought a marked transformation of the department as a dedicated effort was made to revitalize the graduate research program. New faculty members were hired with the goal of developing active, extramurally funded research programs. By the end of the 1990s, research interests in the department had broadened considerably and included fields such as satellite and remote sensing, climate dynamics, and atmospheric chemistry, in addition to the traditional radar, dynamic, and synoptic interests. To reflect this broadening, the department was renamed the Department of Atmospheric Sciences in 1998.

Expansion: 2001–Present
At the beginning of the century, the department comprised 9.5 faculty members (the half member indicating a joint position with oceanography). Since then, the department has more than doubled in size. This expansion is in large part the result of the ‘Faculty Reinvestment Program’ led by TAMU president Robert Gates in the early 2000’s.

During the last two decades, the department’s strategy has been to build and maintain a comprehensive research and education program in the atmospheric sciences. While it is not possible to have expertise in every specialty within meteorology and atmospheric science, the department has particular strengths in four overlapping areas summarized in Section 2.1, namely,
Weather and Forecasting; Dynamical Meteorology and Climate Dynamics; Atmospheric Chemistry; and Physical Meteorology.

2.3 Summary of 2009 External Program Review
In 2009 there were 22 faculty members including a joint appointment from the Department of Oceanography (Table 2.2). Nineteen faculty members from 2009 are still in the department (names in bold in Table 2.2). However, two tenured faculty members (North and Orville) have retired and been reclassified as part-time non-tenure research professors.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenneth Bowman</td>
<td>Professor</td>
<td>Dynamics, climate dynamics</td>
</tr>
<tr>
<td>Sarah Brooks</td>
<td>Assistant Professor</td>
<td>Aerosol physics</td>
</tr>
<tr>
<td>Ping Chang</td>
<td>Professor (Joint OCNG)</td>
<td>Climate variability, modeling</td>
</tr>
<tr>
<td>Don Collins</td>
<td>Associate Professor</td>
<td>Aerosol physics</td>
</tr>
<tr>
<td>Don Conlee</td>
<td>Instructional Associate Professor</td>
<td>Weather analysis, forecasting</td>
</tr>
<tr>
<td>Andrew Dessler</td>
<td>Professor</td>
<td>Climate change</td>
</tr>
<tr>
<td>Craig Epifanio</td>
<td>Associate Professor</td>
<td>Mesoscale dynamics</td>
</tr>
<tr>
<td>Robert Korty</td>
<td>Assistant Professor</td>
<td>Paleoclimate, hurricanes</td>
</tr>
<tr>
<td>Mark Lemmon</td>
<td>Associate Professor</td>
<td>Planetary atmospheres</td>
</tr>
<tr>
<td>Shaima Nasiri</td>
<td>Assistant Professor</td>
<td>Radiative transfer, remote sensing</td>
</tr>
<tr>
<td>John Nielsen-Gammon</td>
<td>Professor</td>
<td>Synoptic meteorology, forecasting</td>
</tr>
<tr>
<td>Gerald North</td>
<td>University Distinguished Professor</td>
<td>Climate and statistics</td>
</tr>
<tr>
<td>Richard Orville</td>
<td>Professor</td>
<td>Physical meteorology, lightning</td>
</tr>
<tr>
<td>Lee Panetta</td>
<td>Professor</td>
<td>Geophysical fluid dynamics</td>
</tr>
<tr>
<td>Ramalingam Saravanan</td>
<td>Professor</td>
<td>Climate dynamics</td>
</tr>
<tr>
<td>Gunnar Schade</td>
<td>Assistant Professor</td>
<td>Biogeochemical cycles</td>
</tr>
<tr>
<td>Courtney Schumacher</td>
<td>Assistant Professor</td>
<td>Tropical and radar meteorology</td>
</tr>
<tr>
<td>Russ Schumacher</td>
<td>Assistant Professor</td>
<td>Mesoscale modeling</td>
</tr>
<tr>
<td>Istvan Szunyogh</td>
<td>Associate Professor</td>
<td>Data assimilation, forecasting</td>
</tr>
<tr>
<td>Thomas Wilheit</td>
<td>Professor</td>
<td>Remote sensing</td>
</tr>
<tr>
<td>Ping Yang</td>
<td>Professor</td>
<td>Radiative transfer, remote sensing</td>
</tr>
<tr>
<td>Renyi Zhang</td>
<td>Professor</td>
<td>Atmospheric chemistry</td>
</tr>
</tbody>
</table>

The 2009 review report states “Maintaining and growing a broad program requires careful consideration of the directions of future faculty hires. The faculty asserts, and the Panel concurs, that the department’s faculty is now at an appropriate size for its mission. Thus, the upward evolution of the faculty will require judicious replacement hiring for retiring faculty members.” Following the 2009 review recommendation, the department has maintained its research strengths within the faculty size recommendations cited in the 2009 report.

Administrative Staff
In 2009 the department’s office staff consisted of a business coordinator and two business associates. The 2009 report pointed out “The workload for department office financial staff is perceived to be unreasonable by both staff and faculty, and it appears that growing workload requires additional staff.” We are pleased to report that the department currently has four full-time business staff positions. In addition, some business functions in the college have been
consolidated. Thus, the aforementioned recommendation issued by the 2009 report has been successfully addressed.

The summary of the 2009 report is quoted below in its entirety:

- “The Department of Atmospheric Sciences has used the Faculty Reinvestment Funds wisely in hiring excellent new faculty members. The addition of the new faculty members has created a broader atmospheric sciences program, which the Panel feels is now competitive with top-tier atmospheric science and meteorology programs in the United States.

- The department has adequate space and has invested in adequate facilities to accommodate productive research and effective teaching by the faculty. However, the administrative and IT staffs have not grown despite the increased needs of the faculty, their research requirements and their students.

- The collegiality among the faculty, staff, graduate students, and undergraduate students appears to be strong and permeates the whole program. The faculty are well organized and working together. The Panel views this environment as being fertile ground for the future growth of the program and will enhance its attractiveness to future faculty, staff, and students.

- Issues and problems with the academic program are similar to those of other departments with successful undergraduate and graduate programs. They appear to be working to resolve these issues in an effective manner.

- The department has the faculty, facilities, organization, collective vision, and will to continue to grow into a top-tier department. Despite the low cost of living in College Station, Texas, competitive salaries are needed to attract and retain a world-class faculty.

- Continued improvement in academic excellence also requires an increase in the quality of graduate students. The panel believes that the existing faculty strength and the developing careers of excellent new faculty members will build the department’s reputation, which will in turn continue to raise the quality of the graduate students. The continued increase in graduate student quality will in turn help the recruiting of future excellent faculty. But this process takes time.

- The department has made the necessary first steps toward developing assessment plans for its academic programs. The faculty recognizes that time will be diverted from other activities in order to develop and implement these assessment plans, but the faculty is committed to the process because it also understands that the information coming from the assessment will help the academic programs improve.

- The Panel agrees with the Department Head’s intention to develop a strategic plan this year. Developing a strategic vision will enable the department to present a compelling case to the new Dean for its program objectives who have the expertise that the faculty has identified as critical for the department’s continued ascent.”
2.4 Improvements in Response to 2009 External Program Review

The department has made substantial progress in responding to the external review team’s report, as detailed below.

Updating Department Strategic Plan

All the departments within the College of Geosciences updated their strategic plans under the leadership of Dean Kate Miller. The departmental strategic plan finalized in 2014 is attached in Appendix D. The updated Department of Atmospheric Sciences strategic plan gives a clear vision of the department and defines its mission. A thorough overview is given in the strategic plan of the department from various perspectives, including personnel, facilities and infrastructure, research activities, and peer and aspirant institutions. Furthermore, the updated strategic plan contains a self-assessment of the department’s strengths and weaknesses. The plan includes two major components: imperatives and frontiers. The plan details how the department intends to implement specific strategies including maintaining a top-tier undergraduate program, developing signature undergraduate programs, increasing student credit hours, improving communications/recruiting/outreach, conducting more research initiatives and faculty hiring, developing undergraduate and graduate textbooks, expanding graduate course offerings, supporting the Office of the State Climatologist, and expanding undergraduate scholarship and graduate fellowship funds.

The department has moved forward to implement a number of action items identified in the strategic plan. For example, the strategic plan identified filling the vacancy created by the departure of Dr. Fuqing Zhang as a specific priority. The department recruited an outstanding faculty member, Dr. Istvan Szunyogh, as an associate professor in 2009, who was promoted to full professor in 2012. More recently, the department recruited and hired an outstanding young researcher, Dr. Christopher Nowotarski, in the area of weather analysis and meteorology. In addition, in 2016 the department recruited and hired Dr. Yangyang Xu in the area of climate science. More generally, the strategic plan included the goal of attracting and retaining high-quality faculty. The department is sensitive to and working very hard in this respect. As just one example, an outstanding faculty member received a job offer from the University of Edinburgh. After this faculty member informed the department that she was interviewed for a Senior Lecturer position in the area of atmospheric aerosols, a proactive faculty retention effort between the department and college was carried out. With a competitive retention package offered to this faculty member and the very positive attitude demonstrated by the college and department towards facilitating this faculty member’s career development, she decided to stay with TAMU. However, the department does not always succeed in retaining our outstanding faculty members. For example, Dr. Shaima Nasiri left TAMU and joined the U.S. Department of Energy as a program manager. Indeed, faculty retention is a pressing challenge.

Improve Faculty Salaries

The external review report notes “The department has the faculty, facilities, organization, collective vision, and will to continue to grow into a top-tier department. Despite the low cost of living in College Station, Texas, competitive salaries are needed to attract and retain a world-class faculty” and “Faculty salaries are substantially below average for comparable atmospheric science departments.”
The department has substantially increased faculty salaries. In addition to merit-based raises averaging ~4%, many faculty members, particularly associate professors and female faculty members, received substantial equity raises thanks to significant support from the Dean’s Office and the Office of the Provost. This is a significant step toward bringing our faculty salaries into alignment with our peer institutions.

**Improve Administrative/IT Staffing Levels and Salaries**
Departmental administrative functions continue to operate well despite the almost complete turnover of office staff during the last three years. Efforts have been made to resolve staff salary equity issues within the college. In addition to generic IT support provided by the college, the college assigns an IT expert, Mr. Neil Smith, to specific tasks related to our department, who is responsible for the department’s specific IT and instrumentation needs, including support for teaching instrumentation support, support for specialized research computing, basic front-line maintenance for the department's roof-mounted radar, and as technical liaison for all outsourced radar engineering. Furthermore, the department uses the department’s returned indirect costs funds to support a part-time IT expert. This position is currently held by Dr. Gyorgyi Gyarmati, who is responsible for teaching software support, specialized research computing, and IT/instrument inventory.

**Major Research Facilities**
Our faculty has worked diligently towards establishing major research facilities. For example, Dr. John Nielsen-Gammon co-led a proposal to host the Department of Interior South-Central Climate Science Center. This strong proposal articulated some unique opportunity matches between needs and expertise and was among the final two considered for funding. Dr. Renyi Zhang led several major research proposals including one entitled “Assessing the Impacts of Atmospheric Aging of Black Carbon on Air Quality and Climate Forcing” submitted with a requested budget of $899,983 to the U.S. Environmental Protection Agency, a proposal entitled “Development of an Integrated Mass Spectrometry System for Chemical Analysis of Nano- to Micron-Sized Aerosols” submitted with a requested budget of $1,378,123 to the U.S. National Science Foundation MRI program, and a proposal entitled “Clean Air Research Centers” submitted with a requested budget of $8,000,000 to the U.S. Environmental Protection Agency. Although these proposals were not funded, they reflected the faculty’s enthusiasm and hard-working attitude toward establishing major research facilities at TAMU in the areas of atmospheric science and climate study.

**Annual and T&P Review**
Consistent with university and college policies, the department has updated its annual performance review procedure and criteria. The department has also developed policies on post-tenure review, which have been approved by the Dean of Faculties and are now in effect. In 2013, post-tenure reviews were conducted for two full professors in the department, which were reported as satisfactory.

**Graduate Program Enhancement**
The department’s graduate program largely depends on supporting graduate students as research assistants funded by grants. Only a few students are supported as teaching assistants through college funding. It is a challenge to maintain the present scale of the department’s graduate
program under the current funding situation. The department strongly encourages faculty members to recruit and support more graduate students. As a result, 18 new graduate students were recruited in 2012 and 14 in 2013. The department graduate program enrollment has been stable since then.

It is important to point out that the quality of new students in the department’s graduate program has been improving. The department provides travel and local lodging support to prospective domestic students invited to visit the department each year. The meetings and activities with the faculty and existing students substantially increase the success rate of recruiting high quality graduate students. Furthermore, among the recruited new students, the percentage of both domestic and international students from highly regarded universities has been increasing over the past four years. Additionally, we call special attention to the fact that the Graduate Program Committee has also enhanced the diversity of the graduate student population, including the offering of fellowships to students from underrepresented groups. To enhance recruitment, the department offers competitive stipends to graduate students; specifically, $1875 per month for master’s degree candidates, $1975 for pre-qualifying examination Ph.D. candidates, and $2,125 per month for post-qualifying examination Ph.D. candidates. Moreover, the department has transitioned to a policy of paid tuition and fees for all students. In the past, the student fees, which can be substantial, were not paid or only partially paid.

The department now offers some carefully-selected graduate elective courses. For example, with the approval of the Dean of Faculties and support of the college, the department invited Professor Manfred Wendisch of the University Leipzig, Germany, to team-teach with Professor Don Collins a graduate elective course on cloud physics and precipitation in the 2013 spring semester. This course turned out to be successful and contributed substantially to the department’s graduate education in physical meteorology.

As stated in the one-year follow up report submitted by Dr. Bowman in 2009, the goal of the department is to require Ph.D. students to take one or two courses beyond those required for the M.S. However, the department lacks sufficient manpower to offer additional graduate elective courses due to the balance of the department’s efforts on teaching undergraduate and graduate courses. The offering of more elective courses for graduate students will be revisited in 2017.

The department’s graduate program has defined three tracks: atmospheric dynamics/climate, atmospheric physics, and atmospheric chemistry. Core courses are offered towards graduate students’ general education in atmospheric sciences and fundamental knowledge required for students’ thesis research and potential future research career. Material selection and updates of the core courses are coordinated by the department’s Graduate Program Committee and the Qualifying Exam Committee with an eye toward balancing the depth and breadth of the core course contents.

**Undergraduate Program Enhancement**

The 2009 external review team agreed with the department that the present size of the undergraduate program is appropriate and “Any increase in the program will likely necessitate multiple sections for the required courses, significantly increasing the undergraduate teaching obligations of the faculty at the expense of the graduate courses and service courses.”
The department’s undergraduate program is one of the largest in meteorology and atmospheric sciences in the country. In the past four years, the size of the undergraduate program varied with approximately between 110 and 140 students (please see Section 5.1 for the details).

While the department has been endeavoring to maintain the stability of the size of the undergraduate program, substantial efforts have also been made to enhance the quality of the undergraduate program. Specifically, there was a significant gap in the department’s undergraduate teaching and mentoring, which became more pronounced after a former lecturer retired in 2008. After an extensive search effort, our department recruited a non-tenure-track instructional associate professor, Dr. Don Conlee, to enhance our undergraduate meteorology program, particularly, to teach introductory courses on atmospheric sciences and undergraduate-level courses related to weather. Dr. Conlee has merged his passion for education and his expertise in observational meteorology in innovative, high-impact learning programs, which have produced both major program enhancements and undergraduate research opportunities. For example, with moderate costs, he developed a modern real-time weather center that has been proved a valuable tool for undergraduate education in meteorology. Dr. Conlee has been promoted as an Instructional Professor. More recently, the department recruited and hired Dr. Timothy Logan as a non-tenure-track instructional assistant professor. Since Dr. Logan joined the department, he has been substantially contributing to the department’s undergraduate education, particularly, teaching ATMO 201.

The undergraduate program has had two courses approved in the new Core Curriculum. Our two introductory classes, ATMO 201 and ATMO 202, were both approved to count towards the required 9 hours of Life and Physical Sciences credits. We normally teach the new Global Climate Change course (GEOS 210), which is also approved in the new Core Curriculum. In addition, we updated our degree plan to fit the new Core Curriculum beginning in the 2014-2015 Academic Year. We replaced the two hours of Kinesiology credits with two additional required credits for classes in the major.

A substantial increase in departmental student credit hours can come through our service courses: ATMO 201 and 202, and GEOS 210. Our department continues to coordinate with the university to obtain large classrooms that are critical to increasing the enrollments in these courses.

Enrollment in GEOS 210 is presently maxed out, indicating a potential to further expand the course. Moreover, the department offers a graduate course on climate change (ATMO 629) that attracts students from across the university. The average enrollment in 2015 and 2016 was 18.5 students, corresponding to 55.5 student credit hours. We expect the enrollment in ATMO 629 to be stable in the next few years.

The department has been considering the development of two additional minor programs, one in air quality and the other in climate policy. The air quality minor program may attract students in civil engineering while the climate policy program may attract students in political science. If these minor programs are successfully put in place, we expect the department’s student credit hours to increase considerably.
2.5 Current State of the Department

Current Faculty and Research Staff

Following the expansion during the 2000’s, the number of faculty members administratively located in the department has stabilized in the low 20s. The current faculty is listed in Table 2.3. Dr. Chang’s primary department is Oceanography; he has a joint appointment in Atmospheric Sciences. Drs. King and Kolb have long-term visitor appointments through the Texas A&M Institute for Advanced Study. Six faculty members hold endowed chairs or professorships, and two hold the title of University Distinguished Professor, which is a high honor at Texas A&M.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenneth Bowman*</td>
<td>Professor</td>
<td>Dynamics, climate dynamics</td>
</tr>
<tr>
<td>Sarah Brooks</td>
<td>Professor</td>
<td>Aerosol physics</td>
</tr>
<tr>
<td>Ping Chang*</td>
<td>Professor (Joint OCNG)</td>
<td>Climate variability, modeling</td>
</tr>
<tr>
<td>Don Collins</td>
<td>Professor</td>
<td>Aerosol physics</td>
</tr>
<tr>
<td>Don Conlee</td>
<td>Instructional Professor</td>
<td>Weather analysis, forecasting</td>
</tr>
<tr>
<td>Andrew Dessler*</td>
<td>Professor</td>
<td>Climate change</td>
</tr>
<tr>
<td>Craig Epifanio</td>
<td>Associate Professor</td>
<td>Mesoscale dynamics</td>
</tr>
<tr>
<td>Michael King</td>
<td>TIAS Faculty Fellow</td>
<td>Radiation, remote sensing</td>
</tr>
<tr>
<td>Charles Kolb</td>
<td>TIAS Faculty Fellow</td>
<td>Atmospheric chemistry</td>
</tr>
<tr>
<td>Robert Korty</td>
<td>Associate Professor</td>
<td>Paleoclimate, hurricanes</td>
</tr>
<tr>
<td>Mark Lemmon</td>
<td>Associate Professor</td>
<td>Planetary atmospheres</td>
</tr>
<tr>
<td>Tim Logan</td>
<td>Instructional Assistant Professor</td>
<td>Aerosol transport</td>
</tr>
<tr>
<td>Raffaele Montouro</td>
<td>Instructional Assistant Professor</td>
<td>Climate modeling</td>
</tr>
<tr>
<td>John Nielsen-Gammon</td>
<td>Regents Professor</td>
<td>Synoptic meteorology, forecasting</td>
</tr>
<tr>
<td>Gerald North</td>
<td>Research Professor &amp; University Distinguished Professor Emeritus</td>
<td>Climate and statistics</td>
</tr>
<tr>
<td>Chris Nowotarski</td>
<td>Assistant Professor</td>
<td>Mesoscale meteorology</td>
</tr>
<tr>
<td>Richard Orville</td>
<td>Research Professor &amp; Professor Emeritus</td>
<td>Physical meteorology, lightning</td>
</tr>
<tr>
<td>Lee Panetta</td>
<td>Professor</td>
<td>Geophysical fluid dynamics</td>
</tr>
<tr>
<td>Anita Rapp</td>
<td>Assistant Professor</td>
<td>Remote sensing, climate</td>
</tr>
<tr>
<td>Ramalingam Saravanan</td>
<td>Professor</td>
<td>Climate dynamics</td>
</tr>
<tr>
<td>Gunnar Schade</td>
<td>Associate Professor</td>
<td>Biogeochemical cycles</td>
</tr>
<tr>
<td>Courtney Schumacher*</td>
<td>Professor</td>
<td>Tropical and radar meteorology</td>
</tr>
<tr>
<td>Istvan Szunyogh</td>
<td>Professor</td>
<td>Data assimilation, forecasting</td>
</tr>
<tr>
<td>Yangyang Xu</td>
<td>Assistant Professor</td>
<td>Climate dynamics</td>
</tr>
<tr>
<td>Ping Yang*</td>
<td>Professor and Head</td>
<td>Radiative transfer, remote sensing</td>
</tr>
<tr>
<td>Renyi Zhang*</td>
<td>University Distinguished Professor</td>
<td>Atmospheric chemistry</td>
</tr>
</tbody>
</table>

*Holder of endowed chair or professorship. Note, Dr. Raffaele Montouro has a 0.5FTE appointment as Instructional Assistant Professor and 0.5FTE as Research Scientist (see Table 3.3).

Table 2.4 lists Atmospheric Sciences faculty members with joint appointments in other departments.
Table 2.4 Atmospheric Sciences Faculty Joint Appointments

<table>
<thead>
<tr>
<th>Name</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lee Panetta</td>
<td>Mathematics</td>
</tr>
<tr>
<td>Ping Yang</td>
<td>Physics</td>
</tr>
<tr>
<td>Renyi Zhang</td>
<td>Chemistry</td>
</tr>
</tbody>
</table>

Current research staff are listed in Table 2.5.

Table 2.5 Atmospheric Sciences Research Staff in 2016

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aaron Funk</td>
<td>Research Associate</td>
</tr>
<tr>
<td>Mary Gammon</td>
<td>Program Aide</td>
</tr>
<tr>
<td>Gyorgyi Gyarmati</td>
<td>Assistant Research Scientist</td>
</tr>
<tr>
<td>Ron Li</td>
<td>Assistant Research Scientist</td>
</tr>
<tr>
<td>Raffaele Montuoro</td>
<td>Research Scientist</td>
</tr>
<tr>
<td>Joseph Niehaus</td>
<td>Postdoctoral Research Associate</td>
</tr>
<tr>
<td>Calvin Owens</td>
<td>Research Assistant</td>
</tr>
<tr>
<td>Jianfei Peng</td>
<td>Postdoctoral Research Associate</td>
</tr>
<tr>
<td>Steven Schroeder</td>
<td>Postdoctoral Research Associate</td>
</tr>
<tr>
<td>Patrick Stegmann</td>
<td>Postdoctoral Research Associate</td>
</tr>
<tr>
<td>Guanglin Tang</td>
<td>Postdoctoral Research Associate</td>
</tr>
<tr>
<td>Richard Weitz</td>
<td>Program Aide</td>
</tr>
</tbody>
</table>
Chapter 3 – Departmental Administration and Management

3.1 Department Head

The Department Head is appointed by and reports to the Dean of the College of Geosciences. The appointment is usually made through a formal search process that includes significant input from the department. The Dean determines whether the search should be internal or external. The last four heads (North, Orville, Bowman, Yang) were selected through internal searches. The Dean appoints a search committee. Faculty members from other departments within the college are usually included in the search committees. After applications are sought through the usual channels, interviews are conducted, with opportunities to visit with all faculty members, staff, and students. Comments are solicited from all interested parties and sent to the search committee and the Dean; subsequently, the committee makes a recommendation to the Dean, usually in the form of a ranked short list. The Dean normally begins negotiations with candidates on the short list, although the final choice is at his or her discretion. One term of the Department Head appointment is four years. The Department Head receives an eleven-month salary.

Department Heads have broad discretionary powers in conducting departmental affairs, although faculty and administrative staff positions are controlled by the college. As the executive officer of the department, the Department Head is responsible for supervising and directing the ATMO’s teaching, research, and service mission, consistent with that of the college and university. The Head’s primary responsibilities include budget, curricula, academic program assessment, degree offerings, faculty and student recruitment, faculty and student development, tenure and promotion, fundraising, long range strategic planning, matters of academic quality, promotion of department interests, and research planning.

The Department Head has ultimate authority over all matters of departmental policy other than those matters involving curricula and degree requirements, which may only be changed internally by majority vote of the faculty. However, the Department Head should strive to involve the faculty and other relevant stakeholders in all policy decisions, acting in the spirit of a Department Chair to the extent practicable.

The Department Head may ask that particular faculty members assume certain responsibilities and authorities in special circumstances, such as when the Department Head will be traveling or otherwise unable to fully carry out the duties of the position.

The Department of Atmospheric Sciences has a formal set of bylaws, which provides guidelines for the important matters in the department, such as course adoption, curriculum, and conduct of exams. There are, of course, written policies in many areas of university activities at the university, college, and department levels as well. Academic policies pertaining to students, such as degree requirements and the procedure for administering the Ph.D. qualifying exam, are provided in the graduate student handbook.

Because the department is relatively small, final decisions on most matters are made either by the Department Head or by a vote of the whole faculty. For example, changes in degree requirements are first discussed within the appropriate committee (graduate or undergraduate). The committee forwards a proposal to the faculty for discussion and possible amendment. The entire faculty then votes on the amended recommendation.
3.2 Departmental Executive Committee
The Department Head is Chair of the Executive Committee. Its other members are the Chair of the Undergraduate Program Committee, the Chair of the Graduate Program Committee, the Chair of the Awards Committee, and the Business Administrator or equivalent staff member.

The Executive Committee advises the Department Head on matters involving budgets, allocation of resources, administration, and development, and on other matters as needed. The Executive Committee establishes its own procedures for operation in all matters not otherwise covered by these bylaws.

Some departments in the college use the department’s internal funds to provide three months of summer salary for an assistant department head. The Department of Atmospheric Sciences has chosen to provide one month of summer salary from the departmental indirect-cost returned funds to support unfunded research of the chairs of the two most burdensome committees, the Undergraduate Program Committee and the Graduate Program Committee. These positions are currently held by Drs. Korty and Szunyogh, respectively. Dr. Dessler currently serves as the chair of the Awards Committee, and Ms. Morrison is currently the department’s Business Administrator.

3.3 Departmental Meetings and Committees
The department as a whole usually meets once per month, or on an as-needed basis, such as for qualifying exams or hiring decisions. The Department Head chairs the meetings. The department’s business administrator and the academic advisor and the department’s IT personnel are often invited to attend faculty meetings if relevant issues are to be discussed.

Much of the department’s academic business is organized into faculty committees. The Department Head appoints the members and chairs of committees on an annual basis. Chairs typically serve two to four years. It is a longstanding department policy that untenured faculty should not be burdened with chairing departmental committees.

Undergraduate Program Committee
This committee has responsibility for overseeing advising, curriculum, and course content for the undergraduate program, both for meteorology majors and for service courses. Recommendations by the committee are brought before the faculty as a whole for a vote. Current membership: Conlee, Dessler, Epifanio, Korty (chair), Logan, Nowotarski, Dennis (academic advisor), and Toy (student representative).

Graduate Program Committee
This committee oversees the recruitment and admission of new graduate students. Matters of graduate curriculum, course content, and advising also come under the purview of this committee. Current membership: Brooks, Epifanio, Lemmon, Panetta, Rapp, Saravanan, Szunyogh (chair), Zhang, Dennis (academic advisor), and Battalio (student representative).
**Qualifying Exam Committee**
This committee prepares and administers the Ph.D. qualifying exam every spring. Current membership: Panetta (chair) and recent instructors for the graduate core curriculum courses (ATMO 601, 602, 606, 611, 612, 613).

**Computing and Facilities Committee**
The Computing and Facilities Committee oversees departmental computing and facilities issues, although much of this is currently handled by the Department Head. Current membership: Conlee, Epifanio (chair), Gyarmati (part-time IT staff), Montuoro, and Rapp.

**Tenure and Promotion Committee** – The Tenure and Promotion Committee is busiest between May and September, when packages for tenure and promotion are prepared and submitted. Due to the relatively small size of the Atmospheric Sciences Department, the Tenure and Promotion Committee consists of all qualified faculty members, excluding the Department Head. Cases for tenure and promotion to associate professor are evaluated by all tenured faculty. Cases for promotion to full professor are evaluated by all tenured full professors. Tenure and Promotion cases follow detailed university and college procedures.

Under university rules, the Tenure and Promotion Committee also carries out annual evaluations of all assistant and associate professors. These evaluations are provided to the individual faculty and are input for annual evaluations conducted by the Department Head. These evaluations also serve to keep faculty members informed of perceptions of progress toward tenure and promotion before it is too late to change course.

Finally, the Tenure and Promotion Committee also provides evaluations of research staff and faculty as needed for promotion and salary decisions.

**Awards Committee**
The Awards Committee seeks out internal and external award possibilities and nominates faculty, staff, and students for those awards. Current membership: Dessler (Chair), Schumacher, and Zhang.

Although not technically committees, two additional departmental service positions are the liaisons for assessment and scholarships. The assessment liaison is responsible for carrying out curricular assessment activities for both the undergraduate and graduate programs, as well as reporting the findings to the university assessment office. The scholarship liaison handles the selection of undergraduate departmental scholarships and awards, as well as assisting the college with the selection of college-level scholarships. Currently, the liaisons are Epifanio for assessment and Schumacher for scholarships.

### 3.4 Administrative and Technical Services

**Administrative Staff**
The current office staff consists of a business administrator, business coordinator, business associate, lead office assistant, academic advisor, and a student worker (Table 3.1).
Atmospheric Sciences has four dedicated business staff members who are led by the Business Administrator. The College of Geosciences centralized the business functions approximately two years ago and now the business staff report to the Dean of Finance and not directly to the Department Head. The Atmospheric Sciences business team is responsible for processing all payroll, human resources and benefits for the college (other departments are responsible for accounts payable, business purchasing cards, travel and scholarships). The business staff are also responsible for day to day business functions in the department. The business administrator is the primary liaison between principal investigators and research administration agencies within the university (see discussion of research administration in the following section). Business administration requires the use of a number of different university information systems, as well as knowledge of many different State and university rules and policies.

The Department of Atmospheric Sciences shares an academic advisor with the Department of Oceanography. The academic advisor handles student advising (in conjunction with faculty), course scheduling, course catalogs, student records, and graduate student applications. Recently, the advising staff began reporting to the Dean’s office and not to the Department Head. The administrative staff work closely with their counterparts in the Dean’s office.

**Technical Staff**
Information Technology (IT) staff and administration have been removed from departments and consolidated in the Dean’s Office of the College of Geosciences, although day-to-day interaction with the IT staff remains in the departments (Table 3.2). The college has also assumed management and operations of college and department web sites. The college has constructed a server room in the basement of the Eller Building to be used for both administrative and research computing needs. The facilities managed by the IT staff are discussed further in the Facilities section below.

<table>
<thead>
<tr>
<th>Table 3.2 Atmospheric Sciences Technical Staff in 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gyorgyi Gyarmati</td>
</tr>
<tr>
<td>Assistant Research Scientist</td>
</tr>
<tr>
<td>Vacant</td>
</tr>
<tr>
<td>Radar engineer/technician</td>
</tr>
</tbody>
</table>

Our radar engineer position has been unfilled since 2007 and is an important issue for the department’s future. Currently, radar maintenance and repairs are carried out by third-party contracts, as assisted by Mr. Smith.

The department uses an online trouble-ticket system to submit and track IT service requests (help requests). Requests can be submitted via e-mail or a web interface. These requests can range from very minor (e.g., replace printer cartridge) to major (e.g., install new hardware or software). Currently, we estimate that about half of all help requests are submitted through the ticketing
system. The remainder of requests are submitted over the phone, in person, or via direct e-mail. We are encouraging department personnel to use the trouble-ticket system rather than informal communication to improve response time and to better track the workload. In 2008, 1280 help requests were submitted via the trouble-ticket system. The average resolution time was about 6 days, but ranged from 1 minute to relatively long durations. The majority of the workload can be classified as research (graduate student and faculty desktop and server computers), followed by teaching (teaching labs and classroom AV equipment), and then by administration (primarily department office computers). These statistics suggest a need to review the IT workload and customer satisfaction, and then consider how we can provide additional IT staff.

3.5 Financial and Academic Summary

Overview

Table 3.3 is a summary of department personnel, enrollment, and research funding over the last seven years. In 2016 the department recruited a new faculty member (Dr. Yangyang Xu) as an assistant professor to fill the position vacated by Dr. Shaima Nasiri, who joined the U.S. Department of Energy as a program manager.

One departmental IT staff position was transferred to the college in 2016. Graduate teaching assistant funding for the department is allocated by the college using a formula based on number of laboratory sections and number of students taught. The formula ignores differences in stipend rates across departments. The radar engineering/technician position remains vacant.

Atmospheric Sciences is not the largest department in the College of Geosciences in terms of tenure track FTEs, but the department generates a significant amount of returned indirect cost. For example, the total (direct and indirect) research expenditures in FY2014, FY2015 and FY2016 were approximately $4.29M, $4.47M, and $4.63M, respectively.

Table 3.3 Statistical summary of personnel, enrollment, and research activities for the period 2010-2016

<table>
<thead>
<tr>
<th>Faculty (FTE= 9mos; 100%)</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professors</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Associate Professors</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Assistant Professors</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total Budgeted</strong></td>
<td><strong>19</strong></td>
<td><strong>19</strong></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
<td><strong>18</strong></td>
<td><strong>19</strong></td>
<td><strong>19</strong></td>
</tr>
<tr>
<td>E&amp;G Base Faculty</td>
<td>$1,671,195</td>
<td>$1,592,706</td>
<td>$1,583,970</td>
<td>$1,562,321</td>
<td>$1,754,643</td>
<td>$2,029,543</td>
<td>$1,967,653</td>
</tr>
<tr>
<td>Temp Faculty (Lecturers/Visiting)</td>
<td>0.25</td>
<td>0.25</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Instructional Assoc/Asst Prof</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>2.50</td>
</tr>
<tr>
<td>Staff (Head Count Includes Advisors)</td>
<td>4.00</td>
<td>4.00</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td><strong>Total Budgeted</strong></td>
<td><strong>21.00</strong></td>
<td><strong>25.00</strong></td>
<td><strong>19.00</strong></td>
<td><strong>17.00</strong></td>
<td><strong>16.00</strong></td>
<td><strong>17.50</strong></td>
<td><strong>14.00</strong></td>
</tr>
<tr>
<td>Admin. E&amp;G Staff Salary</td>
<td>$132,877</td>
<td>$97,014</td>
<td>$90,644</td>
<td>$93,275</td>
<td>$97,093</td>
<td>$111,655</td>
<td>$121,699</td>
</tr>
<tr>
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<td>----------</td>
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<td>----------</td>
</tr>
<tr>
<td>Grad Assts (Headcount-Fall)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Assistant Lecturer (GAL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Graduate Assistant Teaching (GAT)</td>
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<td>SCH (Spr, Sum, Fall)</td>
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<td>TAMU/TAMRF</td>
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<td>95</td>
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<td>Total Active Accounts</td>
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<td>93</td>
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<td>97</td>
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<tr>
<td>Res Proposals Submitted (Prev FY)</td>
<td>74</td>
<td>74</td>
<td>59</td>
<td>58</td>
<td>47</td>
<td>49</td>
<td>42</td>
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<td>Research Proposals per Faculty FTE</td>
<td>3.89</td>
<td>3.89</td>
<td>3.47</td>
<td>3.41</td>
<td>2.61</td>
<td>2.58</td>
<td>3.26</td>
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<td>Direct Research Expenditures (Prev FY)</td>
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<td>$3,090,072</td>
<td>$3,575,005</td>
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<td>$3,181,161</td>
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23
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<th>1st FY</th>
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<th>4th FY</th>
<th>5th FY</th>
<th>6th FY</th>
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<td>$210,294.41</td>
<td>$249,702.47</td>
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<td>Total Indirect Research Exp (Prev FY)</td>
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<td>$1,138,286</td>
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<td>Indirect Research Exp Per T-TT Faculty FTE</td>
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<td>IDC Generated Per T-TT Faculty FTE</td>
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<td>$16,039.74</td>
<td>$20,430.18</td>
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<td>$16,604.39</td>
<td>$15,746.11</td>
<td>$15,144.84</td>
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</table>
Operations Budget
Within the last decade there were periods when the department’s operations budget barely covered routine expenses. However, in recent years the financial condition of the department has substantially improved. For many years the budget depended on indirect cost return and salary contributions from faculty. Salary contributions from senior faculty were particularly important to help fund start-up costs for new faculty hired under the Faculty Reinvestment Program. Some details of the department budget will be discussed in more detail below.

Research Funding and Administration
The department currently has a diverse and well-funded research program. A list of research contracts awarded during the last four years is included in Appendix F. Texas A&M has multiple agencies and offices that administer research grants and contracts. The majority of the department’s projects are administered by the Texas A&M Sponsored Research Services (SRS). TAMU SRS is a consortium of the Texas A&M University System members bringing together expertise and consistent and efficient procedures to enhance research administration.

Additionally, there are independently funded state research agencies attached to the Colleges of Agriculture and Engineering: Texas AgriLife Research (known by its former acronym, TAES) and the Texas Engineering Experiment Station (TEES). When acting as the lead-PI on a grant or contract, faculty in the Colleges of Agriculture and Engineering are generally required to have their projects managed by their local agency.

Because of the variety of funding sources and collaborations by our faculty, the department ultimately deals with all three project management offices (TAMU SRS, TAES, TEES). This places a burden on office staff because the different project management offices have variable policies and procedures and use dissimilar software systems to administer contracts.

The TAMU Indirect Cost return policy was modified September 1, 2014, to establish more consistent practices between university and system units and to provide a process to establish a university research development fund. The new policy provides the following return distribution:

- System component / Unit: 60 percent (The College, VPR Office, and TAMU SRS receive an annual variable portion of the system component/unit funding pending SRS requirements)
- Research Development Fund: 15 percent
- Unit (Department/Other) 15 percent (this reflects a 2.5% decrease compared to previous allocations that the college split equally with the departments)
- PI: 10 percent (this reflects a 5% decrease compared to previous allocations)

Our department receives 15% indirect cost return directly from the university. The return criteria are 1) the allocation is based on grants and contracts that were submitted as proposals through and approved by the department head, and 2) the department receives indirect cost return for PIs whose salary is designated to the specific department. For example, if a single PI proposal is submitted through the department and funded, the department will receive the full (15%) departmental allocation. If two co-PIs in separate colleges/departments are submitting the proposal and it is funded, then the department will receive a portion of departmental allocation in proportion to the departmental PI’s contribution in the proposal as defined by effort committed to the project.
3.6 Facilities

*The Eller Oceanography and Meteorology Building*

The Eller Oceanography and Meteorology Building is a 15-story, 11,500 square meter facility built between 1970 and 1973. The building houses the Departments of Oceanography, Atmospheric Sciences, and Geography, as well as offices for the Dean of the College of Geosciences.

*Classrooms and Student Computing Labs*

Most department classes are now taught on the lowest two floors of the Eller Building, with a handful of classes taught in other buildings around campus. Most classrooms offer typical modern instructional technology, including overhead projectors, DVD players, and computer and internet access. A few classrooms have interactive drawing/note-taking tools and document cameras. The larger lecture halls have personal/audience response (or clicker) systems for evaluating student comprehension. The college also offers one TTVN classroom for videoconferencing and distance teaching.

The department houses two student computer laboratories that are used for undergraduate and graduate classes. The laboratories have 24 and 25 computers, respectively, along with ceiling-mounted computer projectors and at least one printer. The labs are normally upgraded with new hardware on an alternating four-year schedule, with funds provided by both the department and college.

*Computational Resources*

Most research groups in the department maintain a number of desktop computers and workstations. Several groups have rack-mounted computer servers and RAID storage, with a few maintaining high-performance clusters. Network equipment and wiring are installed and managed by University Computing and Information Services (CIS). The department maintains some shared facilities, primarily large-capacity storage systems for research and teaching data. At least one common-use network printer is available on every floor, and a poster printer is available on the 11th floor. Copiers on the 10th and 12th floors double as scanners and printers.

In addition to the department and college resources, faculty members also have free access to the TAMU Supercomputing Center. This facility has two large-scale distributed-memory Intel based systems that are heavily used by the department, primarily for modeling and simulation.

*Aggie Doppler Radar (ADRAD)*

The department houses the Aggie Doppler Radar (ADRAD) on the roof of the Eller O&M Building. ADRAD is an S-band (10-cm), single-polarimetric, Doppler radar that regularly obtains quantitative full volume data within 150 km of campus and surveillance data out to 250 km from campus. ADRAD is primarily a teaching tool, but it is also used for limited research purposes. Each fall, approximately 20 undergraduates take a senior-level radar meteorology course that relies heavily on ADRAD for hands-on lab activities. Other undergraduate courses occasionally use ADRAD or its observations (e.g., Weather and Climate, Severe Weather and Forecasting, Tropical Meteorology) and ADRAD is regularly run by students when interesting weather is in the area. ADRAD is also used by our summer learning experience in practical meteorology and instrumentation (known as SOAP).

Texas A&M has a long history of work in radar meteorology, and the ADRAD radar dates from construction of the Eller Building in the early 1970s. The radar underwent upgrades in 1992 and
1997, but it is no longer state-of-the-art. Its use as a research facility is limited by the size of the dish (which determines beamwidth), and its fixed location on the roof of the building. Over the years, only a few research papers have been written using data from the ADRAD radar. Routine maintenance costs are covered by the department and they currently amount to about $10k/year. Because there is little research use of the radar, it generates little revenue, either through direct research expense (such as an hourly operations charge) or through returned indirect costs. The department does not have a reserve fund to handle large expenses that will result when the radar needs major repairs, such as to the transmitter or dish. In addition, it does not appear that a large investment to modernize the radar would be worthwhile due to factors mentioned above. It is likely that the department will face a difficult decision about what to do with the radar within the next few years or when a major failure occurs.

We are exploring the purchase of a portable, C-band (5-cm), dual-polarimetric, Doppler radar for teaching and research purposes with donor support via a university initiative. This radar system would function doubly as an ADRAD replacement, as well as a replacement for SMART-R, a truck-mounted C-band, single-polarimetric, Doppler radar jointly owned with the University of Oklahoma and recently dismantled.

**Broadcast Studio**
A number of our undergraduate majors are interested in broadcast meteorology, and a portion of the radar operations room is a dedicated broadcast practice space. The department offers a broadcast meteorology class every spring that is taught by a professional broadcaster. The class currently uses studios at the university's Public Broadcasting System station, KAMU, but our students do not have regular access to KAMU to practice or make demo tapes. At the end of 2008, we were successful in obtaining a matching grant of $14,000 from the University Classroom Instructional Technology Fund (an additional $2500 and $5300 were provided by the College of Geosciences and by the department, respectively) for needed broadcast equipment. However, additional updates of the equipment are now warranted and the students would also benefit from practice using commercial broadcast meteorology support software.

**The Houston LMA Network**
The Houston lightning mapping array (LMA) network is an installation of twelve geographically dispersed lightning sensors established by cooperative effort between the National Science Foundation, Vaisala Corporation, and the Department of Atmospheric Sciences. The network began in 2005 and represents a cumulative investment of approximately $1.2 million. Installation and ongoing maintenance of the network are provided by graduate students in Atmospheric Sciences under the direction of Research Professor Richard Orville.

Each sensor site consists of an array of antennas, a Global Positioning System (GPS) receiver, a GPS-based timing circuit, digital signal processing equipment, and a means to both transmit and store acquired data. When a lightning flash occurs, each sensor records the precise time (within several nanoseconds) when the signal reaches the antenna array and then sends data via the internet to a central server in College Station. Based on arrival times of the signal for each site, it is possible to determine the latitude, longitude, and altitude of the associated lightning channel. This information is ultimately displayed graphically, allowing the user to view the lightning channel in three dimensions. The LMA network provides TAMU researchers with a unique opportunity to study lightning characteristics in ways that were not previously possible in southeast Texas. More information on the network is available at:
Chemistry Laboratories and Field Sites
The department houses four major (greater than 1000 square feet each) atmospheric chemistry laboratories. Two of these were added in 2005 and 2006 as part of major renovations to the Eller Building. The new labs are located on the 11th floor and are currently occupied by Professors Brooks and Schade. In addition, Brooks maintains a laboratory in 1202, which was formerly a dark room. This space houses a Raman DXR microspectrometer, which can only be operated optically in the absence of visible light. An additional laboratory on the 11th floor is occupied by Professor Zhang, and Professor Collins has a lab on the 10th floor.

Basic equipment in the labs includes fixed and movable work benches, fume hoods, high-purity water systems, distributed vacuum systems, de-ionized water and compressed air and gas connections, and secure hook-ups for gas cylinders. Professor Collins’ and Professor Brooks' labs have window inlets for sampling ambient air. Professor Schade’s lab features an additional fixed chemistry bench intended for future teaching purposes.

The four labs feature a wide range of specialty equipment, mostly acquired by the individual research groups through externally funded research projects. Examples include several chemical ionization mass spectrometers and a proton transfer reaction mass spectrometer (Professor Zhang’s group), Fourier Transform Infrared Spectrometers equipped with attenuated total reflection (one in the Zhang group and one in the Brooks group), a Raman DXR microspectrometer (Professor Brooks’ lab second lab, 1202), a number of tandem differential mobility analyzers, and gas chromatographs.

Each group has specialized equipment developed in-house as well. Professor Collins’ lab houses several one-of-a-kind instruments for studying aerosols. Dr. Brooks and her group built a unique ice nucleation chamber, the continuous flow diffusion chamber, which has been deployed on an aircraft in the Arctic. Dr. Brooks’ lab has also custom-built ice nucleation apparatus, which her group built here at TAMU, as well as a unique aerosol spectrometer with polarization built specifically for the lab, through a collaboration with Droplet Measurement Technologies. Dr. Zhang holds a patent on specialized design for mass spectroscopy capable of operating under atmospheric pressures. Dr. Schade has constructed a specialized chamber for growing and monitoring plants under conditions representative of the stresses of climate change.

Instruments in these labs have been used to study a wide range of problems, including gaseous photochemical oxidation of hydrocarbons; ice nucleation; the optical properties of non-spherical particles and ice crystals; and the nucleation, growth, and transformation of aerosols. Also, Dr. Brooks is on the Advisory Committee of the Storm Peak Laboratory in Steamboat Springs, CO.
Chapter 4 – Centers and Affiliations
Our department benefits from involvement in a large number of strong collaborative connections, including centers housed directly in the department, affiliations with nationwide research centers, and active working relationships with professors in other departments here at Texas A&M. Each of these collaborative connections is described in more detail in a separate section below (sections 4.1 to 4.15).

4.1 Office of the State Climatologist
In the 1950s the U.S. Weather Bureau (now the National Weather Service) instituted the concept of State Climatologists (SCs). Generally, there was one SC per state who was responsible for preparing relevant publications, quality-controlling data, and acting as an interface with state agencies and the general public. The Office of the State Climatologist of Texas has been housed in the Department of Atmospheric Sciences ever since it ceased being a federal position in 1973. The Office of Texas SC was held in succession by Richard D. W. Blood, Hoye S. Dunham, Robert B. Orton, and John Griffiths. Dr. John Nielsen-Gammon is the current SC, having been appointed in 2000. The mission of the OSC is to help Texas make the best possible use of weather and climate information. The OSC provides weather and climate expertise to state agencies, the Texas Legislature, Texas industry, researchers, students, and the general public. The office is officially recognized by the American Association of State Climatologists and NOAA’s National Centers for Environmental Information.

Over the years, the OSC has published five components of the Agroclimatic Atlas of Texas; four monographs that cover the weather of Texas from 1834 to 1989; ongoing, regular monthly and annual weather summaries for Texas that are posted online at http://climatexas.tamu.edu; a monograph on historic Texas weather events; a chapter on weather and climate for the Texas “Master Naturalist” curriculum; data and information updates for the Texas Almanac, and a chapter on changing Texas climate for a book on the impact of global warming in Texas. Recent research, much of it externally sponsored, has focused on historical climate data, causes of summertime droughts, high-resolution drought monitoring and prediction, extreme rainfall events, and air pollution climatology. The State Climatologist hosts weekly statewide drought assessment webinars and coordinates statewide input to the U.S. Drought Monitor.

Public outreach is an important component of the OSC’s activities. The State Climatologist gives between 25 and 50 invited outreach talks every year on various aspects of Texas climate and conducts more than 100 press interviews per year. The OSC maintains a Facebook page and a Twitter feed as Climatexas.

The OSC receives $75,000 in baseline support from the department, the college, and the Vice President for Research. The Department of Atmospheric Sciences and College of Geosciences recently moved their support for OSC from special annual request status to a recurring budget item, but the Office of the Vice President for Research declined to do so. It is a high priority of the department and college to obtain separate long-term, sustained funding from the State of Texas, and special item requests have been made to the Texas Legislature without success. An endowment might provide additional sustained funding. Presently, the operating budget of the OSC is sufficient to support one graduate student, two part-time undergraduates, one month of State Climatologist salary, and travel costs, yet the State Climatologist presently spends an additional two months per year on unsponsored OSC duties. A guaranteed full-time assistant state climatologist position would reduce the burden on the State Climatologist and would provide the
flexibility to pursue additional funding opportunities for customer-driven applied climatology research.

### 4.2 Center for Atmospheric Chemistry and the Environment

The Center for Atmospheric Chemistry and Environment (CACE, [http://cace.tamu.edu/](http://cace.tamu.edu/)) was established by the Board of Regents of Texas A&M University in 2003, under the auspices of the Vice President for Research (VPR). Professor Don Collins is currently serving as Director of CACE. One of the most important objectives of the CACE is to provide the highest quality information based on laboratory, field, and calculation relevant to sustaining our environment and maintaining air quality. CACE is particularly concerned with the ability to accurately predict the formation, transportation, and mitigation of air pollution from the molecular to regional scale using state-of-the-art modeling capabilities, and to predict air pollution’s effect on climate. CACE members have been assembled from participating faculty in the Colleges of Engineering, Science, Geosciences, and from the Bush School’s Institute of Science, Technology and Public Policy, with associate membership from faculty in the Colleges of Liberal Arts, Architecture, and other units of the university. The center, by nature of its participant membership, has been multidisciplinary from the start. It provides a positive contribution to solving societal problems associated with atmospheric pollution and the environment.

CACE has an external advisory committee with the following members:

- Dr. Peter H. McMurry, Head, Department of Mechanical Engineering, University of Minnesota
- Dr. A.R. Ravishankara, Professor of Chemistry and Atmospheric Science, Colorado State University, member of National Academy of Science (NAS)

Below is a list of CACE participating faculty members:

- **College of Science** - Robert R. Lucchese (Chemistry), Simon W. North (Chemistry), and Joseph H. Newton (Statistics)

- **College of Geosciences** - Kenneth P. Bowman (Atmospheric Sciences), Sarah D. Brooks (Atmospheric Sciences), Don Collins (Atmospheric Sciences), Andrew Dessler (Atmospheric Sciences), Shari Yvon-Lewis (Oceanography), John W. Nielsen-Gammon (Atmospheric Sciences), Richard Orville (Atmospheric Sciences), Gunnar W. Schade (Atmospheric Sciences), Renyi Zhang (Atmospheric Sciences)

- **College of Engineering** - Tony Cahill (Civil Engineering), Qi Ying (Civil Engineering)

- **Bush School of Government and Public Service** - Arnold Vedlitz (Institute for Science, Technology, and Public Policy)

- **College of Architecture** - Jeff S. Haberl (Energy Systems Laboratory)

### 4.3 Texas Center for Climate Studies (TCCS)

The Texas Center for Climate Studies (TCCS) is a multidisciplinary community for climate scientists and scholars at Texas A&M University, other Texas universities and organizations, and climate science centers across the country. Professor R. Saravanan is currently serving as Director of TCCS. The goal is to build on diverse climate expertise to address pressing climate issues through basic and applied research, and through education and outreach. The mission of TCCS is to initiate, encourage, and support climate-related programs in research, service, and outreach,
particularly as they relate to improving the quality of life and economic health of residents of the State of Texas. The Center advances understanding of how the climate system works, how and why it is changing, and what those changes will mean for Texas residents.

Numerous faculty members from the Colleges of Agriculture and Life Science, Architecture, Engineering, Geosciences, and Sciences are affiliated with TCCS. Core activities of TCCS are guided by the Executive Committee having the following members: Kenneth H. Bowman (Atmospheric Science), Samuel Brody (Architecture), David Cairns (Geography), Ping Chang (Oceanography), Gretchen Miller (Civil Engineering), Binayak Mohanty (Biological and Agricultural Engineering), Georgianne Moore (Ecosystem Science and Management), John Nielsen-Gammon (Atmospheric Science/State Climatologist), and R. Saravanan (Atmospheric Science/Director).

While TCCS is a multi-disciplinary, multi-college, and multi-departmental organization, members of the Department of Atmospheric Sciences have traditionally formed a core, demonstrating excellence in research, teaching, and service related to climate science. Since 2010, Atmospheric Sciences faculty who are active in TCCS have:

- Published 165 articles in top, peer-reviewed journals
- Received 32 national level awards
- Received 11 TAMU awards
- Led or participated in dozens of externally funded projects, with total funding approaching $15 million
- Served the broader climate community by leading and/or participating in more than 70 external committees, such as professional societies, special working groups, and funding agency review programs
- Collaborated with researchers across the TAMU campus on multi-disciplinary research and education endeavors
- Served as editor for five top climate journals
- Reviewed hundreds of grant proposals for state, national, and international funding agencies
- Reviewed hundreds of papers submitted to more than 50 different journals
- Written or contributed to 12 books
- Participated in the Intergovernmental Panel on Climate Change’s update and release of major climate reports
- Provided material for more than 200 publications in the popular press and in K-12 educational materials
- Motivated invitations to multiple distinguished climate scientists to visit TAMU and present lectures for the general public
- Presented more than 60 invited talks
- Organized and participated in numerous workshops on the TAMU campus intended to bring people together from diverse disciplines and points of view to initiate discussion and self-education

TCCS has helped to form a core of scientific and scholarly capability at TAMU and other affiliated institutions. The center represents a critical mass of interdisciplinary expertise with the knowledge and experience to advance the fundamental understanding of the global climate system, and to investigate the causes and outcomes of climate variability and change. In this respect, TCCS helps
provide a valuable service to the scientific community at large.

Recently, TCCS, along with the Departments of Oceanography and Atmospheric Science, helped facilitate a broad collaborative research agreement between TAMU, the Ocean University of China (OUC) and the National Center for Atmospheric Research (NCAR). This collaborative agreement, initially spanning three years from 2017-2019, envisages the development of a Regional Earth System Model (RESM) within the global Community Earth System Model (CESM) framework. TAMU will provide the software for the RESM, which is comprised of the Weather Research and Forecast (WRF) model coupled to the Regional Ocean Modeling System (ROMS). NCAR will incorporate the RESM code within CESM. OUC will contribute the coupled data assimilation model for RESM. The RESM will be used to carry out coupled hindcast and forecast experiments over a range of timescales, focusing on the Gulf of Mexico region as well as the Western Pacific region. The collaborative research agreement will also sponsor an active visiting scientist program enabling NCAR scientists as well as OUC faculty and students to spend time in residence at TAMU. This collaborative research agreement will complement the dual doctoral degree program between the Department of Atmospheric Sciences and OUC which is in the process of being finalized.

4.4 Cooperative Institute for Applied Meteorological Studies (CIAMS)
 CIAMS (http://atmo.tamu.edu/ciams/) is affiliated with the Fort Worth-based headquarters office of the Southern Region of the National Weather Service. The Institute employs research scientists and graduate students in a broad program of applied research and service to Texas and surrounding states in agricultural meteorology; marine meteorology and air-sea interactions over the Gulf of Mexico; lightning and severe weather; and Doppler radar studies from the installations in the Texas A&M Department of Atmospheric Sciences and at the Houston Weather Forecast Office.

4.5 Department of Chemistry
Professor Renyi Zhang has held a joint appointment with the Department of Chemistry (http://www.chem.tamu.edu/) since 2007. Presently, he chairs several graduate committees in Chemistry. The students complete all course work and obtain a degree in Chemistry, but take ATMO 691 directed research study.

4.6 College of Engineering
Several individual faculty members have collaborations with faculty in the College of Engineering. Gunnar Schade has had a funded air quality project with Qi Ying. Anita Rapp and Chris Nowotarski have several pending projects with faculty in Electrical (with Dr. Kezunovic) and Civil Engineering (with Dr. Medina-Cetina). Dr. Anita Rapp is also a Smart Grid Center collaborator and has served as an invited focus group co-chair in 2015 and 2016 at the Smart Grid Workshop held by the TEES Smart Grid Center. John Nielson-Gammon is a funded collaborator with colleagues in Biological and Agricultural Engineering. Sarah Brooks is a participant in the internally funded Texas A&M University-Preeminent Research in Imaging Diagnostics for Energy (TAMU-PRIDE) Facility, a state-of-the-art, ultra-high-speed optical diagnostic and imaging facility, which is under development to facilitate energy-related R&D activities in combustion, aerothermochemistry, propulsion, fuels (traditional as well as alternative and biofuels), energetic materials, fluid dynamics, turbulence, atmospheric chemistry, and plasma technology. When complete, this high-end user facility will include modern, kHz–MHz-rate, high-energy laser systems, imaging cameras and related optical instrumentation as well as technical support to
conduct cutting-edge collaborative research in fundamental energy conversion and fluid dynamic processes and related applications.

4.7 Department of Geography

_Contributed by David Cairns, Head, Department of Geography_

The Department of Geography has continued to forge closer ties with the Department of Atmospheric Sciences. Interactions with Atmospheric Sciences are primarily through the Climate Science Laboratory (CSL) in Geography, and through the Texas Center for Climate Studies. Over the period since the last program review in Atmospheric Sciences, the CSL has consisted of Dr. Steven Quiring, Dr. Oliver Frauenfeld, and Dr. Brendan Roark and their students. Dr. Steven Quiring has recently left TAMU, but was very active during the last several years in bringing the two programs closer together. Interactions among the programs have included joint grant proposals to EPA, DOE, and NSF. Many Geography and Atmospheric Sciences faculty serve as out-of-department committee members for the other program’s graduate students, which has led to a number of recent joint publications by Dr. Anita Rapp and the Quiring’s research group. Dr. Nielsen-Gammon is presently providing research funding support to a Geography post-doc. Geography and Atmospheric Sciences faculty have also co-mentored NSF Research Experience for Undergraduates (REU) participants which resulted in several peer-reviewed journal articles and numerous joint conference presentations. Recently, three Geography faculty have paired with three Atmospheric Sciences faculty members to receive three separate internal grants (Drs. Quiring – Rapp, Frauenfeld – Nowotarski, Loisel – Schade).

The Department of Geography offers several climate-related courses: two undergraduate courses, GEOG 324 - Global Climate Regions and GEOG 442 - Past Climates; and three graduate courses, GEOG 612 - Applied Climatology, GEOG 642 - Past Climates (to be co-taught with GEOG 442), and Arctic Climates GEOG 668. In Fall 2012, Dr. Anita Rapp taught a writing intensive section of the GEOG 324 course.

4.8 Department of Oceanography

_Contributed by Shari Yvon-Lewis, Interim Head, Department of Oceanography_

The Departments of Oceanography (http://ocean.tamu.edu) and Atmospheric Sciences have historically had strong research collaborations. Major connections have been in the areas of climate and atmosphere-ocean dynamics. More recently, new collaborations have developed in chemistry. Both departments currently provide faculty members to the Center for Atmospheric Chemistry and the Environment. There are multiple grants in both scientific research and education, with co-PIs from Oceanography and Atmospheric Sciences. We are presently scheduling outside seminar speakers to come to the campus who will appeal to members of both departments.

The departments collaborate on teaching in many ways. Many of Atmospheric Sciences’ undergraduates take a course in physical oceanography taught by the Department of Oceanography, and both departments participate in the Environmental Programs in Geosciences by providing advisors and teaching courses. At the graduate level, students frequently take courses from the other department, and it is very common to have M.S. and Ph.D. committees with members from both. Graduate student committees, in particular, have proven to be an important channel for communication between the departments.

Although administrative barriers to collaboration between faculty members are few, formal joint appointments help maintain the strong relationship between the two departments. Distinguished
Professors Gerald North and Robert Duce have held joint appointments since their arrivals at TAMU in 1986 and 1991, respectively. Dr. Ping Chang also has joint appointments in Oceanography and Atmospheric Sciences. In all three cases, salary and teaching loads reside 100 percent in the primary department. Such appointments serve to recognize close and ongoing collaboration and to simplify administrative processes for research grants and graduate student supervision. There are currently no appointments with faculty salary and teaching split between the two departments, although there have been in the past. Both departments prefer that untenured faculty not have split appointments, as this only complicates the tenure process and potentially makes life more difficult for the untenured faculty member.

4.9 Department of Mathematics
Dr. Lee Panetta has a joint appointment in the Department of Mathematics (http://math.tamu.edu/). His research interests in theoretical aspects of large-scale dynamical models and numerical simulation of electromagnetic wave scattering involve him in collaborations with various members of the mathematics department in the areas of functional analysis, partial differential equations, and numerical analysis. He has taught two graduate level courses in the mathematics department on aspects of geophysical fluid dynamics, and he regularly participates in three departmental seminars (nonlinear pdes, numerical analysis, and applied mathematics). He has co-advised one Ph.D. student, is currently the advisor of two Master’s degree students (one in the mathematics department’s Interdisciplinary Degree program), has been a member of five other Ph.D. committees, as well as a member of a smaller number of M.S. committees. He has taught undergraduate mathematics courses in linear algebra and differential equations and typically offers special sections of the courses tailored by choices of topics and examples to the needs of students.

4.10 Department of Physics & Astronomy
Dr. Ping Yang has established a Joint Appointment in the Department of Physics & Astronomy (http://www.physics.tamu.edu/). Much of Dr. Yang’s research is in Applied Physics, particularly in the areas of light scattering, radiative transfer, and remote sensing of the atmosphere and oceans. A total of ~70 of Dr. Yang’s 284 peer-reviewed papers were co-authored with faculty and graduate students in the Department of Physics & Astronomy. Dr. Yang’s research group has weekly group meetings with members of the Department of Physics & Astronomy. Dr. Yang co-advised four Ph.D. dissertations in Applied Physics (in particular, light scattering and radiative transfer) and Yang’s research funding is currently supporting a postdoctoral research associate in the Department of Physics & Astronomy.

4.11 Department of Statistics
The Atmospheric Sciences department maintains an active collaborative research program with the Statistics Department in the College of Science. Dr. Gerald North, who has made significant research contributions to the application of statistical concepts to climate data analysis, initiated this collaboration. In 2011, Dr. North published a paper in collaboration with faculty in the Statistics Department. The collaboration between departments has expanded to include several other faculty members, as well as their graduate students. Recently, Drs. Saravanan and Schumacher of Atmospheric Sciences were awarded an NSF Big Data seed grant project with Dr. Mikyoung Jun of the Statistics department. Drs. Nowotarski and Rapp from Atmospheric Sciences have also submitted a grant proposal to the NASA Severe Weather program with Dr. Katzfuss of Statistics. As part of these collaborative efforts, Drs. Saravanan and Rapp also serve on the Ph.D. committees of students from the Statistics department and Statistics faculty serve on Atmospheric Sciences committees of Dr. Nowotarski.
4.12 Supercomputing Facility
The Texas A&M Supercomputing Facility (http://sc.tamu.edu/) provides advanced computing resources and support to TAMU faculty and students engaged in all aspects of large-scale computation. Allocations of computer time are awarded on the basis of applications providing justification for the time requested, and there is no charge for this access.

4.13 Center for Geospatial Science, Applications and Technology (GEOSAT)
Contributed by Dr. Michael Bishop, Director, GEOSAT
The mission of the Center for Geospatial Science, Applications and Technology (GEOSAT) is to engage TAMU faculty and students in multidisciplinary collaborations that advance geospatial knowledge and provide practical solutions toward the development and use of geospatial technology innovations in partnership with government and industry. The center fosters excellence in geospatial research, education, and outreach activities at TAMU by establishing campus-wide cyber- and social infrastructures that support the university’s geospatial enterprise to promote collaboration among faculty and students, and to foster the development and use of geospatial technologies. It endeavors to help TAMU partner with government and industry to create innovative geospatial technology and information solutions to foster economic development, and to elevate TAMU as a focal point for geospatial technology solutions at the state, national and international scales.

GEOSAT Objectives:
- Enhance university-wide cyber- and social- infrastructures to develop and grow the University’s geospatial enterprise
- Undertake geospatial research activities
- Facilitate faculty, undergraduate, and graduate student education
- Provide the campus and larger geospatial community with increased opportunities for hands-on education and training
- Facilitate cooperative research with government and private industry
- Support geospatial outreach activities to foster technology development and assist in applied problem solving and capacity building

Research in the atmospheric sciences can be enhanced through the use of GEOSAT’s computational and remote sensing capabilities. GEOSAT offers facilities, equipment and software that permit atmospheric image analysis capabilities that faculty and students can use to study the spatial and temporal dimensions of atmospheric constituents. In addition, assessment of atmospheric temperature and precipitation via multispectral and microwave remote sensing is possible. Furthermore, GEOSAT’s HPC capabilities will ultimately be used to run global and regional climate simulations to facilitate atmospheric and applied climate related investigations, which will support future collaborations between ATMO and other GEOSAT-affiliated faculty.

4.14 Affiliation with the Ocean University of China
Our department is in the process of finalizing a dual degree agreement with the Ocean University of China (OUC) in Qingdao. This collaboration will be modeled after a current agreement between the TAMU Department of Oceanography and OUC. As part of the dual degree program, up to three students from OUC will be recruited annually to attend TAMU and earn Ph.D.s in the Department of Atmospheric Sciences. For the selected students, financial support for the graduate
student stipend will be provided through a grant to OUC from the Chinese National Science Foundation.

4.15 Other Affiliations
The TAMU Atmospheric Sciences department is a diverse group of experts working in a highly collaborative environment. In addition to the centers and affiliations described above, individual faculty members maintain working relationships and members with a number of other organizations and groups on campus, including:

Dr. Nielsen-Gammon is a faculty member of the Water Management and Hydrologic Sciences degree program and has collaborated on several research projects with faculty in the Department of Biological and Agricultural Engineering. He and Dr. Ping Yang are affiliated faculty members of the Texas A&M Energy Institute and fellows of the Institute for Science, Technology, and Public Policy.

Dr. Conlee’s green roof project (described below) is a joint project with faculty members in the colleges of Architecture and AgriLife.

A number of the Atmospheric Sciences faculty, including Drs. Rapp, Schade, Brooks and Schumacher have served as mentors in the interdisciplinary REU program at Texas A&M and the Soltis Center in Costa Rica. Faculty from other colleges represented engineering (Miller, Cahill, Brumbelow) and ESSM (Moore). This work led to a number of conference presentations.
Chapter 5 - Undergraduate Program

5.1 Program Goals

Our undergraduate program in meteorology is designed to develop students’ professional and intellectual capabilities in preparation for careers in government agencies or the private sector or as a basis for graduate study.

Our undergraduate curriculum is designed to prepare and train students for career paths in one or more of these areas. We offer students a range of upper-level electives that can be tailored to fulfill the varying requirements of the different career paths in consultation with their academic and faculty advisor.

5.2 Bachelor of Science degree in Meteorology

Degree requirements for the B. S. degree from the 2016-17 Undergraduate Catalog are listed in Table 5.1. Course descriptions from the catalog are provided in Appendix A. The curriculum includes five semesters of math (calculus through differential equations and a course in statistics), two semesters of physics (mechanics and electricity and optics), and two semesters of introductory chemistry with accompanying laboratory sections. Required Atmospheric Sciences courses include an introductory atmospheric science course (for which we offer a majors-only section during the Fall semester), weather analysis labs, thermodynamics, climatology, atmospheric dynamics, introduction to atmospheric chemistry and air pollution, physical meteorology, and an instrumentation or remote sensing course. Electives are also required and can be chosen among severe weather, satellite meteorology and remote sensing, radar meteorology, numerical weather prediction, practical weather forecasting, tropical meteorology, broadcast meteorology, and air pollution meteorology. At least two of these electives must be recognized writing-intensive, or W, courses. Students must additionally satisfy university requirements in core curriculum areas including courses in English, communications, visual and performing arts, citizenship, social science, and courses that expose students to international or cultural diversity.

In recent years, the university administration has emphasized the need for undergraduates to participate in activities and experiences that enhance their education beyond traditional lectures and coursework; these are collectively referred to as “high impact learning experiences”. Among this set are some more traditional outlets such as summer internships off campus, but many are organized directly by our department and faculty. The number of students participating in directed studies (ATMO 485) or in undergraduate research with an individual faculty member’s research group (ATMO 491) has seen a sharp increase in the last few years (see Table 5.2). Additionally, the department began offering study abroad experiences to China (in partnership with the Ocean University of China) and to Barbados (in partnership the Caribbean Institute for Meteorology and Hydrology) during the month following the end of the Spring semester, led and organized by instructional professor Dr. Don Conlee. About 20 students have participated in the study abroad program each year. Dr. Conlee has also developed a number of hands-on experiences involving instruments and a green roof project to help introduce our undergraduates to field work, and he and other faculty have trained many of our students to operate the radar on the roof of our building.

<table>
<thead>
<tr>
<th>Table 5.1 Bachelor of Science in Meteorology Degree Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
</tr>
</tbody>
</table>

37
<table>
<thead>
<tr>
<th>Freshman Year, Fall Term</th>
<th>14 total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATMO 201: Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 101 &amp; 111: Fundamentals of Chemistry I and Lab</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 104: Composition and Rhetoric</td>
<td>3</td>
</tr>
<tr>
<td>MATH 171*: Analytic Geometry and Calculus</td>
<td>4</td>
</tr>
<tr>
<td>Freshman Year, Spring Term</td>
<td>16 total</td>
</tr>
<tr>
<td>ATMO 203: Weather and Forecasting Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 102 &amp; 112: Fundamentals of Chemistry II and Lab</td>
<td>4</td>
</tr>
<tr>
<td>MATH 172*: Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 218: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>Core curriculum class</td>
<td>3</td>
</tr>
<tr>
<td>Sophomore Year, Fall Term</td>
<td>15 total</td>
</tr>
<tr>
<td>ATMO 251: Weather Observation and Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ATMO 321 or CSCE 206: Computer Programming</td>
<td>3</td>
</tr>
<tr>
<td>ATMO 363: Introduction to Atmospheric Chemistry and Air Pollution</td>
<td>3</td>
</tr>
<tr>
<td>MATH 251: Engineering Mathematics III</td>
<td>3</td>
</tr>
<tr>
<td>Core curriculum class</td>
<td>3</td>
</tr>
<tr>
<td>Sophomore Year, Spring Term</td>
<td>16 total</td>
</tr>
<tr>
<td>ATMO 324: Physical and Regional Climatology</td>
<td>3</td>
</tr>
<tr>
<td>MATH 308*: Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 208: Electricity and Optics</td>
<td>3</td>
</tr>
<tr>
<td>Atmospheric sciences or general elective</td>
<td>3</td>
</tr>
<tr>
<td>Junior Year, Fall Term</td>
<td>14 total</td>
</tr>
<tr>
<td>ATMO 335: Atmospheric Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ATMO 336: Atmospheric Dynamics</td>
<td>4</td>
</tr>
<tr>
<td>STAT 211: Principles of Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>Atmospheric sciences elective</td>
<td>1</td>
</tr>
<tr>
<td>Core curriculum class</td>
<td>3</td>
</tr>
<tr>
<td>Junior Year, Spring Term</td>
<td>15 total</td>
</tr>
<tr>
<td>ATMO 435: Synoptic-Dynamic Meteorology</td>
<td>3</td>
</tr>
<tr>
<td>Atmospheric sciences electives</td>
<td>6</td>
</tr>
<tr>
<td>COMM 203 or 205: Communication for Technical Professions</td>
<td>3</td>
</tr>
<tr>
<td>Core curriculum class</td>
<td>3</td>
</tr>
<tr>
<td>Senior Year, Fall Term</td>
<td>15 total</td>
</tr>
<tr>
<td>ATMO 446: Physical Meteorology</td>
<td>3</td>
</tr>
<tr>
<td>ATMO 441 or 443: Satellite Met. and Remote Sensing or Radar Met.</td>
<td>3</td>
</tr>
<tr>
<td>Atmospheric sciences electives</td>
<td>3</td>
</tr>
<tr>
<td>Core curriculum or general elective</td>
<td>6</td>
</tr>
<tr>
<td>Senior Year, Spring Term</td>
<td>15 total</td>
</tr>
<tr>
<td>Atmospheric sciences electives</td>
<td>9</td>
</tr>
<tr>
<td>Core curriculum or general elective</td>
<td>6</td>
</tr>
</tbody>
</table>

* A grade of C or better is required in these math courses.

| Table 5.2 Participation in Directed Studies and Undergraduate Research |
|-------------------------|---------|---------|
| Academic Year | Directed Studies | Research |
| 2009-10 | 7 | 36 |
| 2010-11 | 17 | 18 |
| 2011-12 | 8 | 21 |
| 2012-13 | 19 | 30 |
| 2013-14 | 20 | 20 |
| 2014-15 | 16 | 43 |
| 2015-16 | 17 | 73 |
5.3 Enrollment

Our program is among the largest in the United States, and we believe it likely ranks about third in size (behind Penn State and the University of Oklahoma). Enrollment numbers for Fall semesters beginning in 2008 are shown in Table 5.3. Beginning about three years ago, total undergraduate enrollment fell from about 140 students to about 110 students.

<table>
<thead>
<tr>
<th>Table 5.3 Bachelor’s of Meteorology Headcount</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>31</td>
<td>49</td>
<td>46</td>
<td>44</td>
<td>34</td>
<td>27</td>
<td>23</td>
<td>34</td>
<td>25</td>
</tr>
<tr>
<td>Sophomore</td>
<td>29</td>
<td>30</td>
<td>25</td>
<td>31</td>
<td>30</td>
<td>25</td>
<td>23</td>
<td>22</td>
<td>23</td>
</tr>
<tr>
<td>Junior</td>
<td>32</td>
<td>25</td>
<td>28</td>
<td>23</td>
<td>32</td>
<td>39</td>
<td>17</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>Senior</td>
<td>41</td>
<td>38</td>
<td>34</td>
<td>40</td>
<td>39</td>
<td>48</td>
<td>50</td>
<td>29</td>
<td>40</td>
</tr>
<tr>
<td>Postbac UG</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>137</td>
<td>146</td>
<td>136</td>
<td>140</td>
<td>137</td>
<td>141</td>
<td>114</td>
<td>113</td>
<td>110</td>
</tr>
</tbody>
</table>

This decline has occurred in several programs in the geosciences at TAMU (substantial drops in the number of geology students occurred concurrently with the recession in the oil and gas industry). Yet it occurs at a time of substantial growth at TAMU. The College Station campus has grown to become one of the largest in the country: Fall 2016 enrollment topped 60,000 students for the first time, which is about 20% higher than even five years ago.

<table>
<thead>
<tr>
<th>Table 5.4 Undergraduate Applications and Admissions Data for Meteorology</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied</td>
<td>124</td>
<td>97</td>
<td>118</td>
<td>80</td>
<td>97</td>
<td>87</td>
</tr>
<tr>
<td>Admitted</td>
<td>73</td>
<td>51</td>
<td>73</td>
<td>42</td>
<td>62</td>
<td>44</td>
</tr>
<tr>
<td>Enrolled</td>
<td>47</td>
<td>37</td>
<td>34</td>
<td>25</td>
<td>40</td>
<td>27</td>
</tr>
<tr>
<td>Campus Enrollment</td>
<td>50,230</td>
<td>50,627</td>
<td>53,538</td>
<td>56,886</td>
<td>58,920</td>
<td>60,979</td>
</tr>
</tbody>
</table>

We do not control the freshman admissions process, but the university administration placed pressures for department teaching responsibilities to grow in concert with the size of the university. Given the decline in our freshmen classes, we have been able to respond to these pressures only by efforts to increase the number of students who take our non-major introductory atmospheric science course, ATMO 201. Table 5.5 shows the number of students taught in ATMO 201 and 202 (a 1 credit laboratory course) each academic year beginning in 2009. Hiring a second instructional-track faculty member (Dr. Tim Logan) has allowed us to expand the number of sections we offer. The core curriculum requirements changed from 8 to 9 credits in science in 2013, which has had the practical effect of fewer students choosing to take associated laboratory courses (three 3 credit courses can satisfy the new requirement, while two 3 credit lectures with associated labs was the most common way to satisfy 8). As a result, our lab course is declining in enrollment even while ATMO 201 grows substantially.

<table>
<thead>
<tr>
<th>Table 5.5 Enrollment in ATMO 201 and 202</th>
<th>2009-10</th>
<th>2010-11</th>
<th>2011-12</th>
<th>2012-13</th>
<th>2013-14</th>
<th>2014-15</th>
<th>2015-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATMO 201</td>
<td>558</td>
<td>643</td>
<td>732</td>
<td>693</td>
<td>705</td>
<td>1072</td>
<td>1167</td>
</tr>
<tr>
<td>ATMO 202</td>
<td>381</td>
<td>403</td>
<td>438</td>
<td>392</td>
<td>430</td>
<td>353</td>
<td>307</td>
</tr>
</tbody>
</table>
The ethnic and gender characteristics of our meteorology majors are given in Table 5.6. African-American students remain underrepresented at TAMU relative to their proportion of the state population, but the university has seen an increase in the number of Hispanic students (of any race) concurrent with their growing share of the total population of Texas. Ethnic demographics of our meteorology students reflect these general trends at the university.

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
<th>Asian</th>
<th>Black</th>
<th>Hispanic</th>
<th>International</th>
<th>Mixed</th>
<th>Other</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>69</td>
<td>68</td>
<td>1</td>
<td>1</td>
<td>24</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>110</td>
</tr>
<tr>
<td>2009</td>
<td>60</td>
<td>86</td>
<td>2</td>
<td>5</td>
<td>23</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>116</td>
</tr>
<tr>
<td>2010</td>
<td>54</td>
<td>82</td>
<td>3</td>
<td>6</td>
<td>22</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>105</td>
</tr>
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### 5.4 Environmental Programs in Geosciences

The College of Geosciences has successfully established degree programs in Environmental Geosciences (ENGS) and Environmental Studies (ENST), and courses (designated with the handle GEOS) are taught by faculty throughout the College, including our department. Teaching credits accrue to the department of the instructor teaching the course, and several atmospheric sciences faculty teach courses in this program each semester.

Our department has established a course on climate change (GEOS 210) that, like ATMO 201, is a part of the University’s Core Curriculum in Science. The general focus of this class is on anthropogenic climate change. Specific objectives include developing an understanding of the physics of climate change; understanding how the scientific method has been used to construct current understanding of the problem; evaluating ethical, financial, and environmental implications of climate change to society; and understanding the major policy options available. In the last year we have begun offering the course every semester (in earlier years a single section was offered once per year), and we hope to grow this course further during future semesters.

### 5.5 Meteorology High-Impact Learning Opportunities for Undergraduates

**SEA-Met Study Abroad:** Student Experiences Abroad in Meteorology is a Maymester program designed to provide a significant scientific and cultural experience without affecting time-to-graduate or summer study, internships, or employment. The focus is primarily on locations with significantly different meteorological mechanisms from North American and/or the mid-latitudes, with strong interactions with host academic institutions. The first SEA-Met class traveled to Beijing and Qingdao, China to study Meteorology of Asia (including air pollution, monsoon and related fronts, and large scale air/ocean interaction) in May 2015, and the second studied Caribbean/Tropical Meteorology (including easterly waves, island and wake effects, and island sustainability) in May 2016 on the island of Barbados. We are currently enrolling students for our

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1 As the current year is in progress, percent changes indicate change in Fall 2016 enrollment relative to Fall 2015 only.
third offering this May, again studying air pollution in Beijing, but this time travelling to the western city of Chengdu to study mountain and plateau effects in addition to monsoon and other core Asia meteorology topics. This program typically includes 15-20 students per year, and thus is on track to provide a quality study abroad experience for approximately half of the undergraduate population by graduation.

Summer SOAP: The primary activity of Summer SOAP (Student Operational ADRAD Project) is in multiple small groups where undergraduate students learn radar fundamentals, man and operate the Texas A&M Aggie Doppler Radar (ADRAD), launch upper-air balloon and tethered soundings, and operate and maintain the Cloud Observatory/Ceilometer. Students also are engaged in special research projects, typically involving observation technologies. During the next phase of the program that began in summer 2015, a new line of investigation engages students in the setup and running of numerical models, with analysis of model results. This activity is designed to fit around a normal Summer I schedule of classes or local employment. Many students from Summer SOAP continue research and present results at the winter American Meteorological Society meeting or at University/College research week events.

SOUP: The Student Operational Upper-Air Program (SOUP) is a volunteer activity open to all students in which they assist in the launch of balloons carrying rawinsondes in support of requests by the National Weather Service to aid in critical forecast situations. These include potential severe weather and freezing/frozen precipitation events. Beginning in Fall 2015 students were enrolled in an ATMO 485/285 directed studies for 0 or more credits to participate. (0 credits do not add to load or tuition, but document the activity for transcript purposes.)

Green Roof: Every semester a group of students enrolls in a special section of ATMO 485, Directed Studies, which builds, maintains, instruments, and studies green roof and living wall installations. This activity is physically located on the roof of the Langford Architecture building “A”, but involves students and professors from three Colleges: Geosciences, Architecture, and Agriculture. Our students typically concentrate on the advanced sensors placed in and around the plots, but certainly occasionally get their hands dirty with planting, weeding, and harvesting!

Observations Directed Studies: The Texas A&M Mesonet high-precision meteorological observation site is maintained by a small number of student enrollees in a special section of ATMO 485, Directed Studies. Students learn about data communications, instrument data collection, programming, and, of course, the instruments themselves.

Individual Professor/Research Group Studies: Perhaps the most exciting opportunity open to those who are doing well in regular courses is to join the research group of an Atmospheric Sciences professor as an Undergraduate Research Assistant. Students typically become integral parts of the group and work on a section of the group’s research under the direction of both the faculty mentor and experienced graduate students. This activity, typically documented as an ATMO 491 course, is among the most important check-boxes for those considering graduate school and further research. The student typically makes the first move, inquiring about possible volunteer opportunities with professors, especially after they have made an impression with excellent work in one of their classes. These student research activities sometimes take the form of participation in the Undergraduate Research Scholars program at TAMU.
ATMO 443, Radar Meteorology: Most of our students will have the opportunity to take this elective course, where there is extensive opportunity to run the Aggie Doppler Radar (ADRAD) in advanced modes and configurations. Texas A&M is one of the only universities where a student can take the controls of a one million watt Doppler radar themselves.

ATMO 461, Broadcast Meteorology: Upperclassmen interested in weather communications have the opportunity to take this elective course, taught by an on-air meteorologist.

5.6 Research Experience for Undergraduates (REU)
The Department began hosting a Research Experience for Undergraduates (REU) under an NSF award in 2013, and the program was recently renewed for another three years. Ten undergraduate students are selected each year and are embedded in faculty research groups to work on a project during the two-month program. Each student is supervised by a faculty advisor and a graduate student mentor to assist with technical or laboratory challenges. There are few REUs in the country that concentrate exclusively on atmospheric science, and Texas A&M has offered the only REU Site in the Atmospheric Sciences in the Gulf Coast region. We have made a specific effort to recruit and serve participants from smaller colleges and minority-serving institutions from across the Gulf Coast states. Most of the participants from prior years have progressed to graduate studies, and some have come to our graduate program.

5.7 Administration
As noted, undergraduate admissions are handled by the university with no input from the department. The department works with Ms. Judy Nunez, director of recruiting for the College of Geosciences, to coordinate prospective student visits from high school students and those considering transferring from community colleges.

The Undergraduate Program Committee (currently chaired by Dr. Robert Korty) consists of four or five faculty appointed by the Department Head to oversee the degree requirements and course inventory. The College provides meteorology students with an Academic Advisor (Mr. Brady Dennis), who divides his time between the Oceanography and Atmospheric Sciences programs. Students are advised by the Academic Advisor during their freshmen and sophomore years; junior and senior meteorology majors are assigned to faculty members in the department to advise them on career and course choices.

5.8 Assessment
The university requires that all academic units carry out annual assessments of their degree programs, as part of the requirements for reaccreditation. In recent years, the college has made this assessment a point of increased emphasis, and has organized a number of meetings and workshops with staff from the Office of Institutional Effectiveness and Evaluation (OIEE) in an effort to encourage meaningful assessment practices.

As determined by the OIEE, assessment practices at the university consist of the following components: a mission statement, student learning outcomes, measures and metrics, targets, findings, analysis, and action plans. Here we give a broad overview of some of the higher-level components. A more complete discussion of assessment practices can be found in Appendix C. Mission and Learning Outcomes

For assessment purposes, the mission of the department's undergraduate program is to provide students with a broad, general knowledge of the atmospheric sciences and to prepare them for careers in government agencies and the private sector. Below this broad disciplinary umbrella are a
set of specific student learning outcomes / competencies, which were established during a workshop with OIEE staff in 2012. Included in these outcomes are that students (i) will be able to communicate effectively, both orally and in writing; (ii) will have mastered the core knowledge of the discipline; and (iii) will acquire advanced quantitative and career skills.

Assessment Methods
Our effectiveness at meeting these learning outcomes is assessed through a range of measures and metrics, each with an associated target value. Included in these measures and metrics are direct evaluations of student work, such as writing samples, problem sets and exams, and forecast presentations, as well as indirect measures such as senior exit surveys. A complete list of the measures used and their associated target values can be found in Appendix C.

Analysis and Action Plans
The failure to meet a target value for any given metric necessitates the formulation of an action plan to address the shortcoming. As mandated by the OIEE, at least one action plan is required for each degree program in any given assessment cycle. In recent years, the results of our assessment have played a role (along with other factors) in motivating several important curricular revisions in the department, including a substantial realignment of the department's undergraduate curriculum in 2012 and a major revision to the Ph.D. qualifying exam in 2015. Some examples of other key findings and associated action plans for the past several assessment cycles can be found in Appendix C.

Opportunity Costs
While our assessment efforts have led to useful insights over the past few years, it is worth keeping in mind that these results do come at a cost, in terms of faculty time and effort. In its current form, we estimate that the faculty as a whole devotes roughly 60 to 70 hours annually to assessment activities (i.e., to activities beyond those normally associated with courses, the qualifying exam, etc.) for our three degree programs combined, with the bulk of this effort carried out by the department's Assessment Liaison. This cost will increase further starting next year, as a separate requirement for assessing courses in the university-wide Core Curriculum is introduced, which applies to our two non-major survey courses, ATMO 201 and GEOS 210.

5.9 Summary
Our undergraduate program is generally healthy and stable, and we have adequate depth in the department to cover nearly all of the courses in our curriculum. One exception is the 1 credit elective in Broadcast Meteorology, for which we contract with a local television meteorologist to offer the course each spring. We have expanded our enrollment in ATMO 201, and are on track to do the same for the climate change service course (GEOS 210) as well.
Chapter 6 – Graduate Program

6.1 Recruitment and Admissions

The prerequisite for the graduate program is a basic knowledge of physics and mathematics. A Bachelor’s degree is required in order to apply to the M.S. or the Ph.D. program. A prior Master’s degree is not necessary in order to apply for the Ph.D. program. The minimum undergraduate course work expected of graduate applicants is 12 hours of calculus and differential equations and 8 hours of calculus-based physics. Although there is no minimum GPA requirement, incoming students typically have GPA’s exceeding 3.00. GRE scores and three letters of recommendation are required, as well as a Statement of Purpose essay. International applicants whose native languages are not English are required to take the TOEFL.

Recruitment of graduate students is a year-round process. Primary recruitment tools are the department’s web site and word-of-mouth knowledge of departmental faculty and their research. The department sponsors a recruitment booth and hosts a reception at the AMS annual meeting. The department, in conjunction with the College of Geosciences, is also represented at the AGU fall meeting and at career fairs held on the TAMU campus. Faculty members are encouraged to give seminars and colloquia at several Texas universities and small undergraduate colleges on general topics such as climate change. Notable goals of this outreach program are to publicize the department’s research and to encourage science and math majors to apply to our graduate program.

Typically 10-15 graduate students are admitted every year, with most starting in the fall semester and the exact number depending on the availability of funding. The department’s Graduate Program Committee oversees the admissions process. It meets during spring and fall to review applications. All departmental faculty members are invited to review and comment on the applications, and to identify potential candidates for financial support. During early spring the committee invites about 6-10 applicants who reside in the United States to visit the campus. The invitation letter includes an offer of admission and financial support for the first year. During their visit, these applicants are given a tour of the department’s facilities and the university campus, and have the opportunity to meet with the faculty and current students.

6.2 Financial Support

Almost all admitted students have financial support for the first year, either as Graduate Assistants in Research (GAR) or as Graduate Assistants in Teaching (GAT). New domestic students may be supported either as GATs or as GARs, but new international students are only supported as GARs. International students are required to pass an English Language Proficiency test administered by the University before they can be employed as GATs in later years. There are also a small number of Graduate Assistant Non-Teaching (GANT) positions, where the graduate student is not the primary instructor, but assists in grading and lab instruction. GANT positions are open to all graduate students. GAT/GANT students typically handle two or three 2-hour lab sections a week.

Decisions to support a student as a GAR are made by individual faculty members based upon the research interests and potential of the applicants, as well as their academic credentials. The Graduate Program Committee decides which applicants are offered GAT/GANT support, based primarily upon their academic credentials. About six or seven GAT/GANT positions are available each semester, with about half of them offered to newly admitted students who receive priority. The remaining GAT/GANT positions are awarded to other students, some of them interested in obtaining teaching experience, while others need temporary bridging support (i.e., between research grants).
The department has access to an annually varying amount of funding ($8,000-$12,000) from the College of Geosciences and the TAMU Office of Graduate and Professional Studies (OGAPS) to offer supplemental funding between $1,500 and $5,000 to 3-4 prospective students, with an emphasis on increasing the diversity of the student population enrolled in the department. We have also had considerable success with nominating prospective students for university level Merit and Diversity Fellowships: two of our students received the 3-year Diversity Fellowship; while 3 of our applicants were offered Merit Fellowships, but all three chose another university for their graduate studies. These two types of fellowships pay a stipend that is slightly higher than that paid to research and teaching assistants.

The monthly stipend for all types of assistantships (GAR/GAT/GANT) is the same and is fixed by the Graduate Program Committee. Stipend rates are reviewed each year to adjust for increases in the cost of living and to remain competitive with other universities’ graduate programs in atmospheric sciences. Our departmental stipend rates are the highest among all departments in the College of Geosciences.

In addition to the stipend, full tuition and mandatory student fees support is provided to all students with assistantships. This means that in-state tuition costs must be included in all research proposals when graduate student support is specified in the proposal budget. In the case of GAT/GANT positions, the university pays for tuition and mandatory fees. Assistantship stipends also include a contribution to health care costs, which is typically sufficient to cover the health insurance premium for an individual. Additional costs associated with insuring a spouse have to be covered by the student.

6.3 Student Profiles
The total number of graduate students enrolled in the Department of Atmospheric Sciences peaked at 66 students in 2014 (Figure 6.1). That year 32 students were enrolled in the M.S. program and 34 students in the Ph.D. program. The decrease of the graduate student population to the current number of 58 students has been primarily due to the decrease of the number of M.S. students: currently 25 M.S. and 33 Ph.D. students are enrolled in the department. The decreasing number of M.S. students is part of a long time trend: the number of M.S. students enrolled in the department reached a peak of 45 in 2002. At that time, the number of Ph.D. students was only 16. While the department has made steady progress toward its goal to increase the number of Ph.D. students, the continued decline of M.S. enrollment is not a desirable outcome. More than half of our graduating M.S. students continue their studies toward a Ph.D. degree in our program, while those who leave the department can typically find employment with their M.S. degree in either the private or the public sector. Several of our M.S. graduates work as support scientists at prestigious national labs, such as NCAR and NASA. In addition, our experience is that our well-respected M.S. program attracts many highly qualified domestic applicants, who later continue their studies toward a Ph.D.
International students make up the bulk of the Ph.D. enrollment at 70%, a fraction that has been growing steadily since 2010, when it was at its lowest value of 47% since we started to track this statistic in 2001 (Figure 6.2). Domestic students make up about 80-90% of the M.S. enrollment. The ratio of female to male students has increased in the last few years, after a long decline from 2004 to 2011 (Figure 6.3). At that time the ratio was less than 1:3, but in the last 3 years it has risen to levels (about 1:2) seen last in 2014. The number of minority students, defined as the count of domestic students who are African-American, Hispanic, or Native American, has hovered between 4 and 5 in the last four years, which is a small but important improvement compared to the period between 2009 and 2011, during which it was 1 or 2. The number of applications received for the graduate program increased from 56 in 2009 to 107 in 2012 (Figure 6.4). Since then, it remained steady at a level of about 100 applications per year (Figure 6.4). The number of international applicants in the last eight years (a total of 362) has been slightly higher than the number of domestic applicants (a total of 331). Most domestic applicants opt, at least initially, for the M.S. track, whereas international applicants tend to opt for the Ph.D. track. The GRE scores of admitted students have remained roughly constant since 2009: the highest Quantitative GRE score typically falls into the top 95 percentile, while the lowest in the top 70 percentile. The pool of domestic applicants tends to be a little weaker (as measured by the GRE scores) and more frequently interested in weather-related research. The international applicant pool is spread over a broad range of research areas and tends to be dominated by applicants from China, Taiwan and South Korea.
6.4 Advising

Advising of graduate students is primarily the responsibility of the student’s M.S. or Ph.D. thesis adviser, with the student’s Advisory Committee having secondary responsibility. Each Advisory Committee consists of no fewer than three faculty members for M.S. students and no fewer than four faculty members for Ph.D. students, with at least one member from outside the department. The thesis adviser chairs the Advisory Committee. Each student develops a degree plan in consultation with the Advisory Committee. It is common for students to have co-chairs for their committees, usually because of joint research projects between faculty members inside and outside the department.
6.5 Curriculum

Core Courses

The six core courses in the list below present the atmospheric sciences at an appropriate graduate level and give students from other technical disciplines (e.g., physical sciences, mathematics, engineering, statistics) the required background to proceed to more advanced graduate courses. The complete graduate curriculum is listed in Appendix B1.

ATMO 601 - Atmospheric Dynamics I
ATMO 602 - Atmospheric Physics I (Thermodynamics/cloud physics)
ATMO 606 - Atmospheric Chemistry I
ATMO 611 - Atmospheric Dynamics II
ATMO 612 - Atmospheric Physics II (Radiative transfer/remote sensing)
ATMO 613 - Advanced Atmospheric Chemistry

The department typically offers one or two advanced graduate elective courses per semester. The selection of the elective courses taught in a particular semester is primarily driven by the research interest of the students in the program.

Master of Science

The university requires all M.S. students to submit a degree plan with at least 32 hours of coursework, of which 23 hours must be formal (i.e., non-research based) coursework. Students must pass each course with a C or better with an average GPA that is not less than 3.0 for good academic standing, and must complete an acceptable thesis. The minimum course requirements of the department are

- 9 hours of ATMO core courses
- 6 hours of additional ATMO courses (may be core courses)
- 3 hours of out-of-department courses
- 1 or 2 hours of ATMO 681 (seminar)
• 4 or 3 additional hours of formal coursework, and
• ATMO 691 (research hours)

Master of Science (non-thesis option)
A non-thesis option requiring a minimum of 36 credit hours is also available to students. Non-thesis option degree candidates must successfully pass, in place of the thesis defense, the comprehensive written exam taken by Ph.D. candidates, although there is a different threshold for passing.

Doctor of Philosophy
All Doctoral students that have a Master’s degree are required to submit a degree plan with at least 64 hours of coursework and all students that do not have a Master’s degree are required to submit a degree plan with at least 96 hours of coursework. The minimum course requirements are
• 12 hours of core courses (both courses in the student’s primary field of interest and at least one course in each of the other two fields)
• 12 hours of additional ATMO courses (may be core courses)
• 6 hours of out-of-department courses
• 2 hours of ATMO 681 (seminar), and
• ATMO 691 (research)

Students are expected to identify the primary field of their interest in consultation with their advisor. They may substitute other coursework for all or part of the core course requirement if those core courses have already been applied toward their Master’s degree. Doctoral students are also required to successfully complete a qualifying exam and a preliminary exam, submit a research proposal, complete their final defense, and submit a dissertation.

6.6 Ph.D. Qualifying Exam
Evaluating the quality of the Ph.D. students is considered one of the department's most important academic obligations. The qualifying exam is a departmental requirement for Ph.D. students, and its objectives are: (1) to restrict our Ph.D. program to students who are likely to be successful in their coursework and research, (2) to establish a minimum foundational knowledge and integrative analysis requirement for Ph.D. students that distributes responsibility broadly among the faculty, and (3) to require students to demonstrate an ability to carry out bibliographical research. The qualifying exam results, along with grades in courses, are used to decide who should be allowed to continue their studies in the Ph.D. program.

The format of the Qualifying Exam of the 2016/2017 Academic Year is new. Students who have passed the old-format written part of the exam prior to fall 2016 will take the “old-format” oral part of the exam. All other students will take the new-format exam.

“New-Format” Exam
The exam is offered once a year, at the end of the spring term. For students who enroll in the fall, the exam must be completed within 36 months after graduate study begins. Students who begin their study during the summer are considered to have enrolled in fall. For students who enroll in the spring semester, the exam must be completed within 32 months. The exam consists of a written and an oral part. Both parts cover the same three fields as the core courses: dynamical meteorology, physical meteorology and atmospheric chemistry. The time of both parts is included in the ATMO Academic Calendar for the spring term. The Department Head announces the time of
both parts of the exam by the start of the spring term. He or she also appoints the Chair of the Oral Exam Committee at that time. (This faculty member chairs the oral exam of all students in any given year).

Only students who satisfy the following requirements are eligible to take the exam:

- The student satisfies the 36 (32) months time limit requirement.
- The student has not failed the exam more than once before.
- The student completed the minimum required core course work of 12 hours.
- The student has a GPR of 3.1 or higher overall core courses taken.
- The student has a cumulative GPR of 3.0 or higher.

Students who enrolled before fall 2016 are exempt of the last three requirements. The Chair of the Qualifying Exam Committee verifies the eligibility of the students to take the exam.

Written Part of the “New-Format” Exam
The written exam has both a short-answer and long-answer section, composed of questions from each of the three fields. The Qualifying Exam Committee selects the problems of both sections from a pool of problems submitted by the Atmospheric Sciences faculty. Students take the short- and long-answer sections in two 3-hour sessions on two different days, which typically take place two days apart. While all students have to answer problems from all three fields (problems based on material covered by ATMO 601, 602, and 606), they have to answer advanced problems (problems based on material covered by ATMO 611, 612, and 613) in their primary field of interest.

Each problem is graded independently by two faculty members, who do not know the students’ identity. They score the answers on a scale of 0-10, with 0 being without merit and 10 being excellent. (Usually a 7 is considered a passing score). The final score for a problem is computed by taking the average of the two scores for each student. Overall scores are computed for both the short-answer and long-answer sections of the written part. Each of these two overall scores has a weight of 1/3 in the calculation of the cumulative Qualifying Exam score.

Oral Part of the “New-Format” Exam
The Qualifying Exam Committee selects a small number of papers in each of the three fields from a pool of papers suggested by the faculty. Students have to choose a paper from those selected by the Qualifying Exam Committee in their primary field of interest. The students have a short period of time (about 1 week) to prepare an oral presentation based on the paper, which they give to their Oral Exam Committee. The oral presentation is limited to 30 minutes or less. The entire exam is limited to 90 minutes.

The purpose of the oral presentation is to give oral demonstration of the ability to understand key scientific concepts and arguments in the chosen paper. Only unmodified figures/tables from the paper and equations can be presented as Powerpoint slides. No additional text should be included in the slides. These restrictions prevent a presentation graphics “arms race” and allow the students to spend more time trying to understand the paper during the week. This also means that the students will not be judged on the quality of their presentation graphics. If students want to talk about material from textbooks or other papers, they can simply “talk about it”, or draw/write on the white board.
The oral exam focuses narrowly on the student’s understanding of the material presented in the paper, and any relevant material covered in the textbooks and core courses. The student is not expected to “back trace” the citations and read all of the important previous papers on the topic in the short time span of a week, although some of them may choose to do so in order to better understand the chosen paper itself. The student will be asked questions that are directly related to core topics discussed in the paper. It is assumed that the student has reviewed these topics using core course material when reading the paper.

The examining committee is not informed of the students’ aggregate score in the written exam, to avoid subconscious bias.

Composition of the Oral Exam Committee:
- Each student’s committee will have the same number of members (three or more)
- Each student’s committee will be chaired by the same faculty member, the Chair of the Oral Exam Committee
- The Department Head will appoint the additional members of the Committee before the exam
- The student’s faculty adviser cannot be a member of the Committee

Oral Exam Score:
The evaluation of the performance of a student is based on a rubric. The rubric items are the following:
- Was the student able to explain the scientific question addressed by the paper, as described in the introductory section of the paper?
- Was the student able to explain the methodology used to address the scientific question, as described in the paper?
- Was the student able to explain the main conclusions of the paper?
- Did the student display an understanding of the concepts discussed in the paper that were covered in the core courses taken by the student, by satisfactorily answering questions related to these concepts?

The students are evaluated on the intellectual content of their presentation and answers, not on their fluency in English.

Each committee member scores the student’s performance on each rubric item on a scale of 0-10, with 0 being very poor and 10 being very good. (Usually a 7 is considered a passing score). An unweighted average of all the rubric items for all committee members will be computed to yield an overall oral exam score in the range of 0-10. This score will have a weight of 1/3 in the calculation of the cumulative Qualifying Exam score.

Decision on Passing the Qualifying Exam
The Qualifying Exam Committee calculates the cumulative Qualifying Exam score for each student, examines the scores in light of the level of difficulty of the various exam components, and makes a recommendation to the full faculty as to which students have passed the exam. The full faculty then discusses the exam and its outcome, and determines by simple majority vote which students have passed the exam. The identity of a student will be revealed before the vote only if the student’s score falls into a grey area between those obviously passing and those obviously failing. In such cases, faculty may also take into account the student’s performance in the different courses and other indicators of future success.
It is the responsibility of the student’s faculty adviser to inform the student about the outcome of the exam, as soon as possible after the meeting of the full faculty. The faculty advisor should also discuss the options of a student who fails the exam. A student who fails the exam for a second time can no longer pursue a Ph.D. degree in the Atmospheric Sciences. The adviser of such a student will usually suggest a path to graduation with a Master’s degree. Students also have the option to transfer to another Ph.D. program.

“Old-Format” Oral Exam
Only those students who passed the written exam prior to fall 2016 may take the old-format oral exam. The old-format oral exam is evaluated separately from the written exam, as described below. The old-format oral exam is a research presentation that is open to the whole department. Students present their research ideas in the context of the background and recent developments in their field of research, including the project's relevance to the atmospheric sciences.

Presentations should include the research project's objectives and may include preliminary data and/or model calculations from ongoing activities that show potential or actual progress towards those objectives. Students may be questioned as part of their research presentation. Presentations are evaluated based on several criteria, including:

- Was the presentation clear and easy to follow?
- Did the student demonstrate the ability to conduct independent research?
- Did the student demonstrate adequate knowledge of the literature?
- Does the student understand how his or her research fits into the general body of scientific knowledge?
- Does the student understand the principles of scientific inquiry?

Each research presentation is evaluated by an ad hoc committee consisting of the student's advisory committee plus two other faculty members selected by the Department Head in consultation with the student's advisor. The student's advisor collects written evaluations from the ad hoc committee and makes a recommendation to the full faculty. The full faculty receives the recommendation, discusses the student’s performance, and decides by majority vote whether the student has passed the oral exam.

6.7 Ph.D. Preliminary Exam
A preliminary examination is required of all doctoral students of the university. In our doctoral program, the preliminary exam is oral. A preliminary exam is given no earlier than a date when the student is within approximately six credit hours of completion of the formal course work (i.e., all course work on the degree plan except 681, 684, 690, 691, and 692 courses). It is recommended that the preliminary examination be completed no later than the end of the semester following the completion of the formal course work on the degree plan.

The scope of the preliminary exam may be any or all of the student’s coursework on their degree plan. Typically, the student submits a dissertation proposal to their committee prior to the preliminary exam, and the questions for the preliminary exam focus on the proposal and on the background knowledge necessary to successfully carry out the proposed work.

A positive vote by all members of the graduate committee, with at most one dissention, is required to pass a student on his/her exam. A department can have a stricter requirement for the number of positive votes required provided there is consistency within all degree programs within a
department. The Department of Atmospheric Sciences has no such stricter requirement. At their discretion, the advisory committee and OGAPS may allow re-examination when adequate time has passed to allow the student to address inadequacies emerging from the first examination (normally six months).

6.8 Seminar
The department has an active weekly seminar series, featuring both internal and external speakers, which is also offered as a 1-hour graduate course. Graduate students are required to enroll in the seminar course for at least two semesters, and are required to attend even if not enrolled. Students attend these seminars regularly, and some actively participate by asking questions and entering the discussion. A number of additional seminars are given during the semester, as well as the occasional internal seminar series.

6.9 Assessment
As with the undergraduate program (see section 5.7), the department is required to carry out an assessment of its M.S. and Ph.D. programs following each academic year. A brief overview of our M.S. and Ph.D. assessment practices is given below, keeping in mind that much of the discussion in section 5.7 applies to the graduate assessment as well. Further details of our assessment activities can be found in Appendix C.

M.S. Program
For assessment purposes, the mission of the department's M.S. program is to provide students with a broad, general knowledge of the atmospheric sciences and to prepare them for careers in government agencies and the private sector. Key learning outcomes of the M.S. program include: (i) students will be able to effectively communicate their work, both orally and in writing; (ii) students will have mastered the core knowledge of the atmospheric sciences, with an in-depth understanding of at least one subdiscipline of the field; and (iii) students will have the knowledge, skills, and experience to conduct research, particularly as it relates to employment in the private sector or with government agencies.

Ph.D. Program
The mission of the department's Ph.D. program is to provide students with both a broad, general knowledge of the atmospheric sciences, as well as in-depth knowledge and research experience in one or more specialty areas, and to prepare students for research and teaching careers, both in higher education and in government or private labs. In terms of student learning outcomes, the Ph.D. program shares the same three outcomes as the M.S. program, with the addition of a fourth: (iv) graduates will be prepared to conduct independent research in at least one subdiscipline of the field, and be able to disseminate this research to a broad audience, both in oral and written forms.

Assessment Methods
Our effectiveness at achieving the stated learning outcomes is assessed using a wide range of measures and metrics. Included in these measures and metrics are assessments of performance on exams and presentations (including defenses), metrics involving numbers of publications and conference presentations, graduating student exit surveys, and direct input from faculty advisors. The department also gathers statistics on graduate applications and admissions to the program, and keeps track of completion times to the M.S. and Ph.D. degrees. A complete list of assessment measures and their associated target values can be found in Appendix C.
Analysis and Action Plans
As discussed in section 5.6, in the past few years our assessment findings have played a role (along with other factors) in motivating several important curricular discussions, including a major revision of the Ph.D. qualifying exam (see section 6.7) and an ongoing discussion on the content of the graduate core curriculum. Details of key assessment findings and associated action plans over the past several assessment cycles can be found in Appendix C.

Opportunity Costs
The costs of our assessment activities in terms of faculty time and effort are described in section 5.7.

6.10 Successes
Graduate Recruitment
The number of applicants to our graduate program has increased significantly since 2009, and we attract applicants with a broad range of scientific backgrounds, well beyond traditional meteorology or atmospheric sciences undergraduates.

Graduate Enrollment
We have maintained the overall size of our graduate program since 2009. We reversed the declining trend of the ratio of female to male students in the program, and in the last five years the ratio has been growing steadily. The number of minority students in the program has also increased.

Time to Degree
The average time to degree for the period 2009-2016 was 2.9 year for the M.S. students and 5.3 year for the Ph.D. students, but most M.S. students took their final exam after 2 years in the program, while most Ph.D. students took their final exam after 4.5 years. We note that the average time to degree is somewhat higher than the typical time to complete all degree requirements, because students who take their final exam in the second half of a semester, formally graduated only in the following semester.

Graduate Placement
More than half of the M.S. students continued their studies toward a Ph.D. degree. Most of those who left with an M.S. degree found employment in the private sector. They work for consulting companies or companies that provide contract support scientists to research labs (e.g., NASA, UCAR). Our experience is that there is a steady demand for our M.S. graduates. With the exception of 3 of them, about whom we have no current information, all of them are employed in the profession. All of our Ph.D. graduates found employment after graduation, typically as postdocs or contract scientists at national labs and universities (NCAR, NOAA Boulder, NESDIS, JPL, Lawrence Livermore National Lab, Sandia National Lab, Pacific Northwest National Lab, UCLA, University of Wisconsin, Johns Hopkins University, University of North Dakota, University of Maryland, Arizona State University, NRL Monterey, NRL D.C.). One of our goals has been to have our Ph.D.s join the ranks of tenure-track faculty at research universities. We are moving towards that goal; two of our recent Ph.D. graduates (Cameron Homeyer and Elinor Martin) joined the faculty of School of Meteorology at The University of Oklahoma as Assistant. Zhibo Zhang is an Associate professor at the University of Maryland, Baltimore County (UMBC), Justin Stachnyk is an Assistant Professor at the University of Kansas, and Naruki Hiranuma is an Assistant Professor at West Texas A&M, Canyon.
6.11 Challenges

Graduate Recruitment
Graduate recruitment remains an ongoing challenge. A fair number of our top-rated domestic applicants choose to accept competing offers from peer institutions such as Colorado State University, University of Washington, etc., even though we offer a competitive stipend and incentives such as graduate fellowships. Our geographical location (and climate) may play some role in this, but improving our overall academic reputation may be the best way to increase the acceptance rate for our offers to the top applicants. Below the top tier of applicants, most of our admission offers are usually accepted.

Graduate Enrollment
The continued decline in M.S. student enrollment is a cause for some concern. One contributing factor may be that the department currently has few faculty offering GAR positions in areas of interest to M.S. students. Most M.S. applicants are domestic students who are interested in areas such as severe weather and synoptic meteorology, rather than atmospheric chemistry or climate research. The addition of Dr. Chris Nowotarski who studies mesoscale meteorology and severe storms has helped in this context.

Another factor that limits graduate enrollment is the small number of GAT positions available in our department, especially in comparison to other departments within the College. We are able to offer a maximum of four or five GAT positions to incoming students each year. If we are able to obtain more GAT positions (presumably by teaching more service courses with labs), we should be able increase our enrollment. Even if such positions were to become available, we would need to actively recruit to improve the pool of domestic applicants so that we can offer the additional GAT positions to qualified domestic candidates. (International applicants cannot be offered GAT positions.)

Minority Enrollment
While minority enrollment in the graduate program has increased since 2009 (ranging from four to five individuals), minorities are still underrepresented in our program compared to the ethnical composition of our state and nation.
Chapter 7 - Research Activities

In alignment with the university’s mission, the department has been striving to become a top-tier department with nationally and internationally recognized strengths in the interdisciplinary atmospheric sciences. A number of faculty members are world-class experts or are emerging as leaders in their respective disciplines. In this chapter the department’s performance is elaborated in terms of several metrics, particularly grant funding, scholarly publications, citations, and awards/honors received by the faculty.

7.1 Overall Department Research Performance

Table 7.1 lists the department’s 2015 rankings in a number of metrics based on a commercial academic database, Academic Analytics, subscribed by the university (note, the 2016 data have not been released because the commercial database lags a year). The statistics are based on the data of 53 departments in atmospheric sciences (or departments containing programs in atmospheric sciences) in the United States.

<table>
<thead>
<tr>
<th>Metric</th>
<th>National Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Grants</td>
<td>20</td>
</tr>
<tr>
<td>Number of Faculty Members with a Grant</td>
<td>21</td>
</tr>
<tr>
<td>Total Grant Dollars</td>
<td>25</td>
</tr>
<tr>
<td>Percentage of Faculty with a Grant</td>
<td>19</td>
</tr>
<tr>
<td>Grant Dollars per Faculty Member</td>
<td>17</td>
</tr>
<tr>
<td>Grant Dollars per Faculty Member</td>
<td>25</td>
</tr>
<tr>
<td>Total Articles</td>
<td>27</td>
</tr>
<tr>
<td>Articles per Author</td>
<td>24</td>
</tr>
<tr>
<td>Number of Faculty with an Article</td>
<td>25</td>
</tr>
<tr>
<td>Articles per Faculty Member</td>
<td>21</td>
</tr>
<tr>
<td>Total Citations</td>
<td>21</td>
</tr>
<tr>
<td>Number of Faculty with a Citation</td>
<td>25</td>
</tr>
<tr>
<td>Citations per Faculty Member</td>
<td>16</td>
</tr>
<tr>
<td>Citations per Publication</td>
<td>10</td>
</tr>
<tr>
<td>Total Awards</td>
<td>9</td>
</tr>
<tr>
<td>Number of Faculty with an Award</td>
<td>10</td>
</tr>
<tr>
<td>Awards per Faculty Member</td>
<td>8</td>
</tr>
<tr>
<td>Percentage of Faculty with Award</td>
<td>6</td>
</tr>
</tbody>
</table>

Figure 7.1 is the department’s performance diagram for the 2015 metrics from Academic Analytics in four areas: grant funding, awards, publications, and citations. The shaded rows indicate the medians of the relevant data for 53 departments nationwide. Overall, the performance of the department is good except the metric “Dollars per Grant”. This weakness may in part reflect the absence of a research cooperative institute (such as the Cooperative Institute for Meteorological Satellite Studies at the University of Wisconsin) at TAMU.

Figure 7.1. Department radar diagram for 2015 metrics from Academic Analytics (this is based on the ad-loc faculty only (Copyright © 2016, Academic Analytics, LLC)
7.2 Awards and Honors Received by the Faculty

To some extent, the awards and honors received by faculty members reflect the excellence and impact of their research. Table 7.2 compares the award metric (specifically, awards per faculty member) with 53 departments in atmospheric sciences or with programs in atmospheric sciences/meteorology. In this aspect, the department is proud of being ranked No. 8 after Harvard University, California Institute of Technology, University of California-Berkeley, University of Washington, Massachusetts Institute of Technology, Colorado State University, and University of California, Los Angeles. This achievement is largely attributed to the department’s tremendous
effort in this regard over the years. Specifically, the department’s Awards Committee takes every possible opportunity to promote our faculty in terms of recognizing their accomplishments.

Table 7.2 Atmospheric Sciences and Meteorology Awards (awards per faculty member from statistics based on 53 departments, provided by Academic Analytics)

<table>
<thead>
<tr>
<th>Name of Institution</th>
<th>Rank</th>
<th>Percentile</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvard University (Earth and Planetary Science, Department of)</td>
<td>1</td>
<td>100%</td>
<td>3.96</td>
</tr>
<tr>
<td>California Institute of Technology (Geological and Planetary Sciences, Division of)</td>
<td>2</td>
<td>98.2%</td>
<td>2.59</td>
</tr>
<tr>
<td>University of California, Berkeley (Earth and Planetary Science, Department of)</td>
<td>3</td>
<td>96.3%</td>
<td>2.46</td>
</tr>
<tr>
<td>University of Washington (Atmospheric Sciences, Department of)</td>
<td>4</td>
<td>94.4%</td>
<td>1.79</td>
</tr>
<tr>
<td>Massachusetts Institute of Technology (Earth, Atmospheric and Planetary Sciences, Department of)</td>
<td>5</td>
<td>92.6%</td>
<td>1.65</td>
</tr>
<tr>
<td>Colorado State University (Atmospheric Science, Department of)</td>
<td>6</td>
<td>90.7%</td>
<td>1.38</td>
</tr>
<tr>
<td>University of California, Los Angeles (Atmospheric and Oceanic Sciences, Department of)</td>
<td>7</td>
<td>88.9%</td>
<td>1.30</td>
</tr>
<tr>
<td>Texas A&amp;M University (Atmospheric Sciences, Department of)</td>
<td>8</td>
<td>87.0%</td>
<td>1.25</td>
</tr>
<tr>
<td>Northwestern University (Earth and Planetary Science, Department of)</td>
<td>9</td>
<td>85.2%</td>
<td>1.15</td>
</tr>
<tr>
<td>University of Maryland, College Park (Atmospheric and Oceanic Science, Department of)</td>
<td>10</td>
<td>83.3%</td>
<td>1.06</td>
</tr>
<tr>
<td>University of Minnesota, Twin Cities (Earth Sciences, Department of)</td>
<td>11</td>
<td>81.5%</td>
<td>1.00</td>
</tr>
<tr>
<td>University of Colorado Boulder (Atmospheric and Oceanic Sciences (ATOC), Department of)</td>
<td>11</td>
<td>81.5%</td>
<td>1.00</td>
</tr>
<tr>
<td>University of Michigan (Atmospheric, Oceanic and Space Sciences, Department of)</td>
<td>13</td>
<td>77.8%</td>
<td>0.91</td>
</tr>
<tr>
<td>Cornell University (Earth and Atmospheric Sciences, Department of)</td>
<td>14</td>
<td>75.9%</td>
<td>0.80</td>
</tr>
<tr>
<td>University at Albany, State University of New York</td>
<td>15</td>
<td>74.1%</td>
<td>0.70</td>
</tr>
<tr>
<td>Georgia Institute of Technology (Earth and Atmospheric Sciences, School of)</td>
<td>16</td>
<td>72.2%</td>
<td>0.69</td>
</tr>
<tr>
<td>University of Illinois at Urbana-Champaign (Atmospheric Sciences, Department of)</td>
<td>17</td>
<td>70.4%</td>
<td>0.69</td>
</tr>
<tr>
<td>Pennsylvania State University, The (Meteorology, Department of)</td>
<td>18</td>
<td>68.5%</td>
<td>0.63</td>
</tr>
<tr>
<td>Purdue University (Earth, Atmospheric, and Planetary Sciences, Department of)</td>
<td>19</td>
<td>66.7%</td>
<td>0.56</td>
</tr>
<tr>
<td>University of Miami (Meteorology and Physical Oceanography, Division of)</td>
<td>20</td>
<td>64.8%</td>
<td>0.52</td>
</tr>
<tr>
<td>University of Minnesota, Twin Cities (Soil, Water and Climate, Department of)</td>
<td>21</td>
<td>63.0%</td>
<td>0.48</td>
</tr>
<tr>
<td>University of Arizona, The (Planetary Sciences, Department of)</td>
<td>22</td>
<td>61.1%</td>
<td>0.47</td>
</tr>
<tr>
<td>University of Wyoming (Atmospheric Science, Department of)</td>
<td>23</td>
<td>59.3%</td>
<td>0.45</td>
</tr>
<tr>
<td>University of Hawaii (Meteorology, Department of)</td>
<td>23</td>
<td>59.3%</td>
<td>0.45</td>
</tr>
<tr>
<td>George Mason University (Atmospheric, Oceanic and Earth Sciences, Department of)</td>
<td>23</td>
<td>59.3%</td>
<td>0.45</td>
</tr>
<tr>
<td>University of Missouri (Soil, Environmental and Atmospheric Sciences, Department of)</td>
<td>26</td>
<td>53.7%</td>
<td>0.44</td>
</tr>
<tr>
<td>North Carolina State University (Marine, Earth and Atmospheric Sciences, Department of)</td>
<td>27</td>
<td>51.9%</td>
<td>0.44</td>
</tr>
<tr>
<td>University of Rhode Island (Oceanography, Graduate School of)</td>
<td>28</td>
<td>50.0%</td>
<td>0.39</td>
</tr>
<tr>
<td>Old Dominion University (Ocean, Earth and Atmospheric Sciences, Department of)</td>
<td>29</td>
<td>48.2%</td>
<td>0.33</td>
</tr>
<tr>
<td>Iowa State University (Geological and Atmospheric Sciences, Department of)</td>
<td>30</td>
<td>46.3%</td>
<td>0.32</td>
</tr>
<tr>
<td>Stony Brook University, State University of New York (Marine and Atmospheric Sciences (SoMAS), School of)</td>
<td>31</td>
<td>44.4%</td>
<td>0.31</td>
</tr>
</tbody>
</table>
Table 7.3 Recent Research, Teaching, and Service Awards

<table>
<thead>
<tr>
<th>Year</th>
<th>Award</th>
<th>Recipient</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Outstanding Reviewer, Journal of Hydrologic Engineering, American Society of Civil Engineers</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>Fellow of the American Association for the Advancement of Science</td>
<td>Renyi Zhang</td>
</tr>
<tr>
<td></td>
<td>Texas A&amp;M University E.D. Brocket Professorship in Geosciences</td>
<td>Courtney Schumacher</td>
</tr>
<tr>
<td></td>
<td>American Chemical Society Symposium in honor of Professor Renyi Zhang, Fall National Meeting, Philadelphia</td>
<td>Renyi Zhang</td>
</tr>
<tr>
<td></td>
<td>Honor Award for Scientific Excellence, Division of Environmental Chemistry, American Chemical Society</td>
<td>Renyi Zhang</td>
</tr>
<tr>
<td>2015</td>
<td>Editor’s Award, Bulletin of the American Meteorological Society, American Meteorological Society</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>NASA Group Achievement Award, MSL Prime Mission Science and Operations Team</td>
<td>Mark Lemmon</td>
</tr>
<tr>
<td></td>
<td>AMS Editor’s Award for Journal of Climate</td>
<td>Courtney Schumacher</td>
</tr>
<tr>
<td></td>
<td>Texas A&amp;M University, College of Geosciences Distinguished Research Award</td>
<td>Ramalingam Saravanan</td>
</tr>
<tr>
<td></td>
<td>Fellow of American Geophysical Union</td>
<td>Ping Yang</td>
</tr>
<tr>
<td></td>
<td>Fellow of the American Meteorological Society</td>
<td>Renyi Zhang</td>
</tr>
<tr>
<td>2014</td>
<td>Dean’s Distinguished Achievement Award in Research, College of Geosciences</td>
<td>Kenneth Bowman</td>
</tr>
<tr>
<td></td>
<td>Fellowship of Japan Society for the Promotion of Science</td>
<td>Ping Chang</td>
</tr>
<tr>
<td></td>
<td>Follow of the Research Center for Advanced Science and Technology, University of Tokyo</td>
<td>Ping Chang</td>
</tr>
<tr>
<td></td>
<td>AMS Louis J. Battan Author’s Award for <em>Introduction to Modern Climate Change</em></td>
<td>Andrew Dessler</td>
</tr>
<tr>
<td>Year</td>
<td>Award Description</td>
<td>Recipient</td>
</tr>
<tr>
<td>------</td>
<td>------------------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>2013</td>
<td>Texas A&amp;M Association of Former Students Teaching Award, College of Geosciences</td>
<td>Andrew Dessler</td>
</tr>
<tr>
<td></td>
<td>Dean’s Distinguished Achievement Award for Teaching</td>
<td>Robert Korty</td>
</tr>
<tr>
<td></td>
<td>NASA Group Achievement Award, Mars Exploration Rover Science &amp; Operations Team</td>
<td>Mark Lemmon</td>
</tr>
<tr>
<td></td>
<td>American Meteorological Society Meisinger Award</td>
<td>Courtney Schumacher</td>
</tr>
<tr>
<td></td>
<td>Dean’s Distinguished Achievement Award for Faculty Teaching</td>
<td>Courtney Schumacher</td>
</tr>
<tr>
<td></td>
<td>E.D. Brocket Professorship in Geosciences</td>
<td>Courtney Schumacher</td>
</tr>
<tr>
<td></td>
<td>University Distinguished Professor, Texas A&amp;M University</td>
<td>Renyi Zhang</td>
</tr>
<tr>
<td></td>
<td>Editors’ Citation for Excellence in Refereeing for JGR-Atmospheres</td>
<td>Sarah Brooks</td>
</tr>
<tr>
<td></td>
<td>NASA Group Achievement Award, MSL Mastcam, MAHLI, and MARDI Instruments</td>
<td>Mark Lemmon</td>
</tr>
<tr>
<td></td>
<td>Editors’ Citation for Excellence in Refereeing for JGR-Atmospheres</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>Sigma Xi – Texas A&amp;M Chapter Outstanding Science Communicator</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>Texas A&amp;M SEC Distinguished Achievement Award</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>Ascent Award by AGU Atmospheric Sciences Section</td>
<td>Ping Yang</td>
</tr>
<tr>
<td></td>
<td>Fellow of the American Meteorological Society</td>
<td>Ping Yang</td>
</tr>
<tr>
<td></td>
<td>NASA Group Achievement Award to ACCRI Aircraft Cloud Effects Team</td>
<td>Ping Yang</td>
</tr>
<tr>
<td></td>
<td>NASA Group Achievement Award to CERES Clouds Team</td>
<td>Ping Yang</td>
</tr>
<tr>
<td>2012</td>
<td>Editors’ Citation for Excellence in Refereeing for JGR-Atmospheres</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>AGU Atmospheric Sciences Ascent Award</td>
<td>Andrew Dessler</td>
</tr>
<tr>
<td></td>
<td>Dean’s Achievement Award, Service, Texas A&amp;M College of Geosciences</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>Weather Hero, The John C. Freeman Weather Museum</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>AGU Editors’ Citation for Excellence in Refereeing for Eos</td>
<td>Courtney Schumacher</td>
</tr>
<tr>
<td></td>
<td>University-Level Distinguished Achievement Award – Research, Texas A&amp;M University and The Association of Former Students</td>
<td>Renyi Zhang</td>
</tr>
<tr>
<td>2011</td>
<td>Google Science Communication Fellow</td>
<td>Andrew Dessler</td>
</tr>
<tr>
<td></td>
<td>Texas A&amp;M College of Geosciences Distinguished Achievement Award for Faculty Research</td>
<td>Andrew Dessler</td>
</tr>
<tr>
<td></td>
<td>Texas A&amp;M Sigma Xi Outstanding Communicator Award</td>
<td>Andrew Dessler</td>
</tr>
<tr>
<td></td>
<td>Association of Former Students Award for Teaching, College of Geosciences,</td>
<td>Robert Korty</td>
</tr>
<tr>
<td></td>
<td>Regents Professor, The Texas A&amp;M University System</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>Newsmaker Image Award, Texas A&amp;M University</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>The Woody Guthrie Award Presented to a Thinking Blogger</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>Fellow, American Meteorological Society</td>
<td>John Nielsen-Gammon</td>
</tr>
<tr>
<td></td>
<td>Texas A&amp;M Association of Former Students Distinguished Teaching Award</td>
<td>Courtney Schumacher</td>
</tr>
<tr>
<td></td>
<td>Certificate of Appreciation, National Institute of Standards and Technology (NIST)</td>
<td>Ping Yang</td>
</tr>
</tbody>
</table>
2010 | Texas A&M Association of Former Students Outstanding Teacher Award | Sarah Brooks
---|---|---
 | Student-Led Award for Teaching Excellence (SLATE), Texas A&M University | Craig Epifanio
 | Student Recognized Award for Teaching Excellence, Texas A&M University System | Robert Korty
 | NASA Exceptional Public Service Medal "for exceptional science leadership of the Phoenix Surface Stereo Imager (SSI) instrument, providing the first surface images of the northern polar region of Mars | Mark Lemmon
 | NASA Group Achievement Award, MER Spirit Dust Storm Survival Team | Mark Lemmon
 | Fellow of the Optical Society of America | Ping Yang
 | Certificate of Appreciation, NASA | Ping Yang
 | Holder of the David Bullock Harris Endowed Chair in Geosciences | Ping Yang
 | Holder of the Harold J. Haynes Endowed Chair in Geosciences | Renyi Zhang

**Career Awards**
A number of our faculty members received early career research awards from NSF, NASA, ONR, and USDA. Listed in Table 7.4 lists are the recent awards received by our faculty since 2010.

<table>
<thead>
<tr>
<th>Recipient</th>
<th>Year</th>
<th>Award</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaima Nasiri</td>
<td>2010</td>
<td>NASA New Investigator Program Award</td>
</tr>
<tr>
<td>Anita Rapp</td>
<td>2014</td>
<td>NASA New Investigator Program Award</td>
</tr>
<tr>
<td>Gunnar Schade</td>
<td>2010</td>
<td>NSF CAREER Award</td>
</tr>
<tr>
<td>Russ Schumacher</td>
<td>2010</td>
<td>NSF CAREER Award</td>
</tr>
</tbody>
</table>

### 7.3 Research Grants and Contracts
A faculty member in a major research university such as TAMU is expected to develop and maintain a vigorous, extramurally funded research program, focusing on significant scientific problems. In this aspect, the department is quite successful as a majority of the faculty actively seek grant funding. Table 7.5 lists the yearly distribution of grants and contracts awarded to the Department’s faculty from 2009 to 2016. Detailed information of the grants and contracts are given in Appendix E.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Newly Awarded Grants or Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 (through mid-October)</td>
<td>18</td>
</tr>
<tr>
<td>2015</td>
<td>31</td>
</tr>
<tr>
<td>2014</td>
<td>18</td>
</tr>
<tr>
<td>2013</td>
<td>20</td>
</tr>
<tr>
<td>2012</td>
<td>20</td>
</tr>
<tr>
<td>2011</td>
<td>26</td>
</tr>
<tr>
<td>2010</td>
<td>26</td>
</tr>
<tr>
<td>2009</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 7.6 lists individual faculty members’ funding profiles since FY2008. Note that in Table 7.6, only grant/contract funding from federal funding agencies are included. The research expenditures listed in Table 3.3 show an increasing trend in the past several years. Specifically, the total (direct
plus indirect) expenditures in FY2014, 2015, and 2016 were $4.29M, $4.47M, and $4.63M, respectively.

Table 7.6 Faculty External Funding Totals Since 2008

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bowman</td>
<td>$1,635,196</td>
</tr>
<tr>
<td>Brooks</td>
<td>$1,737,622</td>
</tr>
<tr>
<td>Collins</td>
<td>$3,602,390</td>
</tr>
<tr>
<td>Conlee</td>
<td>$337,090</td>
</tr>
<tr>
<td>Dessler</td>
<td>$3,218,502</td>
</tr>
<tr>
<td>Epifanio</td>
<td>$473,617</td>
</tr>
<tr>
<td>Korty</td>
<td>$503,517</td>
</tr>
<tr>
<td>Lemmon</td>
<td>$1,995,004</td>
</tr>
<tr>
<td>Logan</td>
<td>$0</td>
</tr>
<tr>
<td>Nasiri</td>
<td>$853,134</td>
</tr>
<tr>
<td>Nielsen-Gammon</td>
<td>$1,555,122</td>
</tr>
<tr>
<td>North</td>
<td>$243,392</td>
</tr>
<tr>
<td>Nowotarski</td>
<td>$218,252</td>
</tr>
<tr>
<td>Orville</td>
<td>$2,637,732</td>
</tr>
<tr>
<td>Panetta</td>
<td>$0</td>
</tr>
<tr>
<td>Rapp</td>
<td>$1,098,539</td>
</tr>
<tr>
<td>Saravanan</td>
<td>$2,808,793</td>
</tr>
<tr>
<td>Schade</td>
<td>$1,594,622</td>
</tr>
<tr>
<td>Schumacher, C</td>
<td>$3,144,514</td>
</tr>
<tr>
<td>Schumacher, R^</td>
<td>$388,168</td>
</tr>
<tr>
<td>Szunyogh</td>
<td>$1,709,671</td>
</tr>
<tr>
<td>Wilheit*</td>
<td>$1,296,794</td>
</tr>
<tr>
<td>Xu (new)</td>
<td>$0</td>
</tr>
<tr>
<td>Yang</td>
<td>$8,198,916</td>
</tr>
<tr>
<td>Zhang</td>
<td>$2,288,788</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>$41,619,386</strong></td>
</tr>
</tbody>
</table>

Note: faculty indicated with an * have retired, and ^ have left the department. Both Drs. North and Orville retired as tenured faculty members, but continue on as part-time research professors.

7.4 Dissemination of Research Findings through Peer-review Publications

Our faculty members are prolific in publishing research findings, as evident from Table 7.7 where the number of papers in high impact interdisciplinary journals (Science, Nature, Nature subjournals such as Nature-Geoscience, and Proc. Natl. Acad. Sc. USA) is also listed. Indeed, the quantity and number of the department’s scholarly publications speak for themselves. Table 7.8 lists the individual faculty profiles in publishing their scholarly work.

Table 7.7 Peer-reviewed Publications of the Department

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Peer-reviewed papers</th>
<th>Number of papers in high-impact journals (Science, Nature, Proc. Natl. Acad. Sc. USA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>71</td>
<td>4</td>
</tr>
<tr>
<td>2015</td>
<td>73</td>
<td>5</td>
</tr>
<tr>
<td>2014</td>
<td>68</td>
<td>11</td>
</tr>
<tr>
<td>2013</td>
<td>97</td>
<td>11</td>
</tr>
<tr>
<td>2012</td>
<td>69</td>
<td>4</td>
</tr>
</tbody>
</table>
7.5 Services for the Research Community
In addition to conducting research, the faculty actively participate in various services for the research community, including reviewing research proposals and manuscripts. At present, the faculty have the following editorships:

Editor, *Journal of the Atmospheric Sciences* (2)
Editor, *Theoretical & Applied Climatology* (1)
Editor, *International Journal of Geophysics* (1)

Associate Editor, *Monthly Weather Review* (1)
Associate Editor, *Journal of Quantitative Spectroscopy & Radiative Transfer* (1)

Senior Editor, *Oxford Research Encyclopedia - Environmental Science*, *Oxford University Press*

<table>
<thead>
<tr>
<th>Year</th>
<th>Bowman</th>
<th>Brooks</th>
<th>Conlee</th>
<th>Collins</th>
<th>Dessler</th>
<th>Epifanio</th>
<th>King</th>
<th>Korty</th>
<th>Lemmon</th>
<th>Logan</th>
<th>Montuoro</th>
<th>Nielsen-Gammon</th>
<th>North</th>
<th>Nowotarski</th>
<th>Orville</th>
<th>Panetta</th>
<th>Rapp</th>
<th>Saravanan</th>
<th>Schade</th>
<th>Schumacher</th>
<th>Szunyogh</th>
<th>Xu</th>
<th>Yang</th>
<th>Zhang</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>7</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>7</td>
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<td>3</td>
<td>2</td>
<td>0</td>
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<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>4</td>
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<td>4</td>
<td>2</td>
<td>12</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>2011</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>6</td>
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<td>1</td>
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<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
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<td>3</td>
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<td>3</td>
<td>18</td>
</tr>
<tr>
<td>2012</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
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<td>2</td>
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<td>3</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>1</td>
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</tr>
<tr>
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<td>0</td>
<td>2</td>
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<td>4</td>
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<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>1</td>
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<td>17</td>
</tr>
<tr>
<td>2014</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>17</td>
</tr>
</tbody>
</table>
7.6 External Research Collaborations

Because of the breadth of disciplines within the department, faculty and research staff have active research projects in the areas of theory, observation and experiment, and numerical modeling. Many of these projects involve large facilities, such as aircraft, satellite, and supercomputers, which necessarily require cooperative efforts. Many collaborations are also underway at the personal level. A list of external institutions with whom our faculty are collaborating is provided below:

Aarhus University, Denmark; Aerodyne Research Inc.; Applied Physics Lab; Arizona State University; Chinese Academy of Science; Colorado State University; Cornell University; Dalhousie University; Fudan University; Harvard University; Imperial College; Institute for Environmental Physics, Bremen, Germany; Lamont Doherty Geophysical Observatory, Columbia University; Malin Space Science Systems; Max Planck Institute for Solar System Research; Massachusetts Institute of Technology; NASA Goddard Space Flight Center; NASA Jet Propulsion Laboratory; NASA Johnson Space Center; National Center for Atmospheric Research; Nanjing University of Information Science and Technology; New York University; Ocean University of China; Peking University; Riso DTU National Laboratory for Sustainable Energy, Denmark; Space Science Institute; United States Geological Survey; University of Arizona; University of California, Berkeley; University of California, San Diego; University of Central Florida; University of Colorado; University of Copenhagen; University of East Anglia; University of Edinburgh; University of Houston; University of Miami; University of Michigan; University of Texas, Austin; University of Wisconsin, Space Science and Engineering Center; Washington University; York University, Canada

7.7 Faculty Mentoring

The department’s future will largely depend on the future performance of the current assistant and associate professors. In order to assist new faculty members with the establishment of their research and teaching programs, the department assigns mentors to each assistant or associate professor. In particular, mentors are encouraged to meet and talk informally with the new faculty members. Mentors are available to answer questions about any aspect of university life. In order to provide the best help with research issues, mentors are normally chosen who have similar research interests with new faculty. In addition to having an identified mentor, new faculty are encouraged to talk with any faculty and staff, both within the department and outside, when they need assistance or advice. The current list of assistant and associate professors and their mentors is given below in Table 7.9.

<table>
<thead>
<tr>
<th>Assistant &amp; Associate Professors</th>
<th>Primary mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epifanio</td>
<td>Panetta and Szunyogh</td>
</tr>
<tr>
<td>Korty</td>
<td>Saravanan and Bowman</td>
</tr>
<tr>
<td>Lemmon</td>
<td>Saravanan</td>
</tr>
<tr>
<td>Logan</td>
<td>Zhang</td>
</tr>
<tr>
<td>Montuoro</td>
<td>Saravanan</td>
</tr>
<tr>
<td>Nowotarski</td>
<td>Nielsen-Gammon</td>
</tr>
<tr>
<td>Rapp</td>
<td>Bowman</td>
</tr>
<tr>
<td>Schade</td>
<td>Collins and Nielsen-Gammon</td>
</tr>
<tr>
<td>Xu</td>
<td>Dessler</td>
</tr>
</tbody>
</table>
Chapter 8 – Summary

8.1 Departmental Strategic Plan

The departmental strategic plan was last revised in 2014. We present here a short summary of the plan’s goals and strategies.

Mission

The Department of Atmospheric Sciences is dedicated to 1) advancing scientific understanding of the atmosphere and imparting that knowledge for the benefit of society, 2) preparing the next generation of atmospheric scientists to acquire and develop scientific knowledge, critical thinking skills, lifelong learning practices, and the potential to contribute to society, and 3) using our expertise to serve the broader scientific, government, and industry communities.

Goals and strategies

Education

- Increase student credit hours – offer non-major courses at good times with good instructors; expand service course offerings with a climate course for non-majors
- Offer high impact learning opportunities for students – continue NSF-funded REU; expand international and research opportunities for undergraduates; increase our scholarship endowment
- Develop an international educational program – pursue a joint international graduate program

Research

- Maintain or increase external funding – identify critical research areas for the next decade when hiring; address problems that are important to the State of Texas;
- Diversify the funding base – encourage grant applications to diverse agencies and sources
- Incentivize interdisciplinary research – encourage interdisciplinary research center activities and proposals

People

- Maintain a collegial and rewarding environment that values all aspects of the work of a faculty member and rewards true integration of teaching, research and engagement/service – Promoting collegiality and diversity and maintaining a friendly work environment are important factors in faculty’s annual evaluations.
- Recognize and reward distinctive, innovative, and effective teaching, research and service – In addition to the university’s and college’s rewarding mechanisms, the department bestows two awards to recognize faculty’s distinctive achievements every year.

Departmental Composition and Research Priorities

As a relatively large atmospheric science department at a large public university, our goal is to maintain a broad range of teaching and research interests in the atmospheric sciences rather than to focus on one or two sub-fields within the discipline. While we recognize that there are many ways that atmospheric science research can be subdivided, our goal is to have significant expertise within the following four broad areas:

- Atmospheric chemistry, air quality, and aerosol physics: Brooks, Collins, Logan, Schade, Zhang
- Radiation and remote sensing, planetary atmospheres, and instrumentation Conlee, Lemmon, Orville, Rapp, Yang

65
• Climate, paleoclimate, and large-scale dynamics
  Bowman, Chang, Dessler, Korty, Nielsen-Gammon, North, Panetta, Saravanan, Xu
• Synoptic, mesoscale, and tropical meteorology; forecasting; and data assimilation
  Epifanio, Nowotarski, Schumacher, Szunyogh

There is a great deal of overlap between these primary areas, and many professors work, either individually or through collaborations, in more than one area.

8.2 Accomplishments and Challenges
At the time of the last external review in 2009, the Department of Atmospheric Sciences had recently undergone a substantial expansion in faculty numbers. Since then, faculty numbers have remained roughly steady with fluctuations due to retirements, departures, and new hires.

Accomplishments
• Many of the young faculty hired in the last decade have moved up the tenure ladder into associate and full professor positions.
• New instructional faculty have boosted our undergraduate teaching capabilities for both majors and non-majors.
• Student credit hours and weighted student credit hours, on both an absolute and per-FTE basis, have increased substantially since the last review.
• The amount of the total (direct plus indirect) research expenditures is approximately $4.6M per year (equivalently, $243k per tenure/tenure-track FTE).
• Student offices have been renovated with new office cubicles. Department labs and office space are generally in good condition.
• Computer servers and storage systems, with their associated noise and heat, have been relocated to the college server facility. This has freed office space for faculty and graduate students.

Challenges
• Several senior faculty members have retired in recent years, and recruiting high-quality faculty will remain a challenge.
• Faculty retention remains a concern.
• Research funding and graduate student mentoring by some faculty members is not meeting expectations for a research department.
• Undergraduate enrollment has declined in the last few years. The reasons for this are not clear.
• The business functions have been consolidated and centralized in the college, resulting in more concerted and efficient services to our faculty, research staff and students. Staff retention is a potential challenge because the department/college does not have a wide range of business position titles due to the department/college size and are regularly competing with larger colleges and departments that have a wider range of titles and salaries. However, the college has taken great efforts mitigate this challenge by providing equity/merit increases to bring staff pay levels up to comparable levels for the same positions across campus. Additionally, the college has worked to provide staff promotion opportunities when openings arise within the department and/or college.
• Student advising functions have been moved to college control, and advisors have been relocated out of departmental offices. This has hindered communication between faculty, advisors, and students. Retention of student advisors has been a problem.
• IT operations have been consolidated within the College. Critical systems have failed without backups or means for recovery. Timeliness of IT response and modernization of systems continue to be problems.

• Administrative staff, IT staff, and advisors are accountable to the Dean’s office instead of the departments. This leads to an imbalance between managerial responsibility, which lies with the department heads, and managerial authority, which lies with the dean.

We believe that we have a work environment that allows everyone to carry out their mission effectively, whether it is learning, teaching, research, or service, and the Atmospheric Sciences Department is performing well. While we face challenges, the state of the department is good, and we believe that we are well positioned to continue our advancement.
Appendix A. Undergraduate Courses

The numbers in parenthesis, (X-Y), are the number of lecture hours (X) and lab hours (Y) per week. “I” designates a fall course, “II” designates a spring course, and “S” designates a summer course. Also listed is the total number of credits. ATMO 456, 459, and 463 are designated W (writing-intensive) courses. Also listed are two college-wide (GEOS) courses created and normally taught by ATMO faculty.

**ATMO 201. Weather and Climate. (3-0)** Credit 3. I, II, S
Structure, energy, and motions of the atmosphere; climate; fronts and cyclones; atmospheric stability; clouds and precipitation; severe storms.

**ATMO 202. Weather and Climate Laboratory. (0-2)** Credit 1. I, II, S
Practical laboratory experiments and exercises, conducted by students in the meteorology and computer laboratories, concerning the fundamental physical processes underlying atmospheric phenomena, and the collection, display and interpretation of meteorological information. For non-majors only.

**ATMO 203. Weather Forecasting Laboratory. (0-2)** Credit 1. I, II
Short-range weather forecasting practice; numerical guidance; weather map analysis and discussions. Prerequisite: Concurrent enrollment in ATMO 201.

**ATMO 251. Weather Observation and Analysis. (2-2)** Credit 3. I
Standard and experimental weather observing techniques; subjective and objective analysis; application of conceptual models; simple kinematic and dynamic constraints. Prerequisite: ATMO 203 or registration therein.

**ATMO 285. Directed Studies.** Credit 1 to 4. I, II, S
Offered to enable majors in meteorology to undertake and complete with credit in their particular fields of specialization limited investigations not covered by any other courses in established curriculum. Prerequisite: Freshman or sophomore classification.

**ATMO 289. Special Topics in…** Credit 1 to 4.
Selected topics in an identified area of meteorology. May be repeated for credit. Prerequisite: Approval of instructor.

**ATMO 291. Research.** Credit 0 to 4.
Research conducted under the direction of faculty member in atmospheric sciences. May be repeated 2 times for credit. Prerequisites: Freshman or sophomore classification and approval of instructor.

**ATMO 321. Computer Applications in the Atmospheric Sciences. (2-2)** Credit 3. II
Introduction to technical computing methods in the atmospheric sciences. Students learn to use specialized software and data analysis systems for meteorological applications.
ATMO 324. Physical and Regional Climatology. (2-2). Credit 3. II.
Climate causes; global and surface energy balance; hydrologic cycle; general circulation; climate change; climate data analysis. Prerequisites: ATMO 201 and 203; MATH 308 or registration therein or approval of instructor; ATMO 321 or equivalent.

ATMO 326. Environmental Atmospheric Science. (3-3). Credit 4. I.
Basic concepts of meteorology as needed in architectural and engineering fields; patterns of climatic elements and their application to practical problems in building and urban sciences; practical experience in use of instruments to measure cryptoclimes of buildings as they relate to outside conditions and analysis of data.

ATMO 336. Atmospheric Dynamics. (3-2). Credit 4. II
Kinematic concepts and relationships; equations of motion; geostrophic and accelerated motions; the vorticity equation and Rossby waves. Prerequisites: ATMO 335, MATH 311 or registration therein.

ATMO 352. Severe Weather and Mesoscale Forecasting. (2-2). Credit 3. II
Parcel theory for dry and moist convection; sounding diagrams and their application to atmospheric convection; organization of midlatitude convection and severe weather; thunderstorm forecasting. Prerequisite: MATH 152 or 172.

ATMO 363. Introduction to Atmospheric Chemistry and Air Pollution. (3-0). Credit 3. I
Descriptive introduction of the composition and chemistry of natural and pollutant compounds in the atmosphere; transport, cycling and reactivity of atmospheric material; atmospheric measurements, data processing, air quality and human health issues; air pollution trends and climate change. Prerequisites: CHEM 101 and 102 or approval of instructor.

ATMO 435. Synoptic-Dynamic Meteorology. (3-0). Credit 3. II
Dynamics and diagnosis of synoptic-scale systems; perturbation theory and baroclinic instability; wave energetics, frontogenesis. Prerequisites: ATMO 336 or equivalent; MATH 308.

Introduction to satellite orbit dynamics, atmospheric radiative transfer, atmospheric remote sensing methods, and analysis and application of remotely-sensed meteorological data. Prerequisites: ATMO 324, MATH 308; junior or senior classification.

ATMO 443. Radar Meteorology. (2-2). Credit 3. I
Principles of radar theory, hardware, operations and analysis using real-time radar and computer-based case studies; conventional, Doppler and polarimetric weather radar; precipitation estimation, hydrometeor identification and air motion analysis; observations and analyses of thunderstorms, mesocyclones, tornadoes and gust fronts. Prerequisites: ATMO 352; PHYS 208.

ATMO 446. Physical Meteorology. (3-0). Credit 3. I
Physics and meteorology of clouds and precipitation; atmospheric electricity; radiative transfer. Prerequisite: ATMO 335.

ATMO 455. Numerical Weather Prediction. (2-2). Credit 3. II
Basic principles of computer models of the atmosphere; parameterizations; use and critical evaluation of models and model output. Prerequisites: MATH 308; ATMO 336 or registration therein.

**ATMO 456.** Practical Weather Forecasting. (1-4). Credit 3. II
Advanced weather forecasting techniques with application to a variety of forecasting problems, both public and private sector. Prerequisites: ATMO 435 or registration therein; junior or senior classification.

**ATMO 459.** Tropical Meteorology. (3-0). Credit 3. I
Tropical climatology; structure, evolution, and motion of tropical cyclones; tropical cyclone hazards; large-scale tropical phenomena. Prerequisites: ATMO 336; ATMO 352 or registration therein.

**ATMO 461.** Broadcast Meteorology. (0-2). Credit 1. II
Instruction in the practice of broadcast meteorology; practice in and preparation of weather forecast products and demonstration videotapes. Prerequisites: ATMO 335 or registration therein; MATH 308 or registration therein; junior or senior classification.

**ATMO 463.** Air Pollution Meteorology. (3-0). Credit 3. II
Problems of air pollution in our global atmosphere; environmental cycles; waste products in the biosphere; atmospheric pollution; natural concentrations of atmospheric constituents; pollution sources; atmospheric transport; pollution sinks; effects of pollution; monitoring and surveillance; and management of air quality. Prerequisite: ATMO 363 or approval of instructor; junior or senior classification only.

**ATMO 464.** Laboratory Methods in Atmospheric Sciences. (2-4). Credit 3. I
Instruction in chemical techniques used to monitor the atmosphere and other earth systems; sampling strategies; survey of current literature focusing on development of new techniques. Prerequisites: CHEM 101 and one semester of calculus (MATH 171 or equivalent).

**ATMO 484.** Internship. Credits 0 to 3.
Supervised internship at National Weather Service or in broadcast meteorology or elsewhere with faculty advisor approval; must complete a report and have a letter from supervisor for credit. May be taken three times for credit. Must be taken on a satisfactory/unsatisfactory basis. Prerequisites: ATMO 251; approval of faculty advisor.

**ATMO 485.** Directed Studies. Credit 1 or more each semester. I, II, S
Offered to enable majors in meteorology to undertake and complete with credit in their particular fields of specialization limited investigations not covered by any other courses in established curriculum. Prerequisite: Junior or senior classification.

**ATMO 489.** Special Topics in… Credit 1 to 4.
Selected topics in an identified area of meteorology. May be repeated for credit.

**ATMO 491.** Research. Credit 0 to 4.
Research conducted under the direction of faculty member in atmospheric sciences. May be repeated 2 times for credit. Prerequisites: Junior or senior classification and approval of instructor.
Examination of the science of climate change; how greenhouse gases warm the planet; scientific evidence that the earth is warming; scientific evidence that humans are causing this warming; what warming we can expect in the future and impacts of that warming.

GEOS 444. The Science and Politics of Global Climate Change. (3-0). Credit 3. I
Examination of the policy and scientific debate over climate change; how scientific debates produce “knowledge”; how political debates produce policies; how policy debates use science; scientific evidence for climate change; impacts of climate change; possible responses to climate change; the political debate over climate change. Prerequisite: One semester of physics or one science core course.
Appendix B. Graduate Courses

The numbers in parenthesis, (X-Y), are the number of lecture hours (X) and lab hours (Y) per week. Also listed is the total number of credits. In [brackets] are the number of times (spring, summer, and fall) each course has been offered in the past seven years.

**ATMO 601. Fundamentals of Atmospheric Dynamics.** (3-0). Credit 3.
Basic concepts of fluid dynamics; meteorological approximations and coordinate systems; simple models and wave motion; barotropic models. Prerequisite: Approval of instructor. [7]

Integrated treatment of fundamental aspects of physical meteorology and atmospheric chemistry; ultraviolet and infrared absorption and emission; radiative transfer; cloud and precipitation micropysics and thermodynamics. [7]

**ATMO 603. Quantitative Methods for the Atmospheric Sciences.** (3-0). Credit 3.
Mathematical and numerical methods applied to ODE’s, PDE’s and statistical methods; methods of analysis and modeling of atmospheric phenomena. Prerequisite: Concurrent registration in ATMO 601 and CPSC 203 or equivalents. [1]

**ATMO 604. General Circulation and Climate.** (3-0). Credit 3.
Observed large scale circulation and climate of the earth; physical processes which maintain relevant budgets; models and theories explaining mean observations. Prerequisite: ATMO 601. [1]

Fundamentals of atmospheric chemistry; tropospheric ozone, NOx and HOx cycling, sulfur chemistry, stratospheric chemistry, and aerosol composition; analytical measurement methods; review of chemical basics as needed. [7]

**ATMO 611. Atmospheric Dynamics II.** (3-0). Credit 3.
Continuation of ATMO 601; flow in planetary boundary layer; balanced flows; atmospheric instabilities; tropical dynamics. Prerequisite: ATMO 601 or approval of instructor. [7]

**ATMO 612. Atmospheric Physics II.** (3-0). Credit 3.
Fundamentals of physical meteorology; includes cloud physics, atmospheric electricity and atmospheric chemistry. Prerequisite: ATMO 602. [7]

**ATMO 613. Advanced Atmospheric Chemistry.** (3-0). Credit 3.
An advanced survey of fundamental atmospheric processes involving biogeochemical cycles, air pollution, tropospheric chemistry, atmospheric aerosols and stratospheric chemistry. Prerequisite: ATMO 606. [7]

**ATMO 618. Numerical Methods for the Geosciences.** (3-0). Credit 3.
Mathematical theory and numerical techniques for modeling physical systems and processes in the Geosciences; discretization of continuum equations for solids and fluids; finite difference methods convergence, consistency, and stability; finite element and spectral methods in fluid dynamics and
seismology; iterative solvers; implicit and explicit methods for diffusion and advection.
Prerequisites: Graduate classification or approval of instructor. Cross Listing: GEOP 618 and OCNG 618. [1]

ATMO 629. Climate Change. (3-0). Credit 3.
Climate of the geological and recent past; methods of assessing climate and climatic change; mechanisms, models, theories, impact and prediction of climatic change. Prerequisites: ATMO 324 or equivalent; approval of instructor. [7]

A study of mathematical models used in the simulation of climate. Development and structure of selected members of the hierarchy of models ranging from energy balance models to general circulation models. Applications to paleoclimate and future climate scenarios. Prerequisite: Approval of instructor. [2]

Advanced techniques especially applicable to climatology; space-time random field analysis applied to stochastic models, parameter estimation, statistical forecasting, data interpolation and signal detection; applications to real data and climate model output. Prerequisites: STAT 601 or equivalent; approval of instructor. [4]

ATMO 636. Dynamic Meteorology. (3-0). Credit 3.
General circulation; stratospheric dynamics; tropical systems. Prerequisite: ATMO 611. [1]

ATMO 638. Dynamics of Convective Clouds. (3-0). Credit 3.
Parcel, slice and entrainment concepts; bubble and plume theories; spherical vortex; the starting plume; one-dimensional models; selected topics of current interest. Prerequisite: ATMO 611. [1]

Physics of atmospheric condensation nuclei, ice in the atmosphere; precipitation processes; artificial modification of clouds; precipitation. Prerequisite: ATMO 612 or approval of instructor. [2]

ATMO 655. Satellite Data in Meteorology. (3-0). Credit 3.
Meteorological satellite programs of the United States and other countries; theory of meteorological measurements from artificial satellites; applications of satellite data in determinations of atmospheric structure and in forecasting; recent and current research studies; future programs. Prerequisite: ATMO251 or approval of instructor. [0]

ATMO 656. Tropical Meteorology. (3-0). Credit 3.
Role of the tropics in global circulation; structure and dynamics of the tropical zone; local and diurnal phenomena; synoptic components; tropical cyclones; role of cumulus-scale convection; current topics. Prerequisite: ATMO 251 or approval of instructor. [2]

ATMO 657. Mesometeorology. (3-0). Credit 3.
Theory and structure of mesoscale weather systems and their relation to larger and smaller scale systems. Prerequisite: ATMO 251 or approval of instructor. [1]
ATMO 658. Synoptic Meteorology. (3-0). Credit 3.
Mechanism and energetics of general circulation. Structure of large-scale systems. Persons desiring practice in analysis techniques should enroll for 1 hour or more of ATMO 685. Prerequisite: ATMO 251 or approval of instructor. [0]

ATMO 659. Tropical Cyclones. (3-0). Credit 3.
Tropical climatology; structure evolution and motion of tropical cyclones; tropical cyclone hazards; large scale tropical phenomena. Prerequisite: ATMO 251. [0]

ATMO 661. Atmospheric Turbulence. (3-0). Credit 3.
Classical turbulence theories and statistical approaches; closure models; effects of rotation and stratification; interpretations of atmospheric observations. Prerequisite: ATMO 611 or suitable background in fluid dynamics. [0]

ATMO 664. Laboratory Methods in Atmospheric and Environmental Sciences. (2-4). Credit 3.
Classroom and laboratory course; introduction to chemical techniques used to monitor the atmosphere and environment; instrumentation, sampling strategies; survey of current literature focusing on development of new techniques. Prerequisite: graduate classification. [2]

Modern data assimilation methods applied to oceanic and atmospheric circulation models, as well as in other simple models; methods to interpolate one-, two-, and three-dimensional randomly spaced data to regular grids for use in numerical models of atmospheric and oceanic circulation. Prerequisites: OCNG 657, ATMO 632, STAT 601. Cross Listing: OCNG677/ATMO677. [1]

Presented by students and faculty based upon their research work and upon surveys of the literature. [14]

ATMO 685. Directed Studies. Credit 1 or more each semester.
Offered to enable majors in meteorology to undertake and complete, with credit, in their particular fields of specialization, limited investigations not covered by any other courses in established curriculum. [6]

ATMO 689. Special Topics in... Credit 1 to 4.
Special topics in an identified area of meteorology. May be repeated for credit.

ATMO 691. Research. Credit 1 or more each semester.
For thesis or dissertation. Topic subject to approval of department head. [21]
Appendix C. Assessment Components and Key Findings

C.1 Assessment Format
The general format taken by assessment efforts at Texas A&M is determined by the Office of Institutional Effectiveness and Evaluation (OIEE). As established by the OIEE, the assessment of academic programs involves the following seven components:

a. A **mission statement** for the program;
b. **Student learning outcomes** (SLOs), which define key competencies that students should have upon graduating;
c. **Measures and metrics** designed to assess the program's success in meeting the stated learning outcomes;
d. **Targets**, which define levels of acceptable performance for each of the associated measures;
e. The particular **findings** produced by evaluation of the measures and metrics in any given year;
f. **Analysis** of the findings;
g. **Action plans** to address any curricular shortcomings uncovered by the assessment.

The mission statements for the Department's three academic programs are as described in sections 5.6 and 6.9, respectively. All academic units in the College share a similar set of SLOs and key competencies, as established during a workshop with OIEE in 2012. These outcomes include:

1. Students will have the ability to communicate effectively, both orally and in writing (*all degree programs*)
2. Students will master the core knowledge of their discipline (*all degree programs*)
3. Students will acquire advanced quantitative and career skills (*B.S. programs*)
4. Students will have the knowledge, experience, and skills to conduct research (*M.S. and Ph.D programs*)
5. Students will be prepared for a professional career in the discipline as an independent researcher (*Ph.D. programs*)

A list of the measures and targets designed to assess these learning outcomes is presented below, while a summary of key findings and associated action plans over the past few assessment cycles can be found in sections B.3 and B.4.

C.2 Measures and Targets
The measures and targets used to assess the effectiveness of our degree programs are as listed below. The targets in particular are cross-referenced to the student learning outcomes listed above, as in some cases the metrics can vary somewhat based on the outcome assessed.

**Ph.D. program**

**Measures and targets**

- **Written exam**: All Ph.D. candidates are examined in principles of atmospheric chemistry, physical meteorology, and atmospheric dynamics by means of a written qualifying exam. The breadth of knowledge across these sub-disciplines and quality of answers will be tracked. Each exam question is graded independently by two faculty members and then reviewed by an examination committee.
  - **Target**: Students can attempt to pass the exam two times; we expect 75% of the students taking the exam to be able to pass within two tries. ***SLO 2: Master knowledge***

- **Conference presentations**: The department will track the number of current and past students (within two years of graduation) who presented research at professional conferences each year. Data will be collected via the Annual Evaluation of graduate students and by faculty reporting.
- **Target**: 80% of all students past the qualifying exam should make at least one presentation (including local ones) each year. --- **SLO 1**: Communicate effectively; **SLO 2**: Master knowledge; **SLO 4**: Conduct research

- **Journal publications**: The department will track the number of current or past students (within two years of graduation) who authored or coauthored a paper published in a peer-reviewed journal each year. Data will be collected via the Annual Evaluation of graduate students and by faculty reporting.
  - **Target**: 75% of students will have submitted for publication in peer-reviewed literature at least one paper before defending their Ph.D. thesis, and at least 90% will have published their work within two years of graduation. --- **SLO 1**: Communicate effectively; **SLO 2**: Master knowledge; **SLO 4**: Conduct research

- **Exit interviews**: The department will conduct an exit interview / survey at the time of graduation to assess the students’ perceptions of the degree program, as well as to gather data about job offers. To the extent possible, the department will follow up (by survey, social media, etc.) three years post-graduation to track career progress.
  - **Targets**: Questions on the exit survey relating to the various student learning outcomes should result in an averaged response of 5.5 or greater (out of 7), indicating general agreement. --- all SLO’s

- **Oral exam**: Oral qualifying exam presentations will be evaluated for presentation clarity and scientific content, as assessed using a survey administered to a committee of faculty.
  - **Targets**: Questions on the grading rubric related to each of the individual student learning outcomes should result in an averaged response of 4 or greater (out of 5), indicating general agreement. --- **SLO 1**: Communicate effectively; **SLO 2**: Master knowledge; **SLO 4**: Conduct research

**M.S. Program**

**Measures and targets**

- **Conference presentations**: The department will track the number of current and past students (within two years of graduation) who presented research at professional conferences each year. Data will be collected via the Annual Evaluation of graduate students and by faculty reporting.
  - **Target**: At least 50% of students will present research at a conference or locally before defending their thesis. --- **SLO 1**: Communicate effectively; **SLO 2**: Master knowledge; **SLO 4**: Conduct research

- **Journal publications**: The department will track the number of current or past students (within two years of graduation) who authored or coauthored a paper published in a peer-reviewed journal each year. Data will be collected via the Annual Evaluation of graduate students and by faculty reporting.
  - **Target**: At least 40% of theses will result in some work that is published in a peer-reviewed journal within two years after graduation. This includes both stand-alone publications, as well as material contributed to a manuscript on a related topic. --- **SLO 1**: Communicate effectively; **SLO 2**: Master knowledge; **SLO 4**: Conduct research

- **Exit interviews**: The department will conduct an exit interview with students at the time of graduation to gather data about the number of job offers and/or admissions to Ph.D.
programs. The department will follow up (by survey, social media, etc.) three years post-graduation to track career progress.
  o **Targets:** Questions on the exit survey relating to the various student learning outcomes should result in an averaged response of 5.5 or greater (out of 7), indicating general agreement. --- all SLO’s

- **Thesis defense:** Oral thesis defenses will be evaluated for presentation clarity and scientific content, as assessed using a survey administered to a committee of faculty.
  o **Targets:** Questions on the grading rubric related to each of the individual student learning outcomes should result in an averaged response of 4 or greater (out of 5), indicating general agreement. --- all SLO’s

- **Written thesis:** Written theses will be assessed based on content suitable for publication in a peer-reviewed journal, as evaluated by the student's faculty advisor and/or committee.
  o **Target:** At least 60% of written theses evaluated will contain work suitable for publication, as assessed by the student's faculty advisor and/or committee. This includes material suitable for stand-alone publication, or as part of a manuscript on a related topic. --- SLO 3: Conduct research

**B.S Program**

**Measures and targets**

- **Writing Assignments:** Writing abilities will be assessed using assignments from upper-level writing intensive courses. (The courses evaluated will rotate annually.) Writing skills will be evaluated using a common rubric.
  o **Target:** Two-thirds of students will be judged (using a rubric) to have demonstrated at least 'satisfactory' writing abilities (3 of 5) and at least 3/4 will be judged to satisfactorily communicate scientific content. --- SLO 1: Communicate effectively

- **Forecast discussions:** Student forecast discussions in Practical Weather Forecasting (ATMO 456) and in weekly briefings in the Weather Center will be evaluated using a rubric. The clarity of the presentation and the meteorological content of the discussions will be evaluated.
  o **Target:** Students are judged on the ability to communicate audibly, to organize their presentations logically, and to explain content clearly. 85% of students leading a forecast discussion will score a B or higher on the rubric. --- SLO 1: Communicate effectively
  o **Target:** Students will show development in mastering meteorological terminology, analysis, and forecasting skills. 85% will be scored B or better on the meteorological content section of the rubric, and 85% or more will receive a B or better on meteorological thought process. --- SLO 2: Mastering knowledge

- **Samples of student assignments (early courses):** Weather analysis skills of new majors will be evaluated in the entry-level laboratory course for majors. Embedded test questions or oral presentations will be evaluated using a rubric to assess meteorological skills. By evaluating students at the beginning of their course of study, we can assess the success of our program in improving their skills in future years.
  o **Target:** At least 90% of entry-level students will demonstrate developing skills or better (assessed using a rubric) in meteorological communication and content. --- SLO 2: Mastering knowledge
• **Samples of student assignments (mathematical and analysis skills):** The ability to apply mathematics to atmospheric problems will be assessed using samples of student exams from atmospheric dynamics courses (ATMO 336, 435), which all meteorology majors take. Evaluation will focus on skills in embedded test questions.
  
  o **Target:** Upper-level majors will demonstrate critical thinking ability by assessing a balance of forces given only the surface pressure field, as assessed using a rubric. To meet the target, at least one third of students will exhibit exemplary ability, and no more than 20% will be judged unacceptable. --- *SLO 2: Mastering knowledge*
  
  o **Target:** No more than 30% of junior level students will show unacceptable deficiency (evaluated using a rubric) in basic mathematical skills and their application to meteorological problems. --- *SLO 3: Quantitative skills*

• **Exit surveys:** The Undergraduate Committee will evaluate graduating students' exit surveys, which are designed to assess the students' career preparation and program satisfaction. Self-reported GRE scores are collected from those who took the exam, as well as data on graduate school applications and admissions. Students are asked to evaluate their comfort level with work requiring computer programming, weather forecasting, and other specific skills.
  
  o **Targets:** Questions relating to various program outcomes should all result in responses of at least 5.0 (out of 7), indicating general agreement. --- *all SLO's*

**C.3 Key Findings and Action Plans: Graduate Programs**

Below we give a brief overview of some of the key assessment findings and associated action plans for our M.S. and Ph.D. programs over the past several assessment cycles.

**2013-14 cycle**

For the 2013-14 cycle, it was discovered that the number of M.S. students giving presentations in the past year (either externally or internally) had noticeably decreased relative to previous years. Our action plan for the M.S. program was thus to encourage students to take advantage of opportunities to present their work, while at the same time encouraging faculty to provide additional presentation opportunities whenever possible, particularly through group meetings.

For the Ph.D. program, the key finding was that the pass rate among the students taking our Ph.D. qualifying exam had fallen below our target pass rate of 75%. This followed several years in which the pass rate on the exam had been relatively inconsistent. To address this issue, an off-campus retreat was held in the fall of 2014 to focus specifically on issues related to the qualifying exam. The outcome of this retreat was a decision to modify the oral part of the exam, as discussed in section 6.7. The new exam format will take effect this coming spring.

**2014-15 cycle**

For the 2014-15 assessment cycle, similar key findings apply for both the M.S. and Ph.D. programs: namely, that students either defending their theses (at the M.S. level) or completing the oral part of their qualifying exams (at the Ph.D. level) were rated by a committee of faculty as having an inadequate grasp on the broader context for their work. To address this issue, graduate advisors were encouraged to foster broader understanding in their interactions with their advisees, while the Graduate Committee was tasked with considering possible changes to the graduate core curriculum.

A proposal was made to introduce a new course to the core curriculum focusing on big-picture ideas, most likely centered around the topic of the Earth's general circulation. However, as a first step, the committee chose to offer the course as an elective, and to ask advisors to encourage second-year students to take the course.

**2015-16 cycle**
For the most recent cycle, the key finding for the M.S. program was that the percentage of theses resulting in at least some work contributing to a publication (even as a relatively small part of the manuscript) within two years fell below our target value of 40%. This followed results from the previous cycle, when the target was met only exactly. A similar finding applied to the Ph.D. program as well, in that the percentage of students having submitted work for publication before their dissertation defense was below the target value of 75%. Again, this followed results from the previous year in which the target was also not met (albeit with a very small sample size).

The Graduate Committee has been tasked with discussing potential solutions to this problem and is expected to bring a recommendation to the faculty in late fall or early spring.

**C.4 Key Findings and Action Plans: Undergraduate Program**

Below are key findings and associated action plans for the undergraduate program over the past several years.

**2013-14 cycle**

For the 2013-14 cycle, our B.S. assessment revealed that many of our senior-level students were struggling with the idea of diagnosing forces from a surface map. The Undergraduate Committee met to discuss this issue and made the recommendation that the first dynamics course (ATMO 336) include weekly exercises on diagnosing forces, with a goal of better connecting this skill to concepts from vector calculus. After implementation of this recommendation, it was found that 100% of students were able to master this skill following a few weeks of exercises.

**2014-15 cycle**

For the 2014-15 cycle, our key assessment finding was that our graduating seniors show a relatively low degree of confidence in their preparation as computer programmers, as reported on senior exit surveys. This followed a similar finding from the previous year, which was the first year we had reliable data for the metric. An ad-hoc committee was formed to discuss the issue, and ultimately the recommendation was made to encourage the use of additional computing exercises in our upper-level courses, thus providing additional opportunities to practice programming skills.

**2015-16 cycle**

The key finding from the 2014-15 cycle was again repeated for 2015-16: namely, that our graduating seniors report a low level of confidence in their preparation as computer programmers. Given the persistence of this problem, the Undergraduate Committee has been tasked with revisiting the issue and recommending additional measures. Under particular consideration are: (a) how to mitigate the use of multiple programming languages in the Department's courses; and (b) the possibility of adding a basic computer-science course to the curriculum, to be taken before the Department's existing computer applications course (ATMO 321).

The committee is expected to bring a recommendation to the faculty by late fall or early spring.
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**Appendix D. Departmental Strategic Plan**

**Department of Atmospheric Sciences**  
**Strategic Plan**  
**2014 – 2019**
1 Vision

Our vision is to provide an educational and research environment in the field of atmospheric science where world-renowned faculty lead efforts to make new discoveries benefiting our educational program and our society. Advances the research frontiers in the core areas of atmospheric science, including meteorology, climate, and atmospheric chemistry, have important short-term and long-term socioeconomic applications, in areas ranging from emergency preparedness for extreme weather to economic policies for addressing climate change. We will strive to foster collaborations within geosciences as well as in other fields such as agriculture and life sciences to facilitate interdisciplinary research and outreach activities than can both advance our scientific knowledge and promote sustainable development. We will integrate our research activities with our undergraduate and graduate programs, to better prepare our students for the new challenges that lie ahead in their careers as atmospheric scientists and to better serve our society.

2 Mission

The Department of Atmospheric Sciences is dedicated to 1) advancing scientific understanding of the atmosphere and imparting that knowledge for the benefit of society, 2) preparing the next generation of atmospheric scientists to acquire and develop scientific knowledge, critical thinking skills, lifelong learning practices, and the potential to contribute to society, and 3) using our expertise to serve the broader scientific, government, and industry communities.

Our most fundamental mission is to educate students at all levels, from undergraduate to postdoctoral. We provide the opportunity for undergraduate students to major in meteorology and graduate students in atmospheric sciences. We also teach students in other disciplines through survey courses, which give students a better understanding of nature and of scientific methods, and through specialized courses for students requiring applied knowledge of meteorology. Our research efforts serve two purposes: to expand the frontiers of fundamental and applied atmospheric science and to train students in how to conduct research. Research results are communicated through professional journals, books, and other media to scientists and the public. As part of a public university, we have a duty to contribute to society through our educational and research activities. This includes administrative and educational efforts inside and outside the university, such as university governance and development of educational materials. We also serve the broader community by serving on committees of scientific societies, providing advice to state and federal governments, acting as reviewers and editors, organizing meetings, and consulting with industry.
3 Values

We believe first and foremost in integrity and quality in all that we do. We believe in service to the university community, the State of Texas, and to the society that sustains our activities. We believe in unselfish cooperation in research and teaching, and we strive to produce a diverse and equitable environment where everyone can develop and grow.

4 Environment

4.1 Overview of the department

People

Table 1 lists current faculty members and their areas of expertise. At this time we have 21 tenured (one as joint appointment) and tenure-track faculty, one instructional professor, and one research professor. We employ outside professional broadcast meteorologists as lecturers to teach an undergraduate course in broadcast meteorology. Many external faculty and scientists participate in joint research projects and on graduate student committees.

We have research strengths in four main areas:

- **Weather and Forecasting** (numerical weather prediction, data assimilation, synoptic meteorology, severe weather)
- **Dynamical Meteorology and Climate Dynamics** (geophysical fluid dynamics, climate prediction, climate change, radar meteorology, tropical meteorology)
- **Atmospheric Chemistry** (fundamental chemistry, air quality, aerosol physics, biogeochemical cycles)
- **Physical Meteorology** (radiative transfer, remote sensing, cloud physics, lightning)

The staff consists of four business staff members, one technical staff member, and one academic advisor who is responsible of academic advising for both the Department of Atmospheric Sciences and the Department of Oceanography.

Facilities and equipment

In the Eller Oceanography and Meteorology Building, the Department of Atmospheric Sciences occupies part of the 9th floor, all of the 10 and 11th floors, all of the 12th floor except for the Oceanography Department offices; and the 14th floor (in the building superstructure). This space includes offices for faculty, students, and staff; research laboratories; two computer teaching laboratories (with 20 and 25 seats); a combined radar operations room and broadcast studio; a weather center for real-time observations and forecasting; a seminar room; a small meeting room; and the department administrative offices. In the college server room (Eller B04), the Department occupies approximately one row of rack space for departmental and PI computers.
The Department maintains the Aggie Doppler Radar (ADRAD) on the roof of the Eller Building and is part of a consortium that operates a mobile Doppler radar (SMART-R). Plans are underway to set up a surface meteorological observing site near the Eller Building for teaching and emergency management purposes. A number of individual professors deploy instruments in the field for research projects using trailers, fixed sites, and aircraft. This includes the Houston Lightning Detection and Ranging network. The Texas A&M Supercomputing Center is an important resource for a number of faculty members in the Department.
Teaching activities

The Department offers the B.S. in Meteorology and M.S. and Ph.D. degrees in Atmospheric Science. Tables 2 and 3 summarize basic enrollment numbers and characteristics of undergraduate majors and graduate students. Our primary service course for non-majors is ATMO 201/202, which serves approximately 600 students per year.

Table 2: Enrollment and gender diversity - Spring 2014

<table>
<thead>
<tr>
<th>Classification</th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
<th>M.S.</th>
<th>Ph.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>57</td>
<td>70</td>
<td>127</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>15</td>
<td>37</td>
<td>52</td>
<td>22</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 3: Student ethnic diversity – Spring 2014

<table>
<thead>
<tr>
<th>Classification</th>
<th>White</th>
<th>Black</th>
<th>Hispanic</th>
<th>Asian</th>
<th>Am. Indian</th>
<th>International</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>90</td>
<td>7</td>
<td>23</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>26</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Research activities

The Department has a diverse and well-funded research program. Annual research expenditures are approximately $5M. The Department receives research grants from a number of federal and state agencies including NSF, NASA, NOAA, DOD, DOE, FAA, EPA, and TCEQ. Research grants expanded significantly during the last decade and the Department pays for one staff position from returned IDC to manage the administrative workload.

Within Texas A&M ATMO faculty have research collaborations with faculty in the Departments of Oceanography, Geography, Chemistry, Physics, Statistics, Aerospace Engineering, Nuclear Engineering, Ecosystem Science, Soil and Crop Science, Educational Psychology, and the Bush School. External research collaborations involve colleagues at more than 40 universities and government research laboratories.

The Department also contains the Office of the State Climatologist. The position of State Climatologist is appointed by the Governor of Texas and is currently held by Dr. John Nielsen-Gammon. The Office of the State Climatologist perpetually underfunded, which severely limits the services that the Office can provide to the State of Texas.
4.2 Evaluation

Strengths

- We are the only comprehensive undergraduate/graduate/research atmospheric sciences department in Texas, and one of the largest standalone departments in the country.
- Student enrollment numbers are stable. Gender diversity in the undergraduate student body is good.
- A summer REU program in the department, which began in summer 2013, has begun to affect graduate student recruitment.
- A variety of high-impact learning opportunities (summer SOAP, Aggie Doppler Radar operation, weather balloon launches, green roof, research with faculty) available to undergraduates.
- Research strengths: the department has research strengths in four broad areas, namely, 1) weather and forecasting, 2) dynamical meteorology and climate dynamics, 3) atmospheric chemistry, and 4) physical meteorology. These strengths in four diverse areas establish a solid foundation for collaborative and interdisciplinary research.
- Diverse and well-funded research programs in the department.
- Good facilities for teaching and research including a radar, a broadcast studio, a weather center, a lightning detection and ranging network, computer labs, high-performance computing, and lab space.

Weaknesses

- Student credit hours (SCHs) per faculty are relatively low, for example, in comparison with the counterparts of GEOG and GEPL.
- General interests amongst students outside the department have broadened from a traditional weather course to interests in both current climate issues and environmental quality. Our current course offerings do not fully satisfy these interests. We now teach some climate courses, and could offer more. We teach air quality and pollution but only to a select audience who meet the prerequisites.
- While improvements have been made, ethnic diversity amongst majors is low and the majority of majors come from within Texas.
- Our faculty and staff do not reflect the demographics of our students or our state and nation.
- Some research strengths may be weakened due to possible faculty retirement in the next few years.
- The radar system is not a state-of-the-art facility for research. The facility is quite old and may stop functioning at any time.
- Lack of a co-located federal research lab makes it more difficult to compete with peer institutions.
Opportunities

- The addition of a new tenure-track assistant professor position through faculty retention efforts will help enhance the department’s capacities in teaching, research, and service.
- Upcoming changes to the core curriculum science requirements and planned development of online classes (distance learning) provide opportunities to increase enrollment in ATMO 201 and GEOS 210.
- The undergraduate program can be strengthened through a broader incorporation of high-impact learning opportunities
- As the geosciences are inherently interdisciplinary, we are well prepared to participate in and lead new interdisciplinary research initiatives.
- Interdisciplinary opportunities within the college and broader university exist. A proposed new curriculum in high-performance computing could provide new opportunities for collaboration between disciplines, both within the college and in other science and engineering departments.

Threats

- We cannot predict how the changes in the core curriculum will impact student enrollment in our service courses. Loss of SCHs from decreased demand for ATMO 202 is likely.
- Flat to declining federal research budgets, increased competition from researchers at regional universities, and shifts towards interdisciplinary research priorities over disciplinary funding threatens growth in our research portfolio.
- The challenging funding situation may directly affect maintaining the scale of our graduate program.
- Other universities in Texas could develop atmospheric science programs that would compete with us for students and state funding.
- There are potential retirements of internationally prominent faculty, which will affect our stature and reputation.
- Faculty retention is a challenge. There is a risk of loss of our best faculty to ‘better’ institutions.

4.3 Peer and aspirant institutions

All are large public universities with excellent research reputations. These are arguably the best atmospheric sciences departments at public universities in the country. Our recent external program review committee included members from Penn State, U. Washington, and UCLA.

**Penn State** Probably most similar to Texas A&M. Large ATMO department. No co-located national lab. Attracts students regionally and nationally. Their department is better known nationally with a long-standing reputation in the field.
**University of Washington** A leading research department also known as a source for excellent undergraduate and graduate textbooks.

**Colorado State University** Leading research department. No undergraduate degree program.

**UCLA** Leading research department with a modest undergraduate program.

## 5 Strategy
### 5.1 Critical Issues

**Research**
- Maintaining (or even increasing) the current level of external funding support
- Diversifying the funding base
- Incentivizing interdisciplinary research

**Education**
- The top priority is to increase SCHs
- Systematically revisit the course designs, so as to ensure that courses and curricula meet current university learning outcomes.
- Maintaining high impact learning opportunities for students
- Conduct objective assessment to demonstrate that student learning is improving and meets expectations of university learning outcomes
- Develop an international component in the ATMO educational program to integrate teaching about a global science with global cultural competencies

**Human Capital**
- Maintaining an attractive, collegial, and rewarding overall environment and culture that value all aspects of the work of a faculty member and rewards true integration of teaching, research and engagement/service.
- As a faculty retention effort, establish recognition and allocate appropriate departmental resources to award truly distinctive, innovative, and effective teaching, research and service.
- Provide mentoring opportunities and career-development opportunities to “develop” faculty over a career.

### 5.2 Goals
- Increase student credit hours through increasing combined enrollment in ATMO 201 and GEOS 210 to approximately 900 students per academic year within the next 4 to 5 years.
- Increase the national stature of our undergraduate meteorology program so that we attract undergraduate students from around the country. This will address dual goals of increasing undergraduate student numbers and quality.
- Increase our current scholarship endowment to be able to provide new scholarships, and
offer three new $1,000 four-year scholarships each year (on an ongoing basis) at both the undergraduate and graduate levels.

- Increase the national stature of our graduate program in Atmospheric Sciences so that we can compete successfully for graduate students with leading public and private graduate programs in atmospheric science.
- Attract and retain high-quality faculty.
- Maintain a broad, well-funded research program with strengths across the atmospheric sciences. This depends fundamentally on high-quality research proposals developed by individual faculty and groups of faculty.
- Increase research funding, and facilitate interdisciplinary research involving other departments/colleges to take advantage of new funding opportunities for integrative research.

5.3 Action Plan

Increase SCHs through increasing enrollment in undergraduate service courses

- We are working on increasing enrollment in ATMO 201 through changes to departmental resource prioritization, better advertising of the course, developing distance learning options, and increasing course consistency from semester to semester.
- The title of ATMO 201 will be updated to a more descriptive and appealing name (e.g., replace “Introduction to Atmospheric Sciences” with “Weather and Climate”).
- We will improve visibility and marketing for the course through direct contacts with academic advisors outside of the College.
- We will survey the syllabi of successful similar courses at peer institutions to get insights into appropriate course content.
- To the extent possible, we will schedule popular instructors to teach ATMO 201 to ensure continuity of content and build the reputation of the course.
- To address the difficulty in getting large classroom space, we will test the effectiveness of a flipped classroom model that will allow us to better utilize space while maintaining intellectual rigor. An increased online presence could provide another alternative.
- We will increase the number of ATMO faculty who regularly teach GEOS 210 and take advantage of the reorganization of the course to 1) teach larger sections and 2) offer the course more often.
- We will work with the Environmental Programs to capitalize on changes in the core curriculum and increase enrollment in GEOS 210.

Increase national stature of undergraduate meteorology major and develop signature undergraduate programs

- Maintain a high-quality undergraduate program to prepare students for careers in weather forecasting, air quality, and other technical areas, as well as for graduate or professional education.
• Improve recruitment of students from within Texas to attract more high performing students and continue to increase diversity. We will work with the new College of Geosciences Director of Recruitment to develop a recruitment strategy.

• Develop a national recruitment strategy to attract high performing students from across the country. This will involve collaboration with the College of Geosciences Director of Recruitment.

• Revise the undergraduate curriculum as needed to meet university learning outcomes and incorporate the results of ongoing assessment programs, as well as tracking of our graduates.

• Build upon and improve existing high-impact learning opportunities for undergraduates such as our unique student-operated S-band Doppler weather radar, the summer SOAP program, and the upper-air observation facilities, as well as developing additional high-impact learning opportunities for our students.

• Advertise and offer four-year incentive scholarships of at least $1000 per year to outstanding prospective undergraduates. (Requires that we increase our scholarship endowment, see below.)

• Work with the College Communications office to develop a strategy for advertising our program and departmental accomplishments through the web and other venues.

• Maintain the recently funded NSF Research Experiences for Undergraduates site grant.

Expand undergraduate scholarship and graduate fellowship funds
• Work with the College Development Officer to develop a plan to quadruple our scholarship endowment. Our current scholarship endowment is less than $200,000 and funds are divided among many small scholarships.

• Create scholarships that can assist in undergraduate and graduate recruitment.

Increase the national stature of our graduate program
• Continue to increase the fraction of students with Ph.D. as the terminal degree relative to the number of students who leave the program with M.S. degrees.

• Increase the number of graduate students per faculty by 15% compared to the five-year period that ends with the 2012/2013 academic year.

• Produce Ph.D. graduates capable of becoming faculty at leading research universities, researchers at national labs, and employees in major industries.

• Develop courses and workshops to improve our graduate students’ oral and written communication skills to enhance their career opportunities. This includes preparing and presenting research talks, how to apply for fellowships and grants, and professional ethics and responsibility.

• Continue to expand graduate course offerings that allow students to capitalize on the research breadth of our faculty.

• Participate in college-wide discussions for a proposed graduate High-Performance Computing curriculum.

• Work with the College to develop a communications and recruitment strategy that
addresses the challenge of recruiting a diverse graduate student population.

Research initiatives: Over the next five years there is also the possibility of retirements in climate dynamics and physical meteorology (lightning). In order to maintain research strength in critical areas, we have identified the following research initiatives and faculty hiring priorities.

- **Hurricane research** – Texas is highly vulnerable to hurricane damage, but no focused research effort in this area exists within the state. Hurricanes pose exciting scientific research problems, including improvement of intensity and track forecasts, response of hurricanes to a changing climate, and the impacts of hurricanes on the natural land- scape and human society. Hurricane research has high priority in the national atmospheric research plan. We propose to hire a leading expert in hurricane simulation and forecasting. Improvements in hurricane forecasts will have a direct benefit to the citizens of Texas. A high visibility research program will attract research funding as well as undergraduate and graduate students. This hire will have excellent opportunities for collaborative research with Geography, Geology & Geophysics, Oceanography, and Civil & Environmental Engineering.

- **Air quality and global atmospheric chemistry modeling** – Air quality is a pressing environmental issue for Texas that is related to outstanding scientific problems in atmospheric chemistry. We have a strong research program in the areas of air quality chemistry and meteorology, but lack an air quality modeler to provide a central focus for many research funding opportunities.

- **Regional climate modeling and prediction** – Climate change remains one of the great research challenges in atmospheric science and a critical issue for Texas. In combination with Oceanography, we have considerable strengths in this area. We believe that the time is ripe to develop a regional climate modeling and prediction center in collaboration with the Jackson School of Geophysics at the University of Texas. This initiative has the possibility of bringing substantial research funds into the College, developing a very strong multi-institutional graduate education program in climate, and making Texas A&M a highly visible leader in climate research.

- **Data assimilation** – Data assimilation is the process of obtaining an estimate of a complex, partially observed system such as the atmosphere, ocean, or the entire climate system based on observations. These observations may include both in situ and remotely-sensed data. The department has an active data assimilation research program that opens up a wide range of opportunities for collaborative research with other disciplines of geosciences, statistics, nonlinear dynamics, planetary sciences, and different areas of engineering. In particular, opportunities may arise for pursuing data assimilation initiatives jointly with the Oceanography department, taking advantage of their unique observational capabilities in the Gulf of Mexico region.

- **Physical meteorology - lightning** – The Department has unique capabilities in the area of lightning research. The Houston Lightning Mapping Array is the only facility of its kind in a large metropolitan area. We plan to build upon this
strength over the coming years, but it may require a replacement faculty position in this area of research.

- **Technical support staff** – Because the Department has a large teaching commitment with the Aggie Doppler Radar (ADRAD), it is essential to have partial support for a radar and facilities engineer to maintain the mechanical, electrical, electronic, and software infrastructure of the radar. Additional support can come from faculty with laboratory and field research programs.

**Research center:** The main weakness identified in the analysis of department’s research performance is the low number research dollars per grant, relative to peer departments. This is tied directly to the lack of a large research center associated with the department. Over the next 5 years, we plan to leverage our strengths in the area of air quality research, remote sensing and climate modeling to explore opportunities for a research center supported by agencies such as EPA, NOAA, or DOE.

**Research funding:** To increase external research funding, more high-quality proposals should be submitted. Strategically, we will encourage faculty to submit additional proposals each year, with a target of 2 proposals per year per faculty member with requested funding support of $2M. The goal for research expenditures (direct plus indirect funds) will be $0.5M per faculty per year. We will also encourage faculty to submit collaborative and interdisciplinary research proposals requesting significant amounts of funding support (> $5M per proposal).
January 2, 2017

TO: External Program Reviewers and Program Accreditors

FROM: Michael T. Stephenson
Associate Provost for Academic Affairs and SACSCOC Accreditation Liaison

RE: Information required for USDOE Accrediting Bodies

Texas A&M University is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award baccalaureate, master's, and doctoral degrees. Consistent with comprehensive standard 3.13.1, the following provides the institution’s official position on its purpose, governance, programs, degrees, diplomas, certificates, personnel, finances, and constituencies and is published in official university documents as noted.

**Purpose**

Classified by the Carnegie Foundation as a Research Doctoral University (Highest Research Activity), Texas A&M embraces its mission of the advancement of knowledge and human achievement in all its dimensions. The research mission is a key to advancing economic development in both public and private sectors. Integration of research with teaching prepares students to compete in a knowledge-based society and to continue developing their own creativity, learning, and skills beyond graduation.

The institution’s official mission statement, published both on the institution’s web page as well as in its annual university catalog, is:

> Texas A&M University (Texas A&M) is dedicated to the discovery, development, communication and application of knowledge in a wide range of academic and professional fields. Its mission of providing the highest quality undergraduate and graduate programs is inseparable from its mission of developing new understandings through research and creativity. It prepares students to assume roles in leadership, responsibility and service to society. Texas A&M assumes as its historic trust the maintenance of freedom of inquiry and an intellectual environment nurturing the human mind and spirit. It welcomes and seeks to serve persons of all racial, ethnic and geographic groups, women and men alike, as it addresses the needs of an increasingly diverse population and a global economy. In the twenty-first century, Texas A&M University seeks to assume a place of preeminence among public universities while respecting its history and traditions.
Governance

The governance of the institution was described in the 2012 certification of compliance submitted to SACSCOC.

Texas A&M University at College Station, the flagship institution of the Texas A&M University System, has branch campuses located in Galveston, Texas and Doha, Qatar. A ten-member Board of Regents, appointed by the Governor, directs the Texas A&M System. The appointment of each Regent follows Texas Education Code (TEC, Chapter 85, Section 21).

TEC outlines the duties and responsibilities of the Board of Regents. These responsibilities are also defined in System Policy 02.01 Board of Regents and TEC 51.352. The Board elects two officers: Chair and Vice Chair. There are four standing committees: Audit, Academic & Student Affairs, Finance, and Buildings & Physical Plant. Special committees may be appointed by the Chair with Board approval.

At Texas A&M University the President is the chief executive officer; the President is not the presiding officer of the Board of Regents. The President reports to the state-appointed Board of Regents through the Chancellor of the Texas A&M University System. System Policy 2.05 defines the duties of the President. The appointment of the President follows conditions set forth in System Policy 01.03 Appointing Power and Terms and Conditions of Employment, section 2.2.

Personnel

The institution is led by the President and members of his cabinet:

- Michael K. Young, President
- Karan L. Watson, Provost and Executive Vice President
- Jerry R. Strawser, Executive Vice President for Finance and Administration and CFO
- Michael Benedik, Vice Provost
- M. Dee Childs, Vice President for Information Technology and CIO
- Michael G. O'Quinn, Vice President for Government Relations
- Dr. Douglas Palmer, Interim Vice President and COO, TAMU-Galveston
- Barbara A. Abercrombie, Vice President for HR & Organizational Effectiveness
- Jessica Rubie, Associate Vice President for Strategic Initiatives
- Christine Stanley, Vice President and Associate Provost for Diversity
- Amy B. Smith, Senior Vice President and Chief Marking & Communications Officer
- Glen A. Laine, Vice President for Research
- Carrie L. Byington, Senior Vice President TAMU Health Science Center, Dean of the College of Medicine, and Vice Chancellor for Health Services
- Daniel J. Pugh, Sr., Vice President for Student Affairs
- Gen Joe E. Ramirez, Jr. Commandant, Corps of Cadets
- Amy B. Smith, Senior Vice President and Chief Marketing and Communications Officer
- Scott Woodward, Director of Athletics
Programs, Degrees, Diplomas, and Certificates

See the Institutional Summary submitted to SACSCOC

Finances

See the Financial Profile 2016 submitted to SACSCOC

Southern Association of Colleges and Schools
Commission on Colleges

INSTITUTIONAL SUMMARY FORM
PREPARED FOR COMMISSION REVIEWS

GENERAL INFORMATION

Name of Institution
Texas A&M University

Name, Title, Phone number, and email address of Accreditation Liaison
Michael T. Stephenson
Associate Provost for Academic Affairs and SACSCOC Accreditation Liaison
979.845.4016
mstephenson@tamu.edu

Name, Title, Phone number, and email address of Technical Support person for the Compliance Certification
Alicia M. Dorsey
Assistant Provost for Institutional Effectiveness
979.862.2918
amdorsey@tamu.edu
IMPORTANT:

Accreditation Activity *(check one)*:

- [x] Submitted at the time of Reaffirmation Orientation
- [ ] Submitted with Compliance Certification for Reaffirmation
- [ ] Submitted with Materials for an On-Site Reaffirmation Review
- [ ] Submitted with Compliance Certification for Fifth-Year Interim Report
- [ ] Submitted with Compliance Certification for Initial Candidacy/Accreditation Review
- [ ] Submitted with Merger/Consolidations/Acquisitions
- [ ] Submitted with Application for Level Change

Submission date of this completed document: September 29, 2015
EDUCATIONAL PROGRAMS

1. Level of offerings (Check all that apply)

☐ Diploma or certificate program(s) requiring less than one year beyond Grade 12
☐ Diploma or certificate program(s) of at least two but fewer than four years of work beyond Grade 12
☐ Associate degree program(s) requiring a minimum of 60 semester hours or the equivalent designed for transfer to a baccalaureate institution
☐ Associate degree program(s) requiring a minimum of 60 semester hours or the equivalent not designed for transfer
☒ Four or five-year baccalaureate degree program(s) requiring a minimum of 120 semester hours or the equivalent
☒ Professional degree program(s)
☒ Master's degree program(s)
☒ Work beyond the master's level but not at the doctoral level (such as Specialist in Education)
☒ Doctoral degree program(s)
☐ Other (Specify) ________

2. Types of Undergraduate Programs (Check all that apply)

☐ Occupational certificate or diploma program(s)
☐ Occupational degree program(s)
☐ Two-year programs designed for transfer to a baccalaureate institution
☒ Liberal Arts and General
☒ Teacher Preparatory
☒ Professional
☐ Other (Specify) ________

GOVERNANCE CONTROL

Check the appropriate governance control for the institution:

☐ Private (check one)

☐ Independent, not-for-profit

Name of corporation OR Name of religious affiliation and control: _____
☐ Independent, for-profit *

If publicly traded, name of parent company: _____
Public state * (check one)

☐ Not part of a state system, institution has own independent board
☒ Part of a state system, system board serves as governing board
☐ Part of a state system, system board is super governing board, local governing board has delegated authority
☐ Part of a state system, institution has own independent board

* If an institution is part of a state system or a corporate structure, a description of the system operation must be submitted as part of the Compliance Certification for the decennial review. See Commission policy “Reaffirmation of Accreditation and Subsequent Reports” for additional direction.

INSTITUTIONAL INFORMATION FOR REVIEWERS

Directions:
Please address the following and attach the information to this form.

1. History and Characteristics
Provide a brief history of the institution, a description of its current mission, an indication of its geographic service area, and a description of the composition of the student population. Include a description of any unusual or distinctive features of the institution and a description of the admissions policies (open, selective, etc.). If appropriate, indicate those institutions that are considered peers. Please limit this section to one-half page.

2. List of Degrees
List all degrees currently offered (A. S., B.A., B.S., M.A., Ph.D., for examples) and the majors or concentrations within those degrees, as well as all certificates and diplomas. For each credential offered, indicate the number of graduates in the academic year previous to submitting this report. Indicate term dates.

3. Off-Campus Instructional Locations and Branch Campuses
List all locations where 50% or more credit hours toward a degree, diploma, or certificate can be obtained primarily through traditional classroom instruction. Report those locations in accord with the Commission's definitions and the directions as specified below.

Off-campus instructional sites—a site located geographically apart from the main campus at which the institution offers 50% or more of its credit hours for a diploma, certificate, or degree. This includes high schools where courses are offered as part of dual enrollment. For each site, provide the information below. The list should include only those sites reported and approved by SACSCOC. Listing unapproved sites below does not constitute reporting them to SACSCOC. In such cases when an institution has initiated an off-campus instructional site as described above without prior approval by SACSCOC, a prospectus for approval should be submitted immediately to SACSCOC.
Name of Site | Physical Address (street, city, state, country) Do not include PO Boxes. | Date Approved by SACSCOC | Date Implemented by the institution | Educational programs offered (specific degrees, certificates, diplomas) with 50% or more credits hours offered at each site | Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)
---|---|---|---|---|---

**Institutions with off-campus instructional sites** at which the institution offers 25-49% credit hours for a diploma, certificate, or degree—including high schools where courses are offered as dual enrollment—are required to notify SACSCOC in advance of initiating the site. For each site, provide the information below.

Name of Site (Indicate if site is currently active or inactive. If inactive, date of last course offerings and date of projected reopening) | Physical Address (street, city, state, country) Do not include PO Boxes. | Date Notified SACSCOC by SACSCOC | Date Implemented by the institution | Educational programs offered (specific degrees, certificates, diplomas) with 25-49% credit hours offered at each site | Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)
---|---|---|---|---|---

**Branch campus**—an instructional site located geographically apart and independent of the main campus of the institution. A location is independent of the main campus if the location is (1) permanent in nature, (2) offers courses in educational programs leading to a degree, certificate, or other recognized educational credential, (3) has its own faculty and administrative or supervisory organization, and (4) has its own budgetary and hiring authority. *The list should include only those branch campuses reported and approved by SACSCOC.* Listing unapproved branch campuses below does not constitute reporting them to SACSCOC. A prospectus for an unapproved branch campuses should be submitted immediately to SACSCOC.

Name of Branch Campus | Physical Address (street, city, state, country) Do not include PO Boxes. | Date Approved by SACSCOC | Date Implemented by the institution | Educational programs (specific degrees, certificates, diplomas) with 50% or more credits hours offered at the branch campus | Is the campus currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)
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4. **Distance and Correspondence Education**
Provide an initial date of approval for your institution to offer distance education. Provide a list of credit-bearing educational programs (degrees, certificates, and diplomas) where 50% or more of the credit hours are delivered through distance education modes. For each educational program, indicate whether the program is delivered using synchronous or asynchronous technology, or both. For each educational program that uses distance education technology to deliver the program at a specific site (e.g., a synchronous program using interactive videoconferencing), indicate the program offered at each location where students receive the transmitted program. Please limit this description to one page, if possible.

5. **Accreditation**

(1) List all agencies that currently accredit the institution and any of its programs and indicate the date of the last review by each.

(2) If SACS Commission on Colleges is not your primary accreditor for access to USDOE Title IV funding, identify which accrediting agency serves that purpose.

(3) List any USDOE recognized agency (national and programmatic) that has terminated the institution’s accreditation (include the date, reason, and copy of the letter of termination) or list any agency from which the institution has voluntarily withdrawn (include copy of letter to agency from institution).

(4) Describe any sanctions applied or negative actions taken by any USDOE-recognized accrediting agency (national, programmatic, SACSCOC) during the two years previous to the submission of this report. Include a copy of the letter from the USDOE to the institution.

6. **Relationship to the U.S. Department of Education**
Indicate any limitations, suspensions, or termination by the U.S. Department of Education in regard to student financial aid or other financial aid programs during the previous three years. Report if on reimbursement or any other exceptional status in regard to federal or state financial aid.

**Document History**

- Adopted: September 2004
- Revised: March 2011
- Revised: January 2014
1. History and Characteristics

Provide a brief history of the institution, a description of its current mission, an indication of its geographic service area, and a description of the composition of the student population. Include a description of any unusual or distinctive features of the institution and a description of the admissions policies (open, selective, etc.). If appropriate, indicate those institutions that are considered peers. Please limit this section to one-half page.

History. Texas A&M University was established in 1871 as the state’s first public institution of higher education and opened for classes in 1876. We are now one of a select few institutions in the nation to hold land grant, sea grant (1971) and space grant (1989) designations. We are also one of few universities to host a presidential library; the George Bush Presidential Library and Museum opened in 1997. A mandatory military component was a part of the land grant designation until 1965 and today we are one of only three institutions with a full-time corps of cadets, leading to commissions in all branches of service. We have two branch campuses, one in Galveston, Texas, (established in 1962, officially merged with Texas A&M in 1991) and one in Doha, Qatar (established in 2003). In 2001 we were admitted to the Association of American Universities (AAU) and in 2004 to Phi Beta Kappa. We are classified by the Carnegie Foundation as a Research University (very high research activity).

Mission. Texas A&M University is dedicated to the discovery, development, communication, and application of knowledge in a wide range of academic and professional fields. Its mission of providing the highest quality undergraduate and graduate programs is inseparable from its mission of developing new understandings through research and creativity. It prepares students to assume roles in leadership, responsibility and service to society. Texas A&M assumes as its historic trust the maintenance of freedom of inquiry and an intellectual environment nurturing the human mind and spirit. It welcomes and seeks to serve persons of all racial, ethnic and geographic groups as it addresses the needs of an increasingly diverse population and a global economy. In the 21st century, Texas A&M University seeks to assume a place of preeminence among public universities while respecting its history and traditions.

Enrollment Profile.
77.42% Undergraduate, 18.41% Graduate, 4.02% Professional, and 0.14% Post-Doc Certificate

Undergraduate Students:
93.58% Texas Residents, 3.96% non-Texas Residents, 2.46% non-Texas, non-US Residents;
62.41% White, 3.11% Black, 22.33% Hispanic, 6.21% Asian

Graduate Students:
45.09% Texas Residents, 16.57% non-Texas Residents, 38.34% non-Texas, non-US Residents
Admissions Process. Selective. Automatic admission for Texas resident applicants in the top 10% of their high school graduating class; automatic admission for applicants who rank in the top 25% of their high school graduating class and achieve a combined (old) SAT math and SAT critical reading score of at least 1300 with a test score of at least 600 in each component, or combined (newly redesigned) SAT math and SAT evidence based reading and writing (EBRW) score of at least 1360 with a test score of at least 620 in Math and 660 in EBRW, or 30 composite on the ACT with a 27 in the math and English components; review of all other applicants based on academic potential, distinguishing characteristics, exceptional circumstances and personal achievements.

Peer Institutions. Georgia Institution of Technology, Ohio State University, Pennsylvania State University, Purdue University, University of California- Berkeley, Davis, Los Angeles, San Diego, University of Florida, University of Illinois – Champaign/Urbana, University of Michigan, University of Minnesota, University of North Carolina – Chapel Hill, University of Texas – Austin, and University of Wisconsin – Madison.
2. List of Degrees
List all degrees currently offered (A. S., B.A., B.S., M.A., Ph.D., for examples) and the majors or concentrations within those degrees, as well as all certificates and diplomas. For each credential offered, indicate the number of graduates in the academic year previous to submitting this report. Indicate term dates.

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<td>VETERINARY PUBLIC HEALTH - EPIDEMIOLOGY</td>
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3. Off-Campus Instructional Locations and Branch Campuses

List all locations where 50% or more credit hours toward a degree, diploma, or certificate can be obtained primarily through traditional classroom instruction. Report those locations in accord with the Commission’s definitions and the directions as specified below.

**Off-campus instructional sites**—a site located geographically apart from the main campus at which the institution offers **50% or more** of its credit hours for a diploma, certificate, or degree. This includes high schools where courses are offered as part of dual enrollment. For each site, provide the information below. **The list should include only those sites reported and approved by SACSCOC.** Listing unapproved sites below does not constitute reporting them to SACSCOC. In such cases when an institution has initiated an off-campus instructional site as described above without prior approval by SACSCOC, a prospectus for approval should be submitted immediately to SACSCOC.

### Off-Campus Instructional Locations – 50% or more.

<table>
<thead>
<tr>
<th>Name of Site</th>
<th>Physical Address (street, city, state, country) Do not include PO Boxes.</th>
<th>Date Approved by SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs offered (specific degrees, certificates, diplomas) with 50% or more credit hours offered at each site</th>
<th>Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
</tr>
</thead>
</table>
| Texas A&M Health Science Center | 8441 State Highway 47 Clinical Building 1, Suite 3100 Bryan, TX  77807 | 2000 | 2000 | EDUCATION FOR HEALTHCARE PROFESSIONALS  
MEDICAL SCIENCES  
MEDICAL SCIENCES  
MEDICAL SCIENCES  
MEDICINE  
NURSING  
NURSING  
EDUCATION  
PHARMACY  
FAMILY NURSE PRACTITIONER | MS  
MD  
MS  
PHD  
MD  
BSN  
MSN  
MSN |
Yes |
| City Centre | 842 West Sam Houston Parkway North, Suite 200 Houston, Texas 77024-3920 | 2012 | 2012 | ANALYTICS  
BUSINESS ADMINISTRATION | MS  
MBA  
Yes |
| College of Dentistry | 3302 Gaston Ave. Dallas, TX 75246 | 2001 | 2000 | ADVANCED EDUCATION IN GENERAL DENTISTRY  
DENTAL HYGIENE  
DENTAL PUBLIC HEALTH  
DENTISTRY  
ENDODONTICS  
MAXILLOFACIAL SURGERY  
ORAL AND | CTGFA  
BS  
Certificate  
DDS  
CTGFA  
CTGFA  
CTGFA  
CTGFA |
<table>
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<tr>
<th>Name of Site</th>
<th>Physical Address</th>
<th>Date Approved by SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs offered (specific degrees, certificates, diplomas) with 50% or more credits hours offered at each site</th>
<th>Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
</tr>
</thead>
</table>
| Institute of Biosciences and Technology          | 2121 W. Holcombe Blvd. Houston, TX 77030  | 2000                     | 2000                                 | MAXILLOFACIAL PATHOLOGY  
ORAL AND MAXILLOFACIAL RADIOLGY  
ORAL BIOLOGY MS  
ORAL BIOLOGY PHD  
ORTHODONTICS CTGFA  
PEDIATRIC DENTISTRY CTGFA  
PERIODONTICS CTGFA  
PROSTHODONTICS CTGFA                                                                 | Yes                                                                 |
| Rangel College of Pharmacy                       | 1010 W. Avenue B. Kingsville, TX 78363    | 2011                     | 2006                                 | HEALTH ADMINISTRATION MHA  
MEDICINE MD  
PHARMACY PHMD                                                                 | Yes                                                                 |
| College of Medicine - Temple                     | 2401 S. 31st Street Temple, TX 76508      | 2000                     | 2000                                 | MEDICINE MD  
MEDICAL SCIENCES PHD                                                                 | Yes                                                                 |
| Clinical Learning Resource Center                | Health Professions Building  
3950 North A. W. Grimes Blvd. Round Rock, TX 78665 | 2011                     | 2010                                 | MEDICINE MD  
NURSING BSN                                                                 | Yes                                                                 |
| Rural Public Health - McAllen Teaching Site      | 2101 South McColl Road McAllen, TX 78503  | 2011                     | 2010                                 | HEALTH POLICY AND MANAGEMENT MPH  
HEALTH PROMOTION AND COMMUNITY HEALTH SCIENCES MPH  
NURSING BSN                                                                 | Yes                                                                 |
| Texas A&M University School of Law               | 1515 Commerce St Fort Worth, TX 76102      | 2013                     | 2013                                 | HEALTH CARE LAW JM  
INTELLECTUAL PROPERTY ML  
INTELLECTUAL PROPERTY MJ  
JURISPRUDENCE MJ  
LAW JD  
LAWS ML                                                                 | Yes                                                                 |
| Houston Methodist Hospital                       | 6670 Bertner Avenue, R2-216 Houston, TX 77030 | 2015                     | 2015                                 | MEDICINE MD                                                                                   | Yes                                                                 |
| Baylor University Medical Center                 | 3500 Gaston Avenue Dallas, TX 75246        | 2012                     | 2011                                 | MEDICINE MD                                                                                   | Yes                                                                 |
### Off-Campus Instructional Locations – 25%-49%.

<table>
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<tr>
<th>Name of Site (Indicate if site is currently active or inactive. If inactive, date of last course offerings and date of projected reopening)</th>
<th>Physical Address (street, city, state, country) Do not include PO Boxes.</th>
<th>Date Notified SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs offered (specific degrees, certificates, diplomas) with 25-49% credit hours offered at each site</th>
<th>Is the site currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
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<tr>
<td>Department of State Health Services</td>
<td>1100 West 49th Austin, TX. 78756</td>
<td>2011</td>
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<td>HEALTH POLICY &amp; MANAGEMENT - MPH</td>
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### Branch Campuses

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<th>Name of Branch Campus</th>
<th>Physical Address (street, city, state, country) Do not include PO Boxes.</th>
<th>Date Approved by SACSCOC</th>
<th>Date Implemented by the institution</th>
<th>Educational programs (specific degrees, certificates, diplomas) with 50% or more credits hours offered at the branch campus</th>
<th>Is the campus currently active? (At any time during the past 5 years, have students been enrolled and courses offered? If not, indicate the date of most recent activity.)</th>
</tr>
</thead>
</table>
| Texas A&M University at Galveston | 200 Seawolf Pkwy. Galveston, TX 77553 | 1992 | 1991 | MARINE BIOLOGY BS
OFFSHORE & COASTAL SYSTEMS ENGINEER BS
MARINE BIOLOGY MS
MARINE BIOLOGY PHD
MARINE ENGINEERING TECHNOLOGY BS
MARINE FISHERIES BS
MARINE RESOURCES MANAGEMENT MMR
MARINE SCIENCES BS
MARINE TRANSPORTATION BS
MARITIME ADMINISTRATION BS
MARITIME ADMINISTRATION MML | Yes |
4. Distance and Correspondence Education

Provide an initial date of approval for your institution to offer distance education. Provide a list of credit-bearing educational programs (degrees, certificates, and diplomas) where 50% or more of the credit hours are delivered through distance education modes. For each educational program, indicate whether the program is delivered using synchronous or asynchronous technology, or both. For each educational program that uses distance education technology to deliver the program at a specific site (e.g., a synchronous program using interactive videoconferencing), indicate the program offered at each location where students receive the transmitted program. Please limit this description to one page, if possible.

Initial Approval in February 2000

<table>
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<th>Credit Bearing Degree Programs</th>
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Texas A&M University at Qatar

253 Texas A&M Qatar Engineering Building
Education City
Al Luqta St
Doha, Qatar

2005  2003  CHEMICAL ENGINEERING  BS  Yes
CHEMICAL ENGINEERING  MS
CHEMICAL ENGINEERING  MEN
ELECTRICAL ENGINEERING  BS
MECHANICAL ENGINEERING  BS
PETROLEUM ENGINEERING  BS
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<td>Wildlife Science</td>
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<td>Advanced International Affairs</td>
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<td>Agriculture E-Learning Development</td>
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<td>College Station, TX; Livermore, CA; Sandia, NM</td>
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<td>Nonprofit Management</td>
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<td>REGULATORY SCIENCE IN FOOD SYSTEMS</td>
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<td>APPLIED STATISTICS</td>
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5. Accreditation

<p>| Accreditation Council for Pharmacy Education | The pharmacy professional degree program | Last Review: April 2014 |
| American Council for Construction Education | The B.S. and M.S. curriculum in construction science | Last Review: 2011 (B.S.) and 2012 (M.S.) |
| American Psychological Association | The clinical psychology program in the Department of Psychology and the counseling psychology and school psychology program in the Department of Educational Psychology | Last Review: April/May 2015 |
| American Veterinary Medical Association Council on Education | The veterinary medicine degree program | Last Review: 2013 |
| Association to Advance Collegiate Schools of Business (AACSB) | The business baccalaureate, master’s, and doctoral programs in Mays Business School | Last Review: Fall 2012 |
| Commission on Accreditation for Dietetics Education | The dietetic track in the nutritional sciences curriculum and the dietetic internship program | Last review: January 2015 |
| Commission on Accreditation of Athletic Training Education (caATE) | Athletic Training (College of Education) | Last Review: 2013 |
| Commission on Accreditation of Healthcare Management Education | The Master of Health Administration | Last Review: Fall 2010 |
| Commission on Collegiate Nursing Education and the Texas Board of Nursing | The nursing degree programs | Last Review: July 2013 |
| Commission on Dental Accreditation. (CODA) | The degree programs in dentistry and dental hygiene and the certificate programs in the ten advanced dental graduate education programs | Last Review: August 2013 |
| Commission on English Language Program Accreditation (CEA) | The English Language Institute | Last review: 2013 |</p>
<table>
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<th>Organization</th>
<th>Program Details</th>
<th>Last Review</th>
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<td>Computing Accreditation Commission of ABET</td>
<td>The computer science program</td>
<td>2010</td>
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<td>Council of the Section of Legal Education and Admissions to the Bar of the American Bar Association</td>
<td>Texas A&amp;M University School of Law</td>
<td>2010</td>
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<tr>
<td>Council on Education for Public Health</td>
<td>The School of Public Health degree programs</td>
<td>April 2011</td>
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<tr>
<td>Engineering Accreditation Commission of ABET</td>
<td>Undergraduate programs in aerospace, biological and agricultural, biomedical, chemical, civil, computer, electrical, industrial, mechanical, nuclear, ocean, petroleum and radiological health engineering</td>
<td>2010-2011 (College Station) and 2015 (Qatar)</td>
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<td>Engineering Accreditation Commission of ABET</td>
<td>Maritime systems engineering (Offshore and Coastal Systems Engineering) – TAMU Galveston</td>
<td>2010-11</td>
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<td>Engineering Accreditation Commission of ABET</td>
<td>The electronic systems engineering technology program, the manufacturing and mechanical engineering technology program,</td>
<td>2013-2014 (College Station) and 2015 (Qatar)</td>
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<td>Engineering Accreditation Commission of ABET</td>
<td>Marine engineering technology – TAMU Galveston</td>
<td>2013-14</td>
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<tr>
<td>Forensic Science Education Programs Accreditation Commission (FEPAC)</td>
<td>The forensics and investigative sciences program</td>
<td>October 2011 (Accreditation dates: 1/2012-1/2017)</td>
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<td>Institute of Food Technologists</td>
<td>The food science and technology curriculum</td>
<td>December 2011</td>
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<tr>
<td>Landscape Architectural Accreditation Board</td>
<td>The curriculum in landscape architecture</td>
<td>July 2015</td>
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<tr>
<td>Liaison Committee on Medical Education</td>
<td>The medical education degree program</td>
<td>August 2012</td>
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<tr>
<td>National Architectural Accrediting Board</td>
<td>The curriculum in architecture</td>
<td>March 2013</td>
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<tr>
<td>Network of Schools of Public Policy, Affairs, and Administration</td>
<td>The Master of Public Service and Administration degree in the Bush School of Government and Public Service</td>
<td>April 2014</td>
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<tr>
<td>National Recreation and Park Association</td>
<td>The curriculum in recreation, park and tourism sciences</td>
<td>June 2010</td>
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<tr>
<td>Planning Accreditation Board</td>
<td>The Master of Urban Planning curriculum</td>
<td>2013</td>
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<tr>
<td>Society for Range</td>
<td>The curriculum in rangeland</td>
<td>2006</td>
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</table>
(2) If SACS Commission on Colleges is not your primary accreditor for access to USDOE Title IV funding, identify which accrediting agency serves that purpose.

   Not applicable.

(3) List any USDOE recognized agency (national and programmatic) that has terminated the institution’s accreditation (include the date, reason, and copy of the letter of termination) or list any agency from which the institution has voluntarily withdrawn (include copy of letter to agency from institution).

   None.

(4) Describe any sanctions applied or negative actions taken by any USDOE-recognized accrediting agency (national, programmatic, SACSCOC) during the two years previous to the submission of this report. Include a copy of the letter from the USDOE to the institution.

   None.

6. Relationship to the U.S. Department of Education.

Texas A&M University does not have any limitations or suspensions, nor have we been terminated by the U.S. Department of Education in regard to student financial aid or other financial aid programs during the previous three years. We are not on reimbursement nor do we have any other exceptional status in regard to federal or state financial aid.

<table>
<thead>
<tr>
<th>Management</th>
<th>ecology and management</th>
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<tr>
<td>Society of American Foresters</td>
<td>The curriculum in forestry</td>
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<tr>
<td>State Board of Educator Certification</td>
<td>Programs in professional education and degrees conferred by Texas A&amp;M University</td>
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<td>Texas Education Agency</td>
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</table>

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Appendix F. Curricula Vitae

This appendix contains short CVs for all faculty and research scientists in the Department of Atmospheric Sciences.
Kenneth P. Bowman  
Professor

**Education**

1984  Geophysical Fluid Dynamics, Ph.D., Princeton University  
1981  Geophysical Fluid Dynamics, M.A., Princeton University  
1979  Environmental Design, B.S., University of Colorado, Boulder

**Professional Experience**

2012-present  Harris Professor of Geosciences  
2007-2012  Head, Department of Atmospheric Sciences  
2004  Long-term visitor, National Center for Atmospheric Research, Atmospheric Chemistry Division (six months)  
1998-present  Professor, Department of Atmospheric Sciences, Texas A&M University  
1994-1998  Associate Professor, Department of Meteorology, Texas A&M University  
1992-1994  Associate Research Scientist, Climate System Research Program, Department of Meteorology, Texas A&M University  
1985-1992  Assistant Professor, Department of Atmospheric Sciences, University of Illinois  
1983-1985  National Research Council Resident Research Associate, Laboratory for Atmospheres, NASA Goddard Space Flight Center  
1979-1983  Research Assistant, Geophysical Fluid Dynamics Laboratory, Princeton University  
1976-1979  Research Assistant, Institute of Arctic and Alpine Research, University of Colorado

**Honors and Awards**

Texas A&M University, College of Geosciences, Dean's Distinguished Achievement Award in Research, 2014  
David Bullock Harris Professor of Geosciences, 2012-present  
Texas A&M University Association of Former Students, College of Geosciences Distinguished Teaching Award, 1998  

**Graduate Students Since 2009 (Chair or Co-Chair)**

John Cooney, Texas A&M University, Ph.D., in progress.  
Leong Siu, Texas A&M University, Ph.D., in progress.  
Leong Siu, Texas A&M University, *Convective Transport of Trace Species Observed During The Stratosphere-Troposphere Analyses Of Regional Transport 2008 Experiment (START08)*, M.S., 2014.  
Nichole Kinney, Texas A&M University, *Convective-Resolving Regional Climate Simulations for the Amazon Basin: Comparison with TRMM Rainfall Data*, M.S., 2012.

Elizabeth Baugher, Texas A&M University, *Comparison between Model Simulations and Measurements of Hyperspectral Far-Infrared Radiation from FIRST during the RHUBC-II Campaign*, M.S., 2011.


**Courses Taught**

- ATMO 201 - Introduction to Atmospheric Science
- ATMO 321 - Computer Applications in Atmospheric Science*
- ATMO 324 - Physical and Regional Climatology
- ATMO 336 - Atmospheric Dynamics
- ATMO 435 - Synoptic-Dynamic Meteorology
- ATMO 441 - Satellite Meteorology and Remote Sensing*
- ATMO 485 - Directed Studies
- ATMO 601 - Fundamentals of Atmospheric Dynamics
- ATMO 602 - Principles of Atmospheric Physics and Chemistry
- ATMO 603 - Quantitative Methods for the Atmospheric Sciences*
- ATMO 685 - Directed Studies
- ATMO 681 - Seminar

**Service Activities**

*Internal*

- Geoscience Faculty Advisory Committee, 2014-present
- Department Head, 2007-2012
- Undergraduate Program Committee Chair
- Tenure and Promotion Committee Chair

*External*

- Member, Board of Trustees, University Corporation for Atmospheric Research, 2011-2016
- Committee of Visitors, Department of Energy, Division of Climate and Environmental Science, 2013
- Secretary, Atmospheric Sciences Section, American Geophysical Union, 1998-2000
- Chair, American Meteorological Society Committee on the Middle Atmosphere, 1998-2001
Sarah D. Brooks  
Professor

Education
2002-2004  Atmospheric Science, Postdoctoral, Colorado State University
2002      Analytical Chemistry, Ph.D., University of Colorado
1995      Chemistry, S.B., Massachusetts Institute of Technology

Professional Experience
2016-Present  Professor, Department of Atmospheric Sciences, Texas A&M University
2011-2016  Associate Professor, Department of Atmospheric Sciences, Texas A&M University
2005-2011  Assistant Professor, Department of Atmospheric Sciences, Texas A&M University
1995-1997  Senior Research Technician, Dupont Corporate Catalysis Center, Wilmington, DE, Synthesized new metal oxide materials for catalytic oxidation chemistries
1993  Undergraduate Research, Massachusetts Institute of Technology, Cambridge, MA, Advisor: Dr. Robert Field
2006-2007  Postdoctoral Scholar, California Institute of Technology
2005      Postdoctoral Fellow, Massachusetts Institute of Technology

Honors and Awards
Dean’s Distinguished Achievement Award for Teaching, 2014
Department of Atmospheric Sciences Outstanding Teaching Award, 2014
Association of Former Students Award for Teaching, College of Geosciences, 2011
Student Recognized Award for Teaching Excellence, Texas A&M University System, 2010
National Collegiate Weather Forecasting Contest, First Place Overall for Station, 2003-2004
Warren G. Klein Fellow, Massachusetts Institute of Technology, 1999-2000
Michael Garstang Atmospheric Science Award, University of Virginia, 1999

Graduate Students
Jake Zenker, in progress
Jessica Mirrieless, in progress
Elise Wilborn, co-advised, in progress
Guangland Xu, co-advised, in progress
Tong Ren, co-advised, in progress
Postdoc Associates: Dr. Joseph Niehaus
Former Students:
Kristen Collier, M.S., 2016
Jonn Orcutt, M.S., 2014
Peter Deng, Ph.D., 2013
Andrew Glen, Ph.D., 2013
Katie Suter, M.S., 2012
Laura Mason, M.S., 2010
Naruki Hiranuma, Ph.D., 2010
Adam Fornea, M.S., 2009
Former Postdoctoral Associates:
Dr. German Vidaurre, Assistant Professor, U. Costa Rica
Dr. Elena Avzianova, Lecturer, New Jersey Inst. Tech., Newark, NJ

Synergistic Activities
Participated in aircraft, shipboard, and ground-based measurement campaigns: NASA NAAMES 1&2, DISCOVER-AQ, CRYSTAL-FACE, NCAR IDEAS III; DOE ISDAC Halo-Cast I; and INSPECT II; FAA AIRS II; TEXAS-AQ.
Participation in 2 International Ice Nucleation Instrument Intercomparisons (FIN-02 and FIN-02), Karlsruhe, Germany and Storm Peak Laboratory, Colorado, 2015.
Advisory Board Committee Member, Storm Peak Laboratory Research Facility, present.
Received two National Awards: the Presidential Early Career Award in Science and Engineering, PECASE, 2007 (nominated by USDA), and the National Science Foundation CAREER Award, 2006.

Collaborators (Last 48 Months)
M. Arienti (Sandia), A. Avramov (MIT), M. Behrenfeld (OSU), D. Cziczo (MIT), P. DeMott (CSU), A.M. Frinling (GFDL), T. Garrett (U. Utah), M. Gilles (LBL), A. Korolev (Environment Canada), A. Laskin (PNNL), S. Nasiri (TAMU), V. Molinero (U. Utah), E.S. Saltzman (UC Irvine), L. Russell (Scripps), A. Steiner (U. Michigan), D.C.O. Thornton (TAMU), P. Yang (TAMU), R. Zhang (TAMU), L. Ziemba (NASA)

Graduate and Post-Graduate Advisors
Margaret Tolbert, University of Colorado
Paul Demott and Sonia Kreidenweis, Colorado State University
Ping Chang
Professor

Education
1988 Atmospheric and Oceanic Sciences, Ph.D., Princeton University
1986 Atmospheric and Oceanic Sciences, M.A., Princeton University
1984 Mechanical Engineering, M.E., City College of New York
1982 Applied Mathematics, B.S., East China Engineering Institute, China

Professional experience
2010-present Louis & Elizabeth Scherck Chair in Oceanography, Texas A&M University
2010-2014 Director of the Texas Center for Climate Studies
2007-present Joint Appointment, Professor, Department of Atmospheric Sciences, Texas A&M University, College Station, TX
2002-present Adjunct Senior Research Scientist, The International Research Institute for Climate and Society, Columbia University
2000-present Adjunct Professor, Institute of Oceanology, Chinese Academy of Sciences
1998-present Professor, Department of Oceanography, Texas A&M University
1995-1998 Associate Professor, Department of Oceanography, Texas A&M University
1990-1995 Assistant Professor, Department of Oceanography, Texas A&M University, College Station, TX
1988-1990 Postdoctoral Research Associate, Joint Institute for the Study of the Atmosphere and Ocean, University of Washington, Seattle, WA

Honors and awards
National Science Foundation Presidential Young Investigator Award, 1993
College Award for Outstanding Research, Texas A&M University, 1998
Faculty Fellow, Texas A&M University, 2000
Outstanding Overseas Scholar Award, Chinese Academy of Sciences, 2001
Association of Former Students Distinguished Achievement Award, Texas A&M University, 2003
Louis & Elizabeth Scherck Chair in Oceanography, Texas A&M University, 2010
Recipient of the Short-Term Chinese Thousand Talent Program, 2011
Follow of the Research Center for Advanced Science and Technology, University of Tokyo, 2014
Followship of Japan Society for the Promotion of Science, 2014
Francis Bretherton Visitorship of Climate & Global Dynamics, National Center for Atmospheric Research, 2015

22 Graduate students (8 in progress) since 2001 (chair or co-chair)

Courses taught
OCNG 615 - Numerical Ocean Modeling I
OCNG 616 - Numerical Ocean Modeling II
OCNG 617 - Theories of Ocean Circulation
OCNG 612 - Elements of Ocean Wave Theory
OCNG 614 - Dynamics of the Ocean and Atmosphere
OCNG 651 - Meteorological Oceanography
OCNG/ATMO/GEOP618 – Numerical Methods for Geosciences
OCNG 681 - Seminar
OCNG 685 - Directed Studies
ATMO 685 - Directed Studies

**Service Activities**

*Internal*
- Director, Texas Center for Climate Studies, 2010-2014
- Department of Oceanography IT Committee chair
- Department of Oceanography Tenure and promotion committee member
- College Chair and Professor Committee member
- University HPRC Director Search Committee member

*External*
- Member, editorial board of Chinese Journal of Oceanology and Limnology
- Editor, International Journal of Geophysics
- Guest Editor, Special TACE Issue in Climate Dynamics
- Guest Editor, Proceeding of the National Academy of Sciences
- Co-chair, International CLIVAR Atlantic Implementation Panel
- Member, US CLIVAR Eastern Tropical Oceans Synthesis (ETOS) Working Group
- Member, US AMOC Executive Committee, U.S. CLIVAR program
- Member, Community Climate System Model Scientific Steering Committee
- Panelist, NSF Committee of Visitors (COV) for LARS of the Division of ATM
Don R. Collins  
Professor

**Education**

2000  
Environmental Engineering Science, Ph.D., California Institute of Technology

1994  
Civil Engineering, B.S., Virginia Tech

**Professional Experience**

2010-present  
Professor of Atmospheric Sciences, Texas A&M University

2014-present  
Director of the Center for Atmospheric Chemistry and the Environment

2010-2014  
Director of Environmental Programs in Geosciences, Texas A&M University

2005-2010  
Associate Professor of Atmospheric Sciences, Texas A&M University

1999-2005  
Assistant Professor of Atmospheric Sciences, Texas A&M University

**Honors and Awards**

Texas A&M Dean’s Distinguished Achievement Award for Faculty Research, 2007

Texas A&M Association of Former Students College-Level Faculty Distinguished Award in Teaching, 2003

Texas A&M Center for Teaching Excellence Montague Scholar Award, 2003

National Science Foundation CAREER Award in Physical Meteorology and Atmospheric Chemistry, 2001

National Aeronautics and Space Administration New Investigator Program (NIP) Award in Earth Science, 2001

**Graduate Students Since 2005 (Chair or Co-Chair)**

Manasi Mahish, Ph.D., in progress

Nathan Taylor Ph.D., in progress

Cassandra Lange M.S., in progress

Jordan McCormick M.S., in progress

Jillianne Taylor M.S., in progress

C. Gabriel Antonietti, M.S., *Development of the Captive Aerosol Growth and Evolution Chamber System*, 2013


Joshua Santarpia, Ph.D., *The Application of Size-Resolved Hygroscopicity Measurements to Understanding the Physical and Chemical Properties of Ambient Aerosol*, 2005


Christopher Allen, M.S., *The Seasonality of Optical Properties in Big Bend National Park*, 2005

**Courses Taught**

ATMO 201 - Weather and Climate
ATMO 335 - Atmospheric Thermodynamics
ATMO 363 - Introduction to Atmospheric Chemistry and Air Pollution
ATMO 446 - Physical Meteorology
ATMO 463 - Air Pollution Meteorology
ATMO 489 - Special Topics in Field Measurements in the Atmospheric Sciences
ATMO 602 - Atmospheric Physics and Chemistry
ATMO 613 - Advanced Atmospheric Chemistry (team taught with 2 others)
ATMO 645 - Cloud and Precipitation Physics (team taught with 1 other)
ATMO 681 - Seminar in Atmospheric Sciences
GEOS 101 - First Year Seminar - Geoengineering
GEOS 105 - Introduction to Environmental Geosciences
GEOS 405 - Environmental Geosciences
GEOS 481 - Environmental Programs Seminar

**Service Activities**

*Internal*

Director of the Environmental Programs in Geosciences, 2010 - 2014
Director of the Center for Atmospheric Chemistry and the Environment, 2015 - present
Tenure and Promotion Committee Chair, 2016 - present
Graduate Curriculum Committee Chair, 2004 - 2007

*External*

Associate Editor, *Journal of Geophysical Research – Atmospheres*, 2007 - 2010
Proposal Review Panel Member for the following
  Texas Air Quality Research Program, 2016
  NSF Atmospheric Chemistry, 2015
  NSF International Research Experiences for Students, 2013
  EPA Organic Aerosols, 2012
  NASA New Investigator Program, 2010
  NSF Climate & Large-Scale Dynamics Program, 2007
  NOAA Atmospheric Composition and Climate Program, 2005
Don T. Conlee
Instructional Professor

Education

1994    Meteorology, Ph.D., Texas A&M University
1991    Meteorology and Physical Oceanography, M.S., Naval Postgraduate School
1983    Atmospheric Sciences, B.S., University of Louisiana, Monroe

Recent Professional experience

2014-    Instructional Professor, Department of Atmospheric Sciences
2009–2014 Instructional Associate Professor, Department of Atmospheric Sciences
2007-2008 Gulf Region Manager, NortekUSA, Stennis Space Center, Mississippi
2003-2007 Chief Scientist, National Data Buoy Center, Stennis Space Center, Mississippi
2001-2003 Commanding Officer, Naval Technical Training Unit, Keesler AFB, Mississippi
1999-2001 Director of Remote Sensing Programs and Fleet Systems, Naval Meteorology and
        Oceanography Command, Stennis Space Center, Mississippi

Honors and awards

College of Geosciences Faculty Excellence in Teaching Award 2015
Robert C. Runnels Excellence in Advising Award, Spring 2013
AFS Distinguished Teaching Award, College Level, Fall 2012
Atmospheric Sciences Departmental Teaching Award, Fall 2012
Fish Camp Namesake, Camp Conlee, Spring/Summer 2012
Finalist: Texas A&M Mentors ATMentor of the Year, Spring 2012
Texas A&M System Teaching Excellence Award, Fall 2009
Texas A&M System Teaching Award Finalist, Spring 2010

Courses taught

ATMO 203 – Weather Forecasting Lab
ATMO 251 - Weather Observation and Analysis
ATMO 352 – Severe Weather and Mesoscale Forecasting
ATMO 456W - Practical Weather Forecasting, writing intensive
ATMO 485 – Directed Studies in Meteorological Observations
ATMO 485 – Directed Studies in Green Roof/Living Wall Technologies
ATMO 459W – Tropical Meteorology, writing intensive
ATMO 201 – Atmospheric Science
ATMO 491 - Summer SOAP Undergraduate research program
ATMO 489 – Student Experiences Abroad in Meteorology (SEA-Met), Special Topics in Asia
Meteorology (China), and Tropical/Island Meteorology (Barbados)

Grant/Research Activities

High-Impact Forecasting in the Southeast Texas Upper-Air Sparse Region
COMET Outreach Partners Proposal with NWS Houston Galveston Office. Provides
support for a supplemental on-demand radiosonde student program (SOUP – Student
Operational Upper-Air Program) to investigate impact on NWS forecasting efforts as
well as provide critical operational data in high-impact weather situations. P.I.: Don Conlee, Lance Wood (NWS) Sponsor: NOAA/NWS via UCAR/COMET

Student Operational ADRAD Project, SOAP
College of Geosciences High Impact Learning Program, Hands-on Undergraduate Research involving Radar and other observation technologies.
P.I.: Don Conlee, Responsible Party, and Chris Nowotarski, Anita Rapp, Shaima Nasiri (Co-I)
Sponsor: Texas A&M University

REU SITE: Atmospheric Science in the Gulf Coast Region at Texas A&M University
NSF REU Site in Atmospheric Sciences Department
Sponsor: NSF

Multidisciplinary Experiential Learning with Green Roof and Living Wall Technologies, 3-College Activity for High-Impact Undergraduate Learning. P.I.: Don Conlee, Bruce Dvorak, Astrid Volder
Sponsor: Texas A&M University

Service and Program Enhancement
Principal for the Texas A&M Weather Center and the department’s Mesonet observation site AT Mentor Program, mentoring open to all students regardless of major, Nominated for Mentor of the Year, 2011-2012. QPR Suicide Prevention Gatekeeper.
Co-Advisor, Texas A&M Student Chapter of the American Meteorological Society, and the Texas Aggie Storm Chasers.
American Meteorological Society Annual Meeting: Have coordinated the attendance of our seniors at the past 6 AMS annual meetings and student conferences, along with numerous poster presentation coming out of undergraduate research with Summer SOAP and other undergrad research/directed-studies endeavors.
University Honor Council Member (elected position)
Departmental Undergraduate Program Committee
Andrew E. Dessler
Professor

Education
1994 Chemistry, Ph. D., Harvard University
1990 Chemistry, A.M., Harvard University
1986 Physics, B.A., Rice University

Professional Experience
2007-Present Professor, Dept. of Atmospheric Sciences, Texas A&M University
2005-2007 Associate Professor, Dept. of Atmospheric Sciences, Texas A&M University
2000 Senior Policy Analyst, White House Office of Science and Technology Policy, Environment Division, Washington, DC
1998-2005 Associate Research Scientist, Earth System Science Interdisciplinary Center (ESSIC), Univ. of Maryland, College Park, MD
1996-1998 Assistant Research Scientist, ESSIC and the Department of Meteorology

Honors and Awards
AMS Louis J. Battan Author’s award for Introduction to Modern Climate Change, 2014
Texas A&M Association of Former Students Teaching Award (College of Geosciences), 2014
AGU Atmospheric Sciences Ascent Award, 2012
Google Science Communication Fellow, 2011
Texas A&M College of Geosciences Distinguished Achievement Award for Faculty Research, 2011
Texas A&M Sigma Xi Outstanding Communicator Award, 2011
Aldo Leopold Leadership Program Fellowship, 2006
NASA New Investigator Award Recipient, 1999
AGU Atmospheric Sciences Section Outstanding Student Paper Award, 1993
NASA Graduate Student Fellowship in Global Change Research, 1991-1994

Graduate Students Since 2005 (Chair or Co-Chair)
X. Wang, M.A., in progress
W. Yu, M.A., in progress
K. Smalley, M.A., in progress
H. Ye, Ph.D., in progress
Chen Zhou, Ph.D., 2014
Tao Wang, Ph.D., 2014
A. Christenberry, M.A., 2013
A. Verma, M.A., 2011
Sean Casey, Ph.D., 2009
Jeremy Solbrig, M.A., 2009
Allison Cardona, M.A., 2008
Joonsuk Lee, Ph.D., 2007, Co-Chair (with P. Yang)
Hyun Cheol Kim, University of Maryland, Ph.D., 2005

Courses Taught
GEOS 444 – The Science and Politics of Global Climate Change
GEOS 210 – Climate Change
ATMO 602 – Atmospheric Physics
ATMO 631 – Climate Modeling
ATMO 201 – Atmospheric Science

Service Activities
Internal
   Chair of ATMO Awards Committee, 2005-Present
   Member, College Promotion and Tenure Committee, 2013-2015
External
   Chair of AAAS Section W (Atmospheric and Hydrospheric Sciences), 2012-2015
   Member, AMS Climate and Radiation Committee, 2013-2016
   Member, NASA Earth Science Subcommittee, 2014-2017
Craig C. Epifanio
Associate Professor

Education
1999  Atmospheric Sciences, Ph.D., University of Washington, Seattle
1994  Physics, B.S., Williams College, Williamstown, MA

Professional Experience
2008-Present  Associate Professor, Department of Atmospheric Sciences, Texas A&M University
2002-2008  Assistant Professor, Department of Atmospheric Sciences, Texas A&M University
1999-2001  Postdoctoral Research Fellow, Advanced Study Program, NCAR, Boulder, CO
1994-1999  Research Assistant, Department of Atmospheric Sciences, University of Washington, Seattle

Honors and Awards
Outstanding Teaching Award, Department of Atmospheric Sciences, 2013
Student-Led Award for Teaching Excellence (SLATE), Texas A&M, 2010
AFS College-Level Teaching Award, College of Geosciences, 2007
NCAR ASP Postdoctoral Fellowship, 1999
Best Oral Presentation, Student, Eighth Conference on Mountain Meteorology, Flagstaff, AZ, 1998
National Defense Science and Engineering Graduate Fellowship, 1994
AMS Graduate Fellowship, 1994
University of Washington Graduate School Scholarship, 1994
Phi Beta Kappa, 1994-Present

Selected Service Activities
External
  Program Co-chair of the 15th AMS Conference on Mesoscale Processes, 2013
  Member of the AMS Committee on Mesoscale Processes, 2007-2013

Recent Book Chapters and Monographs

Current Projects
PI: Implementation and testing of advanced surface boundary conditions over complex terrain in the WRF-ARW model, NOAA, $211,057, July 2016 (3 Years)
Co-PI: The dynamical influences of low-level shear and lifting condensation levels on supercell tornadoes, NSF, $436,503, April 2015 (3 years), PI: Chris Nowotarski, TAMU
Aaron Funk
Research Associate

Education
2013 Atmospheric Sciences, M.S., Texas A&M University
2011 Meteorology, B.S., Texas A&M University
2005 Computer Science, B.S., University of Texas at Dallas

Professional experience
2013-Curr. Research Associate, Department of Atmospheric Sciences, Texas A&M University
2010-2013 Undergraduate Research Assistant, Department of Atmospheric Sciences, Texas A&M University

Courses taught
Undergraduate
ATMO 352 Teaching Assistant, Severe Weather and Mesoscale Forecasting, Spring 2013

Field Programs
Fall 2015 NASA OLYMPEX, Quinault, WA, US (radar scientist)
2014-2015 DOE Green Ocean Amazon (GOAmazon), Manaus, Brazil (research scientist)

Professional Memberships
2011-Curr. American Geophysical Union
2009-Curr. American Meteorological Society

Publications
Gyorgyi Gyarmati  
Assistant Research Scientist

Education
2003-2008  Atmospheric Sciences, Postdoctoral Scientist, University of Maryland
2003  Earth Sciences, Ph.D., Eotvos Lorand University
1991  Meteorology, Diploma, Eotvos Lorand University

Professional Experience
2009-Present  Assistant Research Scientist, Department of Atmospheric Sciences, Texas A&M University
2002-2008  Research Assistant and Research Associate, Institute for Physical Science and Technology, University of Maryland
1997-1998  Research Associate, Department of Aerology and Radar Meteorology, Hungarian Meteorological Service, Budapest, Hungary
1994-1997  Research Associate, Satellite Research Laboratory, Hungarian Meteorological Service, Budapest, Hungary
1993-1994  Department of Aviation Meteorology, Air Traffic and Airport Administration, Ferihegy Airport, Budapest, Hungary
1991-1993  Department of Aviation Meteorology, Hungarian Meteorological Service, Budapest, Hungary

Publications from Last 3 Years

Five Additional Publications

**Collaborators and Other Affiliations**

**Collaborators**
Eric Kostelich (ASU), Robert J. Wilson (GFDL), Christina Holt (Texas A&M), Elizabeth Satterfield (NRL, Monterey), Michael J. Kavulich (NCAR), Ross Hoffman (AER), Matthew Hoffman (Rochester College),

**Graduate Advisor and Postdoctoral Sponsor:**
Thesis Advisor: Dezso Devenyi (deceased)
Postdoctoral Sponsors: James A. Yorke and Brian Hunt (UMD)
Michael D. King  
TIAS Faculty Fellow

**Education**

1977  Atmospheric Sciences, Ph.D., University of Arizona  
1973  Atmospheric Sciences, M.S., University of Arizona  
1971  Physics, B.A., Colorado College

**Professional Experience**

2015-2018  Texas A&M University Institute for Advanced Study, and Visiting Professor in the College of Geosciences, Texas A&M University (two months/year)  
2008-present  Senior Research Scientist, Laboratory for Atmospheric and Space Physics, University of Colorado  
2009-present  Team Leader, Moderate Resolution Imaging Spectroradiometer (MODIS) Science Team, NASA  
1992-2008  Senior Project Scientist, Earth Observing System (EOS), NASA Goddard Space Flight Center  
2000  Visiting Professor of Environmental Science, Colorado College  
1986–1987  Visiting Professor, Department of Atmospheric Sciences, University of Washington (on sabbatical leave)  
1983–1992  Project Scientist, Earth Radiation Budget Experiment (ERBE), NASA Goddard Space Flight Center  
1978–1992  Physical Scientist, Laboratory for Atmospheres, NASA Goddard Space Flight Center

**Honors and Awards**

Elected Fellow, American Association for the Advancement of Science, 2015  
Elected Fellow, Institute of Electrical and Electronics Engineers, 2014  
Presidential Rank Award of Meritorious Senior Professional, 2006  
Space Systems Award, Earth Observing System (EOS) Team, American Institute of Aeronautics and Astronautics, 2006  
Elected Fellow, American Geophysical Union, 2006  
Elected Member, National Academy of Engineering, 2003  
NASA Outstanding Leadership Medal, 2001  
Verner E. Suomi Award, American Meteorological Society, 2000  
Doctor of Science *honoris causa*, Colorado College, 1995  
Transactions Prize Paper Award, IEEE Geoscience and Remote Sensing Society (best paper of the year award), 1993  
NASA Exceptional Scientific Achievement Medal, 1992  
Elected Fellow, American Meteorological Society, 1990  
NASA Exceptional Service Medal, 1985

**Graduate Students (Thesis Committee)**
Shi Song, Ph.D., *The Spectral Signature of Cloud Spatial Structure in Shortwave Radiation*, University of Colorado, 2016

Nadia Smith, Ph.D., *Air Quality Monitoring with Polar-Orbiting Hyperspectral Infrared Sounders – A Fast Retrieval Scheme for Carbon Monoxide*, University of Johannesburg, South Africa, 2010

Qingling Zhang, Ph.D., *A Global Spatially and Temporally Complete Reflectance Anisotropy Database to Improve Surface Characterization for Environmental Monitoring*, Boston University, 2009

Gabriel Viera, Ph.D., *Information Analysis of Integral Equations in Remote Sensing of Atmospheric Aerosols*, University of New South Wales, Australia, 1987

**Courses Taught**

**Summer**
- Remote Sensing and its Applications in Meteorology and Environmental Studies (Nanjing University of Information Science and Technology, Nanjing, China), 2008

AOSC 625 - Remote Sensing of the Atmospheric Properties by Satellite (University of Maryland-College Park), 2007

ES 320 - Remote Sensing of the Earth from Space (Colorado College), 2000

ATMS 532 - Remote Sensing of the Atmosphere (University of Washington), 1987

ATMS 534 - Atmospheric Radiation II (University of Washington), 1986

**Service Activities**

*External*

Member, Atmospheric Research Awards Committee, American Meteorological Society, 2010-2013

Member, Expert Team on Satellite Systems, World Meteorological Organization, 2005-2008

Member, International Radiation Commission, 2000-2008

Associate Editor, *Journal of the Atmospheric Sciences*, American Meteorological Society, 1991-1993

Member, International Commission on Clouds and Precipitation, 1986-1996

Member and Chair, American Meteorological Society Committee on Atmospheric Radiation, 1984-1988

Member, NASA Moderate Resolution Imaging Spectroradiometer (MODIS) Science Team, 1998-present

Member, NASA Clouds and the Earth’s Radiant Energy Budget (CERES) Science Team, 1989-2003

Member, NASA Earth Radiation Budget Experiment (ERBE) Science Team, 1980-1992

*National Academies of Sciences, Engineering, and Medicine (formerly NRC)*

Member, Committee on NASA Science Mission Extensions, 2015-2016

Member and Vice Chair, Committee on a Framework for Analyzing the Needs for Continuity of NASA-Sustained Remote Sensing Observations of the Earth from Space, 2013-2015

Member and Co-Chair, Committee on Earth Sciences and Applications from Space, 2012-2017

Member, Board on Atmospheric Sciences and Climate, 2011–2012

Member, Climate Research Committee, 2009–2011

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Robert L. Korty
Associate Professor

Education
2005  Climate Physics and Chemistry, Ph.D., Massachusetts Institute of Technology
1999  Physics and Environmental Sciences, B.A., University of Virginia

Professional Experience
2013-Present  Associate Professor of Atmospheric Sciences, Texas A&M University
2007-2013  Assistant Professor of Atmospheric Sciences, Texas A&M University
2006-2007  Postdoctoral Scholar, California Institute of Technology
2005  Postdoctoral Fellow, Massachusetts Institute of Technology

Honors and Awards
Dean’s Distinguished Achievement Award for Teaching, 2014
Department of Atmospheric Sciences Outstanding Teaching Award, 2014
Association of Former Students Award for Teaching, College of Geosciences, 2011
Student Recognized Award for Teaching Excellence, Texas A&M University System, 2010
National Collegiate Weather Forecasting Contest, First Place Overall for Station, 2003-2004
Warren G. Klein Fellow, Massachusetts Institute of Technology, 1999-2000
Michael Garstang Atmospheric Science Award, University of Virginia, 1999

Graduate Students
Jeremy Anthony, M.S., 2014
Brian Haines, M.S., 2012
Stephen Cathey, M.S., 2011

Courses Taught
ATMO 201 – Weather and Climate (majors section)
ATMO 336 – Atmospheric Dynamics
ATMO 435 – Synoptic-Dynamic Meteorology
ATMO 459 – Tropical Meteorology
ATMO 601 – Fundamentals of Atmospheric Dynamics
ATMO 611 – Atmospheric Dynamics II
ATMO 632 – Statistical Methods in Climate Research
ATMO 681 – Seminar
GEOS 101 – Hurricanes (freshmen seminar)

Service Activities
Internal
  Undergraduate Program Committee Chair, 2014-Present
  Search Committee for Weather Analysis Faculty Position, 2011-2012, 2012-2013
  Faculty Advisor to Texas A&M Student Chapter of the American Meteorological Society and National Weather Association, 2011-Present
Undergraduate Program Committee, 2012-Present
Graduate Program Committee, 2010-2014
Qualifying Exam Committee, 2010-2014
Library Liaison, 2007-Present
Web Liaison, 2008-2010
Computer and Facilities Committee, 2007-2010
Strategic Planning Research and Teaching Strengths Committee, 2009
Seminar Committee Chair, Spring 2008, Fall 2014

External
Program Committee for 30th Conference on Hurricanes and Tropical Meteorology (AMS), 2012
National Research Council Research Associate Review Panelist, 2012
Session Chair, AMS Tropical Meteorology Conferences, 2010, 2012
National Science Foundation Climate Processes Team Review Panelist, 2010
Multiple Media Interviews for Texas Radio Stations and an invited Seminar for a National Insurance Industry Convention on Hurricanes and Climate, 2007-Present
Mark T. Lemmon
Associate Professor

Education
1994 Planetary Sciences, Ph.D., University of Arizona
1989 Physics, B.S., University of Washington

Professional Experience
2005-Present Associate Professor, Department of Atmospheric Sciences, Texas A&M University
2002-2005 Associate Research Scientist, Department of Atmospheric Sciences, Texas A&M University
2000-2002 Visiting Assistant Professor, Department of Physics, Texas A&M University
1999-2000 Senior Research Associate, Department of Planetary Sciences, University of Arizona
1994-1999 Research Associate, Department of Planetary Sciences, University of Arizona

Honors and Awards
NASA Exceptional Public Service Medal, "for exceptional science leadership of the Phoenix Surface Stereo Imager (SSI) instrument, providing the first surface images of the northern polar region of Mars", 2010
NASA Inventions and Contributions Board Award for Cloud & Dust Devil Detector for Rover and/or Lander Imagery, 2006
European Space Agency award for “outstanding contribution to the Huygens Probe”, 1998

Graduate Students
Cihat Kurt, Ph.D., in progress
Emily Mason, Ph.D., in progress
Michael Battalio, Ph.D., in progress
Dominic Cartina, M.S., in progress
Christopher Wolfe, M.S., Using engineering cameras on Mars rovers and landers to retrieve atmospheric dust loading, 2016
Keri Bean, M.S., Determining nighttime optical depth using Mars Exploration Rover images, 2013
Stephanie Grounds, M.S., Mars Exploration Rover (MER) Panoramic Camera (Pancam) twilight image analysis for determination of planetary boundary layer and dust particle size parameters, 2010
Nathan Hall, abandoned

Courses Taught
ATMO 201 – Introduction to Atmospheric Science/Weather & Climate
ATMO 441 – Satellite Meteorology
ATMO 485 – Instrument Design
Service Activities

Internal
- Member, TAMU Atmospheric Sciences Graduate Program Committee, 2007-present
- Member, Qualifying Exam committee, 2014-present
- Member, Strategic Planning Giving subcommittee, 2009-10
- Member, Computer Committee, 2006-7
- Member, Reinvestment Space Modification Committee, 2006-7
- Chair, TAMU Physics Department’s Astronomy Committee, 2000-2002
- Geosciences representative to University Honor Council, 2009-present.
- Member, College of Geosciences Strategic ARRA Response Team (Education and diversity), 2009-10.
- Faculty advisor, Students for the Exploration and Development of Space (2010-present).

External
- Member, Organizing Committee, IAU Commission F2, Exoplanets and the Solar System, 2015-2018
- Member, Mars 2020 rover Mastcam-Z and Mars Environmental Dynamics Analyzer science teams, 2014-present
- Member, Mars InSight Lander science team, 2013-present
- Member, Science Organizing Committee, IAU Focus Meeting “Water and life’s building blocks in the universe”, August 2015, Honolulu, Hawaii, 2014-2015
- Member, James Webb Space Telescope Titan Focus Group (NASA), 2014-2015
- Member, Comet Investigation Observing Campaign Committee (NASA), 2014
- Member, Working Group for Planetary System Nomenclature (IAU), 2013-2015
- Member, IAU Division F (Planetary Systems and Bioastronomy) Steering Committee, 2012-2015
- Member, Mars Science Laboratory Mastcam, MAHLI, and MARDI science team, 2004-present
- Member, Mars Human Precursor Science Steering Group—Dust, Soil, and Toxicology Focus Group (NASA), 2004
- Member, Science Definition Team for 2009 Mars Telecom Orbiter (NASA), 2004
- Member, Mars Phoenix Lander science team, 2003-2009
- Member, Mars Exploration Rover Athena science team, 2002-present
Ron Runjun Li

**Education**
2002 19-hour graduate school course credits, Department of Atmospheric Sciences, Texas A&M
1993 Ph. D. Physical Chemistry, Institute of Chemistry, CAS (Chinese Academy of Sciences), Beijing, China
1990 M. S. Physical Chemistry, Dalian Institute of Chemical Physics, CAS, Dalian, China
1984 B. S. Physics, Inner-Mongolia University, Hohhot, China

**Professional Experience**
2016–pres. Assistant Research Scientist, Department of Atmospheric Sciences, Texas A&M University.
2013-2014 Visiting Associate Research Scientist, Department of Atmospheric and Oceanic Science & Earth System Science Interdisciplinary Center, University of Maryland
1998-2013 Research Associate, Senior Research Associate, Assistant Research Scientist, Department of Chemistry/Department of Atmospheric Sciences, Texas A&M University.
Timothy Logan
Assistant Professor

Education
2014 Atmospheric Science, Ph.D., University of North Dakota
2009 Atmospheric Science, M.S., University of North Dakota
1993 Environmental Science, B.A., University of Virginia

Professional Experience
2015-Present Instructional Assistant Professor, Department of Atmospheric Sciences, Texas A&M University
2014-2015 Lecturer, Department of Atmospheric Sciences, Texas A&M University
2009-2014 Graduate Research Assistant, Department of Atmospheric Sciences, University of North Dakota
2007-2009 Graduate Teaching Assistant, Department of Atmospheric Sciences, University of North Dakota

Honors and Awards
Outstanding Faculty Teaching Award, Texas A&M University, 2015
Hubei Province Scientific Paper Award, 2015
Best Student Poster Presentation, American Meteorological Society (AMS), 2014
Joint Center for Satellite Data Assimilation (JCSDA) Summer Colloquium Fellowship, 2012
East Asia and Pacific Summer Instiuter (EAPSI) Research Fellowship, National Science Foundation, 2011
North Dakota Space Grant Consortium Fellowship, ND and NASA EPSCoR, 2009
Atmospheric Science Teaching Assistant Award, University of North Dakota, 2009

Undergraduate Students Supervised
Joseph Trujillo
Kevin Larson
Erin van Creveld
Collin Douglas

Service Activities and Memberships
Member of the American Meteorological Society
Member of the American Geophysical Union (AGU)
Member of the European Geosciences Union (EGU)
Member of the American Chemical Society (ACS)

Relevant Publications


**Other Publications**


Logan, T., X. Dong, and B. Xi (2016), *Aerosol properties and their influences on surface cloud condensation nuclei at the ARM SGP facility during MC3E*, In preparation to be submitted to Climate.


**Collaborators**

Xiquan Dong, Baike Xi, University of Arizona; Renyi Zhang, Richard Orville, Texas A&M University
Raffaele Montuoro  
Instructional Assistant Professor

**Education**

1996  
Chemistry, Laurea (B.S.), University of Pisa, Pisa, Italy  
1997  
Chemistry, Diploma, Scuola Normale Superiore di Pisa, Pisa, Italy  
2003  
Chemistry (Theoretical), Ph.D., Scuola Normale Superiore di Pisa, Pisa, Italy

**Professional experience**

2015-present  
Instructional Assistant Professor, Department of Atmospheric Sciences, Texas A&M University  
2013-present  
Research Scientist, Department of Atmospheric Sciences, Texas A&M University  
2011-2013  
Senior Lead Information Technology Consultant, Supercomputing, Supercomputing Facility, CIS, Texas A&M University  
2007-2011  
Lead Systems Administrator, Supercomputing, Supercomputing Facility, CIS, Texas A&M University  
2004-2007  
Postdoctoral Research Associate, Department of Chemistry, Texas A&M University  
2004  
Information Technology Consultant, Italy  
2002-2003  
Information Technology Consultant, Eutelsat SA, France  
2000-2004  
Postdoctoral Fellow, Department of Chemistry and Industrial Chemistry, University of Pisa, Pisa, Italy

**Honors and awards**

Sponsored visitor, Institute for Mathematics Applied to Geosciences (IMAGe) and Computational and Information Systems Laboratory (CISL), National Center for Atmospheric Research (NCAR), 2016 CISL Visitor Program

**Courses**

ATMO 689 – Special Topics in High Performance Computing for the Geosciences (developed and taught)

**Service Activities**

Internal  
Chair, Computational Geosciences Program College Committee, 2015-present  

External  
Chair, Service and Support Working Group, SP-XXL, 2008-2013

**Selected Publications**


John W. Nielsen-Gammon
Regents Professor and Texas State Climatologist

Education
1990 Meteorology, Ph.D., Massachusetts Institute of Technology
1987 Meteorology, S.M., Massachusetts Institute of Technology
1984 Earth and Planetary Sciences, S.B., Massachusetts Institute of Technology

Professional experience
2011-present Regents Professor, Texas A&M University
2008-2009 Acting Executive Associate Dean and Associate Dean for Research, College of Geosciences, Texas A&M University
2003-2007 Associate Director, The Center for Atmospheric Chemistry and the Environment
2000-present Texas State Climatologist
2000-present Professor, Department of Atmospheric Sciences, Texas A&M University
1996-2000 Associate Professor, Department of Meteorology, Texas A&M University
1991-1996 Professor, Department of Meteorology, Texas A&M University
2007-Present Fellow, Institute for Science, Technology, and Public Policy
2011-Present Faculty Member, Environmental Studies Program
2012-Present Faculty Member, Water Management and Hydrologic Sciences Program
2014-Present Affiliated Faculty Member, Texas A&M Energy Institute

Honors and awards (since 2007)
Outstanding Reviewer, Journal of Hydrologic Engineering, American Society of Civil Engineers, 2016
Editor’s Award, Bulletin of the American Meteorological Society, American Meteorological Society, 2015
2013 Editors’ Citation for Excellence in Refereeing for Journal of Geophysical Research-Atmospheres, American Geophysical Union, 2014
Sigma Xi – Texas A&M Chapter Outstanding Science Communicator, 2013
Texas A&M SEC Distinguished Achievement Award, 2013
Dean’s Achievement Award, Service, Texas A&M College of Geosciences, 2012
Regents Professor, The Texas A&M University System, 2011
Newsmaker Image Award, Texas A&M University, 2011
The Woody Guthrie Award Presented to a Thinking Blogger, 2011
Fellow, American Meteorological Society, 2011

Graduate students (since 2007; chair or co-chair)
Kang, Y., Ph.D., in progress
Coates, D., Ph.D., in progress
Meyer, S., M.S., in progress
McRoberts, D. B., M.S., 2008: Drought Over the Past Century in Texas and New Mexico: Reducing Inhomogeneities in Long-Term Climate Records Via Statistical Methods to
Study Drought.
Myoung, B., Ph.D., 2007: *Interannual Variability of Summer Precipitation in Texas and its Implication to Summer Drought.*

Undergraduate research scholar theses (since 2007)
Collins, C., 2015: *Effects of ENSO on Atlantic Hurricane Formation.*
Meyer, S., 2015: *Observed Temperature and Precipitation Relationship Across the United States Analyzed at Different Time Scales.*

Courses taught (since 2007)
ATMO/METR 201 - Atmospheric Science
ATMO 324 - Physical and Regional Climatology
ATMO 435 - Synoptic-Dynamic Meteorology
ATMO 456 - Practical Weather Forecasting
ATMO/METR 485 - Directed Studies
ATMO 491 - Undergraduate Research
ATMO/METR 658 - Synoptic Meteorology.
ATMO 685 - Directed Studies.
ATMO 689 - Special Topics in Mesoscale Modeling.
GEOS 210 - Climate Change.

Service activities (since 2007; partial list)
Internal
Promotion and Tenure Committee, 1996-present; Chair, 2008-09; 2010-2011
Shared Mobile Atmospheric Research and Teaching Radar Steering Committee, 2008-2013
Radar/Mesoscale Faculty Search Committee, Chair, 2007-2008
Geosciences Faculty Advisory Council, Chair, 2014-2015, Secretary, 2015-2016
Environmental Programs Advisory Committee, 2013-present
Environmental Programs Director Search Committee, Chair, 2013-2014
College Advisory Committee on Promotion and Tenure, 2009--13; Chair, 2010, 2012-13
Academic Civil Rights Investigation Committee, 2014-present
Center for Teaching Excellence, Graduate Student Teaching Workshop, Instructor, 2010

External
National Academy of Sciences, committee member, 2007-08, 2011-12, 2014
AMS Ad Hoc Committee on Climate and Climate Change Consulting Certification (C6), Co-Chair, 2016-present
AMS Board on Higher Education, 2006-2012; Chair, 2008-2011
AMS/Industry Minority Scholarships Selection Committee, 2008-2011; Chair, 2010-2011
AMS Statement on the Bachelor’s Degree in Atmospheric Sciences, Drafting Committee, Chair, 2010-2011
American Association of State Climatologists Policy Statements Committee, Chair, 2015-2016
International Commission for Dynamical Meteorology, President, 2007-2011
US CLIVAR Program, PPAI Panel, 2016-present
Texas Drought Preparedness Council, 2001-present
Joseph Niehaus
Research Associate

Education
2015      Atmospheric Sciences, Ph.D., Michigan Technological University
2010      Physics and Computer Science, B.S., College of Charleston

Professional experience
2016-present   Post-Doctoral Research Associate, Texas A&M University
2012-2014      Software Developer, Charles River Analytics (part time)

Honors and awards
DeVlieg Fellowship, Michigan Technological University, 2015
Finishing Fellowship, Michigan Technological University, 2015

Courses taught
ATMO 4640 – Fundamentals of Atmospheric Science
PH 1200 – Electricity and Magnetism Lab
PH 3210 – Optics Lab
PH 3480 – Advanced Physics Laboratory

Service Activities
External
2016    Member NASA North Atlantic Aerosol and Marine Ecosystems Study, 2015-present

Internal
2015    Reviewer for NASA SURF grant program, Michigan Technological University
## Gerald R. North
**University Distinguished Professor Emeritus**
**Research Professor**

### Education

<table>
<thead>
<tr>
<th>Year</th>
<th>Degree</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>Physics, Ph.D.</td>
<td>The University of Wisconsin</td>
</tr>
<tr>
<td>1960</td>
<td>Physics, B.S.</td>
<td>The University of Tennessee</td>
</tr>
</tbody>
</table>

### Professional Experience

<table>
<thead>
<tr>
<th>Year</th>
<th>Position</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-2003</td>
<td>Head, Department of Atmospheric Sciences</td>
<td>Texas A&amp;M University</td>
</tr>
<tr>
<td>1994</td>
<td>Visiting Scientist</td>
<td>University of Reading</td>
</tr>
<tr>
<td>1986–1999</td>
<td>Director of Climate System Research Program</td>
<td>Texas A&amp;M University</td>
</tr>
<tr>
<td>1986–2016</td>
<td>Distinguished Professor of Meteorology and of Oceanography</td>
<td>Texas A&amp;M University</td>
</tr>
<tr>
<td>1990-2016</td>
<td>Adjunct Professor of Geography</td>
<td>Texas A&amp;M University</td>
</tr>
<tr>
<td>1986-1993</td>
<td>Senior Consulting Scientist</td>
<td>Applied Research Corporation, Landover, MD</td>
</tr>
<tr>
<td>1987-1993</td>
<td>Senior Consulting Scientist</td>
<td>Applied Res. Corp. Technologies, College Station, TX.</td>
</tr>
<tr>
<td>1980-1986</td>
<td>Lecturer/Adjunct Prof.</td>
<td>Department of Meteorology, University of Maryland</td>
</tr>
<tr>
<td>1977-1980</td>
<td>Professor</td>
<td>Department of Physics, University of Missouri</td>
</tr>
<tr>
<td>1979</td>
<td>Visiting Professor</td>
<td>Columbia University, Summer Lecture Program. NASA/Goddard Institute for Space Studies</td>
</tr>
<tr>
<td>1972-1977</td>
<td>Associate Professor</td>
<td>Department of Physics. University of Missouri</td>
</tr>
<tr>
<td>1977</td>
<td>Visiting Scientist</td>
<td>Main Geophysical Observatory. Leningrad, USSR</td>
</tr>
<tr>
<td>1976</td>
<td>Guest Investigator</td>
<td>Woods Hole Oceanographic Institution. Woods Hole, MA. Summer</td>
</tr>
<tr>
<td>1968-1972</td>
<td>Assistant Professor</td>
<td>Department of Physics, University of Missouri</td>
</tr>
<tr>
<td>1966-1968</td>
<td>Research Associate</td>
<td>Department of Physics. University of Pennsylvania</td>
</tr>
</tbody>
</table>

### Honors and Awards

- Horton Lecturer, American Meteorological Society, January, 2018, Austin, TX
- Goddard Scientific Colloquium Speaker, NASA/Goddard Space Flight Center, 2016, Greenbelt, MD
- Robert D. Cess Distinguished Lecturer, 2015, SUNY-Stony Brook University
- Holder of the Harold J. Haynes Endowed Chair in Geosciences, 2003-2009
- Member, Faculty Advisory Board, Texas Institute for Advanced Studies, 2011-2013
- Member AMS, Awards Oversight Committee, 2013
- Chairman, Panel to Revise AGU Statement on Climate Change 2012-2013
- Chairman, NRC Organizing Committee on Solar Variability and Climate Change, 2011-2013
- Member, AMS Research Awards Committee, 2010-2013 (Chair, 2013)
Graduate Students Since 2009 (Chair or Co-Chair)

Taylor Sansom, Texas A&M University, *Spatial Correlations in General Circulation Models and Observation Reanalysis*, MS, 2013
Kelin Zhuang, Department of Geology/Geophysics, *Energy Balance Climate Model Solutions for Paleoclimatology*, Texas A&M University, PhD, 2010

Courses Taught
ATMO 201 - Introduction to Meteorology
ATMO 335 - Atmospheric Thermodynamics
ATMO 629 - Climate Change
ATMO 631 - Climate Modeling
ATMO 632 - Statistical Methods in Climate Research
GEOS 210 - Climate Change

Service Activities
Member, Faculty Advisory Board, Texas Institute for Advanced Studies, 2011-2013
Member AMS, Awards Oversight Committee, 2013
Chairman, Panel to Revise AGU Statement on Climate Change 2012-2013
Chairman, National Research Council, Organizing Committee on Solar Variability and Climate Change, 2011-2013
Member, AMS Research Awards Committee, 2010-2013 (Chair, 2013)
Member, AGU Fellows Union Selection Committee, 2009-2011
Member, Faculty Advisory Committee, Texas A&M Press. 2009-
Christopher J. Nowotarski  
Assistant Professor

Education
2013  Meteorology, Ph.D., Pennsylvania State University  
2010  Meteorology, M.S., Pennsylvania State University  
2009  Meteorology, B.S., Pennsylvania State University

Professional experience
2014-present  Assistant Professor, Department of Atmospheric Sciences, Texas A&M University  
2013  Postdoctoral Scholar, Department of Meteorology, Pennsylvania State University  
2011  Graduate Lecturer, Department of Meteorology, Pennsylvania State University  
2008-2013  Research Assistant, Department of Meteorology, Pennsylvania State University

Honors and awards
American Meteorological Society Industry/Governmental Graduate Fellowship, 2009-2010

Graduate students (chair or co-chair)
Matthew Brown, M.S./Ph.D, in progress
Michelle Serino, M.S., in progress
Mark Benoit, M.S., Sensitivity of High-Resolution WRF Forecasts to a Single Radiosonde in a Data-Sparse Region, 2016
Felicia Guarriello, M.S., The Effects of Low-Level Wind Shear Orientation, Depth, and Magnitude on Low-Level Rotation in Simulated Supercell Thunderstorms, 2016

Courses taught
ATMO 443 – Radar Meteorology  
ATMO 352 – Severe Weather and Mesoscale Forecasting  
ATMO 491 – Student Operational ADRAD Project (high-impact learning course)  
METEO 003 – Introductory Meteorology for Non-Majors (at Penn State)

Service Activities
Internal
Graduate committee member, 2014-present  
Department seminar coordinator, 2015
New building committee, services working group, 2015
Faculty Mentor, Texas A&M Atmospheric Sciences Summer REU, 2014-present
Instructor, GeosX Summer Program, 2015-2016
Instructor, Texas A&M Youth Adventure Program 2014-2016
Instructor, Mitchell Institute Physics Enhancement Program (MIPEP), 2014

External
Member, AMS STAC committee on Mesoscale Processes, 2016-present
Associate Editor, Monthly Weather Review, 2016-present
Associate Editor, Weather and Forecasting, 2014-2016
Member, Planning Committee for Texas Weather Conference, 2015-present
Proposal reviewer, NSF PDM program, NOAA OAR
Journal reviewer, Journal of Atmospheric Science, Journal of Geophysical Research,
  Monthly Weather Review, Weather and Forecasting, Electronic Journal of Severe Storms
  Meteorology
Richard E. Orville
Research Professor

Education
1966        Meteorology, Ph.D., University of Arizona
1963        Meteorology, M.S., University of Arizona
1958        Physics, B.A., Princeton University

Professional Experience
2014-Pres.  Research Professor, Department of Atmospheric Sciences, Texas A&M University
1993-Pres.  Research Scientist, Fellow, and Director, Cooperative Institute for Applied Meteorological Studies (CIAMS), Department of Atmospheric Sciences, Texas A&M University
1991-Pres.  Member of Graduate Faculty, Department of Atmospheric Sciences, Texas A&M University
1991-2014   Professor (Head, 2003-2007), Department of Atmospheric Sciences, Texas A&M University
1966-1968   Senior Scientist, Westinghouse Research Laboratories, Pittsburgh, PA.
1961-1966   Research Assistant, University of Arizona, Tucson, AZ.

Honors and Awards
American Geophysical Union (AGU) Fellow, 2009
Sigma Xi Distinguished Scientist Award, Texas A&M University, 2008
Award for Outstanding Contribution to the Advance of Applied Meteorology, American Meteorological Society, “For distinguished scientific contributions which have greatly improved our understanding the phenomenology and climatology of the lightning discharge.”, 2006
Faculty Distinguished Achievement Award in Teaching, Texas A&M University, College of Geosciences, 2000
Editors Award, American Meteorological Society (Monthly Weather Review), 1996
Charles Franklin Brooks Award, American Meteorological Society: “for superb leadership as Commissioner for more than a decade.”, 1995
Editors Award, American Geophysical Union, Journal of Geophysical Research Atmospheres, 1992
J. Murray Mitchell Lecturer, Blue Hill Observatory, Cambridge, MA, 1991
Suomi Distinguished Lecturer, University of Wisconsin, Madison, 1989
Sackler Medal in Geophysics, Tel Aviv University, Israel, 1987
Editors Award, American Geophysical Union, Journal of Geophysical Research Atmospheres, 1986
American Meteorological Society (AMS) Fellow, 1979

Graduate Students
Brandon Ely, Ph.D., 2008
Scott Steiger, Ph.D., 2005
Gary Huffines, Ph.D., 2000
Tom Kopp, Ph.D., 1988
Vincent Idone, Ph.D., 1982
John Helsdon, Ph.D., 1979
Approximately 45 Master’s Students

Competitive Awards in the last 5 years:

DOC/NOAA 8/1/2008 – 7/31/2012  $373,030

NSF Digital High Speed Spectroscopic Lightning Studies
NSF 9/1/2008 – 8/31/2013  $412,051

NSF Lightning Detection and Ranging (LDAR II) Network Operation and Analyses over a Highly Polluted City – Houston, Texas.
NSF 9/1/2009 – 8/31/2013  $749,852

NSF Digital High Speed Spectroscopic Lightning Studies
NSF 05/2013 – 4/2016  $442,903

Five Recent Products


R. Lee Panetta  
Professor

Research Interests

Mathematical theory of geophysical models, general circulation of atmospheres and oceans, computational electromagnetic scattering, partial differential equations.

Education

1978 Mathematics, Ph.D., University of Wisconsin-Madison  
1972 Mathematics, M.S., University of Wisconsin-Madison  
1969 Mathematics, B.S., McGill University

Professional Experience

2008- Professor, Department of Mathematics, TAMU  
2007- Professor, Department of Atmospheric Sciences, TAMU  
1988-2007 Associate Professor, Department of Atmospheric Sciences, TAMU  
1985-1988 Research Associate, Joint Institute for the Study of the Atmosphere and Oceans, University of Washington  
1982-1985 Visiting Scientist, GFD Program, Princeton University  
1979-1982 Project Associate, Space Science and Engineering Center, University of Wisconsin-Madison  
1978-1979 Assistant Professor, Department of Mathematics, Occidental College

Selected recent publications  
(* indicates mentored student)


Graduate students since 2001  
Zhai, Siyao, Ph. D., in progress
Zhang, Jianing, Ph.D., 2016
Tang, Guanglin, Ph.D., 2014
Liu, Chao, Ph.D., 2013
Ramotowski, Michelle, Ph.D., 2013
Cocks, Stephen, Ph.D., 2003
Collier, Craig, M.S., 2001

Courses taught at TAMU
ATMO 201 - Introduction to Atmospheric Science
ATMO 335 - Atmospheric Thermodynamics
ATMO 336 - Atmospheric Dynamics
ATMO 435 - Synoptic-Dynamic Meteorology
ATMO 446 - Physical Meteorology
ATMO 459 - Tropical Meteorology
ATMO 485 - Directed Studies
ATMO 601 - Fundamentals of Atmospheric Dynamics
ATMO 611 - Atmospheric Dynamics II
ATMO 636 - Dynamic Meteorology
ATMO 661 - Atmospheric Turbulence
ATMO 685 - Directed Studies
ATMO 681 - Atmospheric Sciences Seminar
MATH 308 - Differential Equations
MATH 311 - Topics in Applied Mathematics
MATH 485 - Directed Studies (Undergraduate)
MATH 685 - Directed Studies (Graduate)
MATH 689 - Mathematical Introduction to Geophysical Fluid Dynamics

Professional Service (Selected)
2002-2008 HIPCAT (High Performance Computing Across Texas); Texas A&M Institutional Representative and Executive Committee member.
1995-2015 Texas A&M Faculty Steering Committee on High Performance Computing; Chair since 2001
2004-2006 TIGRE (Texas Internet Grid for Research and Education), Steering Committee
Jianfei Peng
Postdoctoral Research Assistant

Education
2014-2016 Postdoctoral, College of Environmental Sciences, Peking University
2008-2014 Environmental Sciences, Ph.D., Peking University
2004-2008 Environmental Sciences, B.S., Peking University

International Experience
2015 Scholar Visitor, University of Gothenburg, Sweden
2015 International Conference, Kanazawa, Japan
2014 Student Visitor, University of Surrey, UK
2013 International Conference, Vienna, Austria
2011 Student Visitor, Texas A&M University, USA

Honors and Awards
Outstanding Student Award, 2012
Fangzheng Top 10% Scholarship, 2010
Outstanding Student of Social Practice, 2010
Wusi Top 15% Scholarship, 2009
DSDF Top 5% Scholarship, 2007

Leadership Experience
President, Postgraduate Association of College of Environmental Sciences and Engineering, Peking University, 2009-2010
Chairman, Environmental Protection Alliance of Universities, Beijing (EPAU), 2009-2010
Minister of Career Department, Postgraduate Association, Peking University, 2008-2009

Involved Projects
National Science Foundation (NSF), The mechanism of new particle formation and growth as well as environmental effects under the complex air pollution in China, 2015-Present
Chinese 973 Project, Fundamental research of source control technology on PM2.5 emissions of fossil fuel combustion, 2012-Present
National Science Foundation (NSF), Chemical process and health effects of atmospheric secondary formation, 2012-Present
Ministry of Environmental Protection of China (MEP), Long-distance Transport of Atmospheric Pollutants in East Asia, 2010-2013
EU FP7 Prospective, Scoping China’s Environmental Research Excellence and major Infrastructure: Foresight, Potentials, and Roadmaps, 2009-2011
World Bank, Air pollution management program in China, 2009-2011
Chinese 863 Program, Synthesized Prevention Techniques for Air Pollution Complex and Integrated Demonstration in Key City-Cluster Region, 2008-2011
Air Quality Research in Beijing and surrounding regions, 2007-2008
Anita D. Rapp
Assistant Professor

Education
2008 Atmospheric Science, Ph.D., Colorado State University
2004 Atmospheric Science, M.S., Colorado State University
2000 Meteorology, B.S., Texas A&M University

Professional experience
2014-present Assistant Professor, Department of Atmospheric Sciences, Texas A&M University
2012-2014 Research Assistant Professor, Department of Atmospheric Sciences, Texas A&M University
2010-2012 Assistant Research Scientist, Department of Atmospheric Sciences, Texas A&M University
2008-2009 Visiting Postdoctoral Fellow, Cooperative Institute for Research in Environmental Sciences, University of Colorado
2002-2008 Graduate Research Assistant, Department of Atmospheric Science, Colorado State University
2005 Teaching Assistant, Department of Atmospheric Science, Colorado State University
2000 Intern, Science Applications International Corporation, Hampton, VA
1998-2000 Student Technician, Mesoscale Research Group, Department of Meteorology, Texas A&M University

Honors and awards
Texas A&M University Department of Atmospheric Sciences Outstanding Faculty Research Award, 2014
Outstanding Poster Presentation, World Climate Research Programme Open Science Conference, October 2011

Graduate students since 2011 (chair or co-chair)
Corey Howard, M.S., in progress
Robert Marter, M.S., in progress
Anthony Viramontez, M.S., in progress
Kevin Smalley, Ph.D., in progress
Lu Sun, Ph.D., in progress
Tong Ren, Ph.D., in progress
Kyle Wodzicki, Ph.D., in progress
M.S., A Climatology of Pacific ITCZ Characteristics from an Automated, Objective Algorithm, 2015
Allison Zapalac, M.S., Characteristics of a Marine Stratocumulus to Cumulus Cloud Transition, 2014
Alisha Brooke Sutphin, M.S., *Characteristics of Tropical Midlevel Clouds using A-Train*, 2013

**Courses taught**
ATMO 441 - Satellite Meteorology and Remote Sensing
ATMO 443 - Radar Meteorology
ATMO 446 - Physical Meteorology
ATMO 485 - Directed Studies
ATMO 491 - Independent Research
ATMO 681 - Seminar
ATMO 691 - Independent Research
GEOG 324W - Global Climatic Regions

**Service Activities**

*Internal*
Search committee member for Assistant Professor in Department of Atmospheric Sciences, 2015
Member, Self-assessment committee for Atmospheric Sciences Academic Program Review, 2016
Departmental representative for Texas A&M Atmospheric Science research staff, 2010-2011

*External*
Member, NASA Precipitation Measurement Missions science team, 2013-present
Member, NASA Energy and Water Cycle (NEWS) science team, 2013-present
Co-Chair, NASA NEWS Cloud and Radiation working group, 2013-2015
Member, NASA CloudSat/CALIPSO science team, 2009-2014
Committee Member, American Meteorological Society Committee on Satellite Meteorology and Oceanography, 2006-2009
Ramalingam Saravanan
Professor

Education
1990      Atmospheric and Oceanic Program, Ph.D., Princeton University, New Jersey
1988      Atmospheric and Oceanic Program, M.A., Princeton University, New Jersey
1986      Physics, Indian Institute of Technology, M.S., Kanpur, India

Professional experience
2005-present Professor of Atmospheric Sciences, Texas A&M University
2000-2005 Scientist III, National Center for Atmospheric Research, Boulder, Colorado
1996-2000 Scientist II, National Center for Atmospheric Research, Boulder, Colorado
1993-1996 Scientist I, National Center for Atmospheric Research, Boulder, Colorado
1990-1993 Postdoctoral Research Associate, Dept. of Applied Math. & Theoretical Physics, University of Cambridge, UK

Honors and awards
Texas A&M University, College of Geosciences Distinguished Research Award, 2015

Graduate students since 2001 (chair or co-chair)
Xiao Yu, Ph.D., in progress
Tarun Verma, Ph.D., in progress
Jesse Steinweg-Woods, Ph.D., A Lagrangian analysis of midlatitude air-sea interaction associated with mesoscale oceanic eddies, 2015
Xiaojie Zhu, Ph.D., Influence of mean state on climate variability at interannual and decadal time scales, 2013
Kyle Borg, M.S., Statistical relationships of the tropical rainfall measurement mission (TRMM) precipitation and large-scale flow, 2015
Salil Mahajan, Ph.D., Free and forced tropical variability: role of the wind-evaporation-sea surface temperature (WES) feedback, 2008
Kathleen Collins, M.S., How El Niño affects energy consumption: a study at national and regional levels, 2007

Courses taught
ATMO 201 - Introduction to Atmospheric Science
ATMO 321 - Computer Applications in Atmospheric Science
ATMO 324 - Physical and Regional Climatology
ATMO 459 - Tropical Meteorology
ATMO 485 - Directed Studies
ATMO 604 – General Circulation and Climate
ATMO 611 - Atmospheric Dynamics II
ATMO 681 – Seminar
GEOS 210 – Climate Change

Service Activities
Internal
Department Tenure and Promotion Committee chair
Department Graduate program committee chair
Faculty search committee chair
Geosciences Faculty Advisory Committee chair

External
Member, American Meteorological Society Committee on Climate Variability and Change (2014-)
Member, Prediction and Research Moored Array in the Atlantic (PIRATA) Science Steering Committee (2010-)
Member, NRC Committee on the Assessment of Intraseasonal to Interannual Climate Prediction and Predictability (2009)
Editor, Journal of Climate (2007-2010)
Gunnar W. Schade
Associate Professor

Education
1997 D.Sc. in Chemistry, Johannes Gutenberg University, Mainz, Germany
1993 Diploma (M.Sc.) in Chemistry, Johannes Gutenberg University

Professional experience
2012-present Associate Professor, Department of Atmospheric Sciences, TAMU
2012-2013 Forsker, Kjemisk Institutt, Universitetet i Oslo, Norway
2005-2012 Assistant Professor, Department of Atmospheric Sciences, Texas A&M University (TAMU)
2003-2005 Emmy Noether Research Fellow, University of Bremen, Germany
2001-2002 Assistant Specialist, University of California at Berkeley, Department of Environmental Science, Policy, and Management (ESPM)
1998-2001 Post-doctoral Research Fellow, University of California at Berkeley, ESPM
1997-1998 Post-doctoral Researcher at the Max-Planck-Institute of Chemistry
1994-1997 Post-Graduate Research Assistant (Doktorstudent) at the Max-Planck-Institute of Chemistry, Air Chemistry Department, Mainz, Germany
1993-1994 Graduate Research Assistant (diploma/masters student) at the Max-Planck-Institute of Chemistry, Air Chemistry Department

Honors and awards
NATO program postdoctoral fellowship award, 1999
DFG Emmy Noether program award, 2002
NSF CAREER award, 2009

Graduate students since 2003 (chair or co-chair)
Geoffrey Roest, Ph.D., in progress
Matthew Watson, M.Sc., in progress
Jonathan Gramann, M.Sc., Investigations of atmospheric and plant physiological effects along an urban-to-rural gradient in the Houston metropolitan area comparing 2011 to 2012, 2014
Martin Hale, M.Sc., Flux measurements of volatile organic compounds from an urban tower platform in Houston Texas: Trends and Tracers, 2013
Nicholas Werner, M.Sc., Anthropogenic and biogenic carbon dioxide fluxes from typical land uses in Houston, Texas, 2013
ChangHyoun Park, Ph.D., Flux measurements of volatile organic compounds from an urban tower platform, 2010
Lijun Zhou, M.Sc., New chemical aerosol characterization methods: examples using agricultural and urban airborne particulate matter, 2010
Sheena J. Solomon, Ph.D., Atmospheric and biospheric methanol flux measurements: Development of a novel technique, 2007

Courses taught
UGST 181 – Freshman Seminar: Science Denialism
ATMO 201 – Introduction to Atmospheric Science
ATMO 326 – Environmental Atmospheric Science
ATMO 363 – Introduction to Atmospheric Chemistry and Air Pollution
ATMO 463 – Air Pollution Meteorology
GEOS 405 – Environmental Programs capstone
GEOS 489/689 – Global Biogeochemical Cycles
GEOS 489 – Climate Change Considered
ATMO 491 – Atmospheric Science undergraduate research
GEOS 491 – Geosciences undergraduate research
ATMO 606 – Introduction to Atmospheric Chemistry
ATMO 613 – Advanced Atmospheric Chemistry
ATMO 681 - Seminar

Service Activities

Internal
  Undergraduate program committee member
  Graduate program committee member
  Qualifying Exam committee member
  College of Geosciences Undergraduate Curriculum committee member

External
  Proposal Reviewer for NSF, NOAA, DFG (Germany), NERC (UK), and ESF
  Review Panel member for ESF, NOAA, and NASA
  Journal reviewer for over 20 publications, including top AGU and EGU journals
Steven R. Schroeder  
Postdoctoral Research Associate

EDUCATION
1998  Meteorology, Ph.D., Texas A&M University
1979  Operations Research, M.S., Air Force Institute of Technology
1973  Mathematics and Physics, B.A., Capital University, Columbus, OH

EXPERIENCE:
2015- Present  Postdoctoral Research Associate, Department of Atmospheric Sciences, Texas A&M University
2012-2015  Visiting Assistant Research Scientist, Department of Atmospheric Sciences, Texas A&M University
1999-2012  Postdoctoral Research Associate, Department of Atmospheric Sciences, Texas A&M University
1993-1998  PhD Student, Department of Meteorology, Texas A & M University
1973-1993  Officer, United States Air Force (retired as Major)
1991-1993  Plans Officer, Air Education and Training Command, Randolph AFB, TX
1989-1991  Wargame Officer, Combined Forces Command, Yongsan Army Installation, Seoul, Korea
1987-1989  Technical Training Officer, Air Training Command, Randolph AFB, TX
1978-1979  M. S. Student, Air Force Institute of Technology, Wright-Patterson AFB, OH
1977-1978  Computer Systems Duty Officer, Air Force Global Weather Central, Offutt AFB, NE
1974-1977  Forecaster, Air Force Global Weather Central, Offutt AFB, NE
1973-1974  Student, Basic Meteorology Program, St. Louis University, St. Louis, MO

PUBLICATIONS:
Conference Presentations and Proceedings


Grants
1 July 2008 to 30 June 2010 PI: Gerald North $88000
NOAA Grant NA08OAR4310686
Development of Adjustments to Compensate for Instrument Biases in Radiosonde Temperature and Moisture Data Using Complete Inferred Station and Instrument Metadata

1 November 2007 to 31 October 2008 PI: Gerald North $10000
NCDC Order Number EL133E08SE3529
Metadata collaboration to provide references, instrument names, and formatted events to IGRA (Integrated Global Radiosonde Archive)

Other Activities
Participant, Applied Research Center for Data Set Development Workshop, NCDC, Asheville, NC, Sep 2007
Courtney Schumacher
Professor

Education
2003  Atmospheric Sciences, Ph.D., University of Washington
2000  Atmospheric Sciences, M.S., University of Washington
1994  Environmental Sciences, B.A., University of Virginia

Professional Experience
2013-Present  Professor, Texas A&M University
2009-2013  Associate Professor, Texas A&M University
2003-2009  Assistant Professor, Texas A&M University

Honors and Awards
Texas A&M University E.D. Brocket Professorship in Geosciences, 2016
AMS Editor’s Award for *Journal of Climate*, 2015
AMS Clarence Leroy Meisinger Award, 2014
AGU Editors’ Citation for Excellence in Refereeing for *EOS*, 2012
Texas A&M Association of Former Students Distinguished Teaching Award, 2011
Special Recognition by Texas A&M’s Women Former Students’ Network, 2009
College of Geosciences Dean’s Distinguished Faculty Teaching Award, 2008
College of Geosciences Robert C. Runnels Excellence in Advising Award, 2007
Texas A&M University Fish Camp Namesake, 2007
NASA New Investigator Program Award, 2006
NSF CAREER Award, 2005
NASA/GSFC Summer Faculty Fellowship, 2004

Graduate Students
Fiaz Ahmed, Ph.D., in progress
Sophie Mayne, Ph.D., in progress
Emily Monroe, M.S., in progress
Montana Etten-Bohm, M.S./Ph.D., in progress
Hedanqui Bai, M.S./Ph.D., in progress
Hannah Upton, *Using storm kinematics and surface ozone measurements to describe the convective transport in downdrafts over the Brazilian Amazon*, M.S., 2016
Keith White, *Assessing the accuracy of vertical profiles of heating and vertical motion in the tropical eastern pacific*, M.S., 2015
Cristiano Eichholz, Visiting Ph.D. student during 2015 (Brazilian advisor: Luiz Machado)
Aaron Funk, *Analysis of TRMM Precipitation Radar algorithms and rain over the tropics and southeast Texas*, M.S., 2013
Amanda DePasquale, *Radar observations of MJO and Kelvin wave interactions during DYNAMO/AMIE/CINDY2011*, M.S., 2013, co-chair with Anita Rapp
Justin Stachnik, *Observed characteristics of clouds and precipitating systems associated with the tropical circulation in global models and reanalyses*, Ph.D., 2013
Jonathan Fliegel, *Quality control and census of SMART-R observations from the DYNAMO/CINDY2011 field campaign*, M.S., 2012
Larry Hopper, *Investigations in SE Texas precipitating storms: Modeled and observed characteristics, model sensitivities, and educational benefits*, Ph.D., 2011
*Effects of baroclinicity on storm divergence and stratiform rain in a precipitating subtropical region*, M.S., 2008
Elinor Martin, *Caribbean precipitation in observations and IPCC AR4 models*, Ph.D., 2011
Matt Mosier, *Radar-derived forecasts of cloud-to-ground lightning over Houston, TX*, M.S., 2009, co-chair with Dick Orville
*The frequency of tropical precipitating clouds as observed by the TRMM PR and ICESAT/GLAS*, M.S., 2007, co-chair with Andy Dessler
Wei Li, *A climatology of tropical anvil and its relationship to the large-scale circulation*, Ph.D., 2009
Celina Hernandez, *The QBO’s influence on lightning production and deep convection in the tropics*, M.S., 2008
Karen Brugman, *Variations in storm structure and precipitation characteristics associated with the degree of environmental baroclinicity in southeast Texas*, M.S., 2007
Kaycee Frederick, *Anvil characteristics as seen by C-POL during the Tropical Warm Pool International Cloud Experiment (TWP-ICE)*, M.S., 2006

**Courses Taught**
ATMO 201 – Introduction to Atmospheric Sciences
ATMO 285 – Directed Studies (Spring 2006 [10])
ATMO 291 – Undergraduate Research
ATMO 449 – Radar Meteorology
ATMO 459 – Tropical Meteorology
ATMO 485 – Directed Studies
ATMO 491 – Undergraduate Research
ATMO 638 – Dynamics of Convective Clouds
ATMO 656 – Tropical Meteorology
ATMO 691 – Graduate Research

**Service Activities**
*Internal*
Department Awards Committee (2014-present)
NSF Atmospheric Science in the Gulf Coast Region REU (2013-2015)
Department SMART-Radar Coalition Representative (2007-2015)
Department Six Faculty Search Committees (2004-2013)
Department Undergraduate Committee Member; Recruiting Coordinator (2003-2007, 2010-)
College Scholarship Committee Member (2015-)
University Research Development Fund (RDF) Advisory Committee (2015-)

*External*
Multiple committees, panels, and reviews for AMS, AGU, NWA, DOE, NSF, NASA
Patrick G. Stegmann
PostDoctoral Research Associate

Education
2015 Mechanical and Process Engineering, Ph.D. (Dr.-Ing.), TU Darmstadt, Germany
2012 Mechanical and Process Engineering, M.Sc. (Dipl.-Ing.), TU Darmstadt, Germany
2009 Mechanical and Process Engineering, B.Sc., TU Darmstadt, Germany

Professional Experience
2016-present Postdoctoral Research Associate, Department of Atmospheric Sciences, Texas A&M University, USA
2015 Research Associate, Institute for Fluid Mechanics and Aerodynamics, TU Darmstadt, Germany
2011 Engineering Project Internship, Rolls-Royce Aero Engines Deutschland Ltd. & Co KG, Germany
2010 Graduate Student Research Associate, Fraunhofer Institute for Structural Durability and System Reliability, Germany
2007 Internship, Linde Material Handling GmbH, Germany

Honors and Awards
Membership in the organizing committee for the LIP2018 conference
Session chair for the LIP2016 conference, 2016
Journal referee for Optics Express, 2015
Session chair for the 2015 iteration of the Bremen workshop series on light scattering
Associated Membership at the Graduate School Computation Engineering, Darmstadt, Germany, 2013
Scholarship of the German Research Foundation, research training group 1114, 2012
Erasmus Scholarship of the European Union, 2009

Students since 2014 (co-chair for Prof. Cameron Tropea, TUD)
Killian Fischer, Timo Hofmann, Andre Horn, Lilian Müller, Tina Wehner, Advanced Design Project, Aufbau einer Nukleationskammer für Wassereis-Kristalle, 2015
Chase Wells, B.Sc. Mechanical Engineering UC Bolder, IREP project, 2015
Advanced Design Project group 2013

Courses Taught (TU Darmstadt)
2013 – Research Seminar on Spectroscopic Methods in the Characterisation of Reacting Flows
Service Activities

Internal
  LIP2018 organizing committee member
  Scheduling of group meetings for the group of Dr. Ping Yang

External
  Recent Graduate Member of the Optical Society of America, 2016
Istvan Szunyogh
Professor

Education
1997 Atmospheric Sciences, Postdoctoral Scientist, Massachusetts Institute of Technology
1996-1997 Atmospheric Sciences, Postdoctoral Scientist, NCAR
1995-1996 Meteorology, Postdoctoral Scientist, Eotvos Lorand University
1994 Earth Sciences, Ph.D., Earth Sciences, Hungarian Academy of Sciences
1991 Meteorology, Diploma, Eotvos Lorand University

Professional Experience
2009-Present Full and Associate Professor, Department of Atmospheric Sciences, Texas A&M University
2001-2009 Associate and Assistant Research Scientist, Institute for Physical Science and Technology, and Department of Atmospheric and Oceanic Science, University of Maryland
1997-2001 Visiting Scientist, University Corporation for Atmospheric Research, at NCEP
1998-1999 Research Scientist (on leave), Department of Meteorology, Eotvos Lorand University
1991-1998 Assistant Research Scientist (on leave after 1995), Department of Meteorology, Eotvos Lorand University

Publications from Last 3 Years


**Additional Selected Publications**


**Synergistic Activities**

Member of the International Commission on Dynamical Meteorology (ICDM) 2012-present.


Member of the Joint Scientific Committee of the World Weather Research Program (WWRP) of the World Meteorological Organization (WMO), 2010-2014.

Lead Organizer of the Summer School on Advanced Mathematical Methods to Study Atmospheric Dynamical Processes and Predictability at the Banff International Research Station (BIRS), Canada, July 10-July 15, 2011.

Program Chair of the Organizing Committee, The Third THORPEX International Science Symposium, Monterey, CA, USA, 2009

Reviewed journal articles for 21 different peer reviewed journals; proposals for NASA, NOAA, NSF, Swiss NSF, Austrian NSF; report of the National Research Council/National Academy of Sciences (NRC/NAS).

Guanglin Tang
Postdoctoral Research Associate

**Education**

2015  Atmospheric Sciences, Ph.D., Texas A&M University

2010  Atmospheric Sciences, M.S., Texas A&M University

2008  Atmospheric Sciences, B.S., Peking University

**Professional Experience**

2015-Present  Postdoctoral Research Associate, Texas A&M University

2010-2015  Graduate Research Assistant, Texas A&M University

2008-2010  Graduate Research Assistant, Texas A&M University

2006-2007  Undergraduate Research Assistant, Peking University

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Shel Winkley
Lecturer and Meteorologist Liaison

Education
2005 Meteorology, B.S., Texas A&M University

Professional Experience
2014-Present Meteorologist Liaison, College Station, Texas
2013-Present Chief Meteorologist, KBTX Media, Bryan, Texas
2013-Present Lecturer, Department of Atmospheric Sciences, Texas A&M University
2007-2009 Weekend Meteorologist/Lead Storm Chaser, KFDA Media, Amarillo, Texas

Honors and Awards
Texas Associated Press Broadcasters – Division 3
- Weathercast – 1st Place 2014-2015
- Continuing Coverage – 1st Place 2012-2013
- Morning Newscast – 1st Place 2009-2010

Texas A&M University Fish Camp Namesake
- Nominated and Selected as namesake of Camp Winkley in August 2014
- Seven Session, four-day camp program designed to introduce incoming freshman to Texas A&M

Organizations
YPA-Young Professionals of Aggieland, July 2010-Present
- Co-founder of non-profit 501(c)(3) organization
- Support local non-profits through fiscal & volunteer efforts
- Help local young professionals network and get involved within the community
Yangyang Xu
Assistant Professor

Education
2014  Earth Sciences, Ph.D., Scripps Institution of Oceanography, University of California, San Diego
2011  Oceanography, M.S., Scripps Institution of Oceanography, University of California, San Diego
2008  Atmospheric Sciences, B.S., School of Physics, Peking University

Professional Experience
2016-Present  Assistant Professor, Department of Atmospheric Sciences, Texas A&M University
2016  Project Scientist I, Climate Change Research Section, Climate and Global Dynamics Lab, NCAR
2014-2016  ASP Postdoctoral Fellow, Advanced Study Program, NCAR
2014  Visitor (postdoctoral), Climate and Global Dynamics Division, NCAR
2013  Visitor (graduate student), Advanced Study Program, NCAR
2008-2013  Graduate Student Researcher, Scripps Institution of Oceanography, University of California, San Diego

Honors and Awards
ASP Postdoctoral Fellowship, NCAR/Advanced Study Program, 2014
Graduate Student Excellence Travel Award, Scripps Institution of Oceanography, 2013
Chinese Government Award for Outstanding Self-financed Students Abroad, 2013
Graduate Visitor Program Funding, NCAR/Advanced Study Program, 2012

Publications


Ping Yang
Professor & Holder of the David Bullock Harris Chair in Geosciences

Education
1995  Meteorology, Ph.D., University of Utah, Salt Lake City
1988  Atmospheric Physics, M.S., Lanzhou Institute of Plateau Atmospheric Physics, Chinese Academy of Science, Lanzhou University, China
1985  Theoretical Physics, B.S., Lanzhou University, China

Professional Experience
2012-Present  Department Head, Department of Atmospheric Sciences, Texas A&M University
2010-Present  Holder of the David Bullock Harris Chair in Geosciences, College of Geosciences, Texas A&M University
2009-Present  Joint Professor, Department of Physics and Astronomy, Texas A&M University
2008-Present  Professor, Department of Atmospheric Sciences, Texas A&M University
2005-2008  Associate Professor, Department of Atmospheric Sciences, Texas A&M University
2001-2005  Assistant Professor, Department of Atmospheric Sciences, Texas A&M University
2001  Associate Research Scientist, Goddard Earth Sciences and Technology Center, University of Maryland Baltimore County
1999-2001  Research Scientist, Science and System Application, Inc. Lanham, Maryland (worked on-site in code 913, NASA Goddard Space Flight Center, Greenbelt, Maryland)
1997-1999  Assistant Research Scientist, Department of Atmospheric Sciences, University of California, Los Angeles
1992-1995  Graduate Research Assistant, Department of Meteorology/Center for Atmospheric Remote Sensing Study, University of Utah, Salt Lake City
1988-1992  Assistant Researcher, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences, Nanjing, China

Honors and Awards
Elected (2015) Fellow of American Geophysical Union (AGU)
Ascent Award (2013) by AGU (American Geophysical Union) Atmospheric Sciences Section
Elected (2013) fellow of the American Meteorological Society (AMS).
NASA Group Achievement Award to ACCRI Aircraft Cloud Effects Team (8/30/2013)
NASA Group Achievement Award to CERES Clouds Team (8/30/2013)
Holder of the David Bullock Harris Chair in Geosciences (1/1/2010--), College of Geosciences, Texas A&M University
Elected (2010) fellow of the Optical Society of America (OSA).
Certificate of Appreciation, National Institute of Standards and Technology (NIST), March 2011.
Holder of the David Bullock Harris Chair in Geosciences (1/1/2010--), College of Geosciences, Texas A&M University
The Association of Former Students’ (AFS) College-level Teaching Award, Texas A&M University, 2008.
Dean’s Distinguished Achievement Award for Faculty Research, College of Geosciences, Texas A&M University, 2004.
National Science Foundation (NSF) CAREER Award, 2003
NASA Group Achievement Award to CRYSTAL-FACE Science Team, 2003
Best Paper Award, Climate and Radiation Branch, NASA Goddard Space Flight Center, 2000

Membership in Professional Societies
Member of American Geophysical Union (Fellow Status)
Member of the Optical Society of America (Fellow Status)
Member of the American Meteorological Society (Fellow Status)

Editorship
Editorial Board, Remote Sensing of Environment (5/2015-present)
Editorial Board member/editor: Theoretical and Applied Climatology (09/2010-present)
Associate Editor: Journal of Quantitative Spectroscopy & Radiative Transfer (01/2007-present)
Associate Editor: Journal of Applied Meteorology and Climatology (01/2007-07/2012)

Publications
Number of Peer-Reviewed Journal Papers: 285
Invited Book Chapters: 11
Books: 3
Citation Information:
  Google Scholar – Citations: 12130, H-index: 54
  Web of Science – Citations: 7845, H-index: 43

Theses and Dissertation Supervised/Co-supervised and Current Graduate Students
18 completed master’s degree theses
19 completed Ph.D. degree dissertations
Dr. Ping Yang, as Thesis Committee Chair/Co-chair, is currently supervising 11 graduate students (1 Master’s Student and 10 Ph.D. Students)

Research Grants/Contracts
11 Current Grants (totaling ~$2.6 M) that support four research staff members (three Postdoctoral Research Associates and one Assistant Research Scientist) and 10 graduate students as Graduate Assistants – Research
46 Completed Grants/Contracts totaling ~$8.61 M
Renyi Zhang
Holder of Harold J. Haynes Endowed Chair in Geosciences and University Distinguished Professor

Education
1994    Atmospheric Chemistry, Ph.D., MIT
1989    Physics, M.S., University of Nevada-Reno
1983    Atmospheric Science, B.S., Nanjing Institute of Meteorology

Professional Experience
2014-Present    Senior editor, Oxford Research Encyclopedia - Environmental Science, Oxford University Press
2014-Present    Editor, Journal of the Atmospheric Sciences,
2007-2014        Director, Center for Atmospheric Chemistry and Environment, Texas A&M University (TAMU)
2007-Present     Professor, Department of Chemistry, Texas A&M University
2005-Present     Professor, Department of Atmospheric Sciences, Texas A&M University
2002-2005        Associate Professor, Department of Atmospheric Sciences, Texas A&M University
1997-2002        Assistant Professor, Department of Atmospheric Sciences, Texas A&M University
1996-1997        Research Associate, Department of Chemistry and Department of Earth, Atmospheric, and Planetary Sciences, MIT
1993-1996        Post Doctoral Research Associate, Chemical Kinetics and Photochemistry Group, NASA Jet Propulsion Laboratory, California Institute of Technology

Honors and Awards
Honor Award for Scientific Excellence, Division of Environmental Chemistry, American Chemical Society, 2016
Fellow, American Meteorological Society (AMS), 2015
University Distinguished Professor, Texas A&M University, 2014
University-Level Distinguished Achievement Award – Research, Texas A&M University and The Association of Former Students, 2012
Fellow, American Geophysical Union (AGU), 2012
Holder of Harold J. Haynes Endowed Chair in Geosciences, Texas A&M University, 2010
Cheung-Kong Distinguished Scholar Award, Ministry of Education - China, 2009
Bush Excellence Award for Faculty in International Research, Texas A&M University, 2009
Outstanding International Research Collaboration Award, China National Science Foundation, 2007
Honorary Professorship, Fudan University, China, 2007
Distinguished Achievement Award for Faculty Research, College of Geosciences, Texas A&M University, 2002
NASA New Investigator Program Award, 1998
Invited attendee in Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS), Harvard University, 1993
NASA Graduate Fellowship, 1990 – 1993

Graduate Students (chair), Post docs, Visiting scholars/Students Supervised
Current Ph.D. graduate students: Yun Lin, ATMO, since 2011; Jeremiah Secrest, CHEM, since 2011; Wilmarie Ortiz, CHEM, since 2012; Bowen Pan, ATMO, since 2013; Jiaxi Hu, ATMO, since 2013; Yixin Li, CHEM, since 2015; Rashno Poormotamed, CHEM, since 2016
Supervised 16 post docs and 18 visiting students/Scientists

Courses Taught at TAMU
ATMO - 363, Atmospheric Chemistry and Pollution
ATMO - 446, Atmospheric Physics
ATMO – 463, Air Pollution Meteorology
ATMO – 602, Thermodynamics and Atmospheric Physics
ATMO – 606, Introduction to Atmospheric Chemistry
ATMO – 613, Advanced Atmospheric Chemistry
ATMO – 681, Atmospheric Sciences Seminars
ATMO – 685 Advanced Topics in Atmospheric Chemistry
ATMO – 689, Advanced Atmospheric Chemistry

Service Activities
Internal
Member, TAMU Institute for Advanced Study (TIAS) Administrative Council, 2016 – present

External
Member, search Committee for Editor-in-Chief, Journal of Geophysical Research – Atmospheres, 2016
Member, Follow Committee of the Atmospheric Science Section, American Geophysical Union, 2015 – present
Chair, Committee on Atmospheric Chemistry, American Meteorological Society, 2011 – 2014
Member, International Commission on Atmospheric Chemistry and Global Pollution (ICACGP), 2010 - present
Appendix G. Publications, 2009-present

Books


2016 (incomplete list)


Hu, Min, Guo Song, Peng JianFei, Wu ZhiJun, 2015: Insight into characteristics and sources of PM_{2.5} in the Beijing-Tianjin-Hebei region, China, National Science Review, 2, 257-258, 10.1093/nsr/nwy003.


Lemmon, M.T., M.J. Wolff, J.F. Bell III, M.D. Smith, B. Cantor, and P.H. Smith, 2015: Dust aerosol, clouds, and the atmospheric optical depth record over 5 Mars years of the Mars Exploration Rover mission. Icarus 251, 96-111. DOI: 10.1016/j.icarus.2014.03.029.


Luz, Ellen S. A. M., O. Pinto, K. Naccarato, A. C. V. Saraiva, M. A. Bravo, and R.E. Orville, 2015: Temperature and electron density in the lightning channel during the continuing current of a negative downward lightning, SIPDA.


micrometeorological flux measurements, Atmospheric Chemistry and Physics, 15, 7413-7427, doi:10.5194/acp-15-7413-2015


2014


2013


Patricola, C.M., P. Chang, and R. Saravanan, 2013: Impact of Atlantic SST and high frequency atmospheric variability on the 1993 and 2008 Midwest floods: Regional...


2012


Balaguru, P. Chang, R. Saravanan, and C. J. Jang, 2012: The Barrier Layer of the Atlantic warmpool: Formation mechanism and influence on the mean climate. Tellus. A 2012, 64, 18162, http://dx.doi.org/10.3402/tellusa.v64i0.18162


Jackson, R.C., G.M. McFarquhar, A.V. Korolev, J.W. Strapp, M.E. Earle, P. Liu, R.P. Lawson, 


2011


2010


2009


Measurements of OH and HO\textsubscript{2} concentrations during the MCMA-2006 field campaign – Part 2: Model comparison and radical budget, *Atmos. Chem. Phys.* **9**, 6655-6675.


Oreopoulos, L., S. Platnick, G. Hong, P. Yang, and R. F. Caha, 2009: The shortwave radiative forcing bias of liquid and ice clouds from MODIS observations, Atmospheric Chemistry and Physics, 9, 5865-5875.


2016

Bowman, Kenneth; Dynamics and Kinematics of the Monsoon Anticyclones; National Science Foundation; 1/1/2016 to 2/28/2019; $291,049

Collins, Donald; A Multi-Instrument Cloud Condensation Nuclei Spectrum Product; Colorado State University; 8/1/2016 to 7/31/2018; $100,020

Collins, Donald; Atmospheric Processing of Chemical Warfare (CW) Simulant Aerosols; Sandia National Laboratories; 4/22/2016 to 12/30/2016; $50,000

Conlee, Don; REU Site: Atmospheric Science In the Gulf Coast Region at Texas A&M University; National Science Foundation; 9/1/2016 to 8/31/2019; $178,346

Dessler, Andrew; Assessing the impact of TTL cirrus on the climate system - CloudSat and CALIPSO Science Team Recompete/ROSES-2015; NASA-Langley; 7/1/2016 to 6/30/2019; $184,959

Epifanio, Craig; Implementation and Testing of Advanced Surface Boundary Conditions Over Complex Terrain In the WRF-ARW Model; DOC-NOAA-Earth System Research Laboratory; 7/18/2016 to 7/17/2019; $211,057

Korty, Robert; REU Site: Atmospheric Science In the Gulf Coast Region at Texas A&M University; National Science Foundation; 9/1/2016 to 8/31/2019; $178,346

Nielsen-Gammon, John; Wind Rotation and Pollutant Concentrations In Southeast Texas; 8-Hour Ozone SIP Coalition; 6/1/2016 to 8/31/2017; $16,100

North, Jerry; Thomas T. Wilheit, Jr. Symposium; NASA-Goddard Space Flight Center; 10/20/2016 to 10/22/2016; $20,173

Saravanan, Ramalingam; Investigation of the Effects of Oceanic Mesoscale Eddies on the Midlatitude Storm Tracks and Their Predictability; DOC-National Oceanic and Atmospheric Administration; 7/1/2016 to 6/30/2019; $132,768

Schumacher, Courtney; Convective-Environmental Interactions In the Tropics; DOE-Office Of Science; 9/1/2016 to 8/31/2017; $389,739

Schumacher, Courtney; From the Tropics to the Midlatitudes: A Seamless Analysis of Convective and Stratiform Rain and Latent Heating Using GPM; NASA-Washington; 2/3/2016 to 2/2/2019; $282,756

Szunyogh, Istvan; Coupled Global-Regional Data Assimilation with NAVDAS-AR; DOD-Navy-Office of Naval Research; 4/1/2016 to 12/1/2017; $79,616

Szunyogh, Istvan; Investigation of the Effects of Oceanic Mesoscale Eddies on the Midlatitude Storm Tracks and Their Predictability; DOC-National Oceanic and Atmospheric Administration; 7/1/2016 to 6/30/2019; $136,791

Szunyogh, Istvan; Regionally Enhanced Global (REG) 4D-Var; DOD-Navy-Office of Naval Research; 8/1/2016 to 9/20/2017; $80,000

Yang, Ping; Development of Ice Cloud and Snow Optical Property Models In Support of CERES Science Team; NASA; 10/1/2016 to 9/30/2019; $203,258

Yang, Ping; Development of An Optimal Ice Cloud Model In Support of JPSS; NOAA; 8/26/2016 to 8/25/2017; $31,500

Yang, Ping; Collaborative Research: Systematic Evaluation and Further Improvement of Present Broadband Radiative Transfer Modeling Capabilities; National Science Foundation; 9/1/2016 to 8/31/2019; $509,434

238
Bowman, Kenneth; Collaborative Research: Observational and Modeling Studies of Overshooting Convection and Stratosphere-Troposphere Exchange; National Science Foundation; 7/15/2015 to 6/30/2018; $289,572
Brooks, Sarah; Air Quality Measurements at the Shaperanch, Dimmit County, During Spring 2015; Hugh Fitzsimons; 1/20/2015 to 12/15/2015; $26,237
Brooks, Sarah; Identification of Cloud-Nucleating and Ice-Nucleating Biological Aerosol Sources; National Science Foundation; 9/15/2015 to 8/31/2018; $268,908
Brooks, Sarah; Sources and Properties of Atmospheric Aerosol In Texas: DISCOVER-AQ Measurements and Validation; University of Texas at Austin; 1/26/2015 to 9/30/2015; $51,945
Brooks, Sarah; The North Atlantic Aerosols and Marine Ecosystems Study (NAAMES); NASA-Johnson Space Center; 2/1/2015 to 1/31/2020; $149,597
Collins, Donald; Atmospheric Processing of Chemical Warfare (CW) Simulant Aerosols; Sandia National Laboratories; 3/31/2015 to 9/30/2015; $95,049
Collins, Donald; Tandem Differential Mobility Analyzer/Aerodynamic Particle Sizer Support; UChicago Argonne, LLC; 10/1/2015 to 9/30/2016; $64,424
Epifanio, Craig; The Dynamical Influences of Low-Level Shear and Lifting Condensation Level on Supercell Tornadoes; National Science Foundation; 2/15/2015 to 1/31/2018; $218,252
Hioki, Souichiro; Variability of Ice Cloud Particle Roughness Determined from Polarimetric Satellite Observations; NASA-Washington; 9/1/2015 to 8/31/2017; $60,000
Lemmon, Mark; Deciphering Fine-Scale Surface Properties from Visible/Near-Infrared Spectrophotometry at Recent Martian Landing Sites; Johns Hopkins University; 8/1/2015 to 7/31/2018; $30,604
Lemmon, Mark; Mars Exploration Rover; NASA - Jet Propulsion Lab - Pasadena, CA; 9/1/2015 to 9/30/2018; $54,800
Lemmon, Mark; Mastcam-Z: A Geologic, Stereoscopic, and Multispectral Investigation for the NASA Mars 2020 Rover Mission; Arizona State University; 4/1/2015 to 8/31/2020; $167,848
Nielsen-Gammon, John; PMP Study Peer Review Committee; Texas Commission On Environmental Quality; 1/6/2015 to 8/31/2016; $38,599
Nowotarski, Christopher; The Dynamical Influences of Low-Level Shear and Lifting Condensation Level on Supercell Tornadoes; National Science Foundation; 2/15/2015 to 1/31/2018; $218,252
Orville, Richard; Collaborative Research: Lightning Studies In a Polluted Atmosphere; National Science Foundation; 9/1/2015 to 8/31/2018; $569,447
Orville, Richard; Lightning Mapper Array Operation In Oklahoma and the Texas Gulf Coast Region to Aid Preparation for the GOES-R GLM; University of Oklahoma; 7/1/2015 to 9/30/2017; $33,500
Rapp, Anita; Multi-Parameter Diagnostics of Cloud Influences on the Atmospheric Energy and Water Cycle; University of Wisconsin; 1/1/2015 to 12/31/2017; $122,514
Schade, Gunnar; Air Quality Measurements at the Shaperanch, Dimmit County, During Spring 2015; Hugh Fitzsimons; 1/20/2015 to 12/15/2015; $26,237
Schumacher, Courtney; Collection and Processing of Brazilian S-band Radar Data; Battelle Pacific Northwest Division; 7/17/2015 to 9/30/2016; $14,741
Schumacher, Courtney; *Dynamo Legacy Data Products*; University of Miami; 4/15/2015 to 3/31/2017; $53,517

Yang, Ping; *Collaborative Research: Inferring Marine Particle Properties from Polarized Volume Scattering Functions (IMPROVE)*; National Science Foundation; 9/1/2015 to 8/31/2018; $197,140

Yang, Ping; *Development and Improvement of Single-Scattering and Radiative Transfer Modeling Capabilities in Support of PACE, MODIS, and VIIRS Missions*; NASA-Goddard Space Flight Center; 4/1/2015 to 3/31/2017; $148,737

Yang, Ping; *Development of New Theoretical Framework for Inferring Ice Crystal Surface Roughness from Multi-Angular Sensor Measurements*; NASA-Washington; 7/15/2015 to 7/14/2018; $402,579

Yang, Ping; *Improving Scattering/Absorption/Polarization Properties of Snow, Graupel, and Ice Aggregate Particles from Solar- to Microwave-Region Wavelengths In Support of CRTM*; DOC-National Oceanic and Atmospheric Administration; 8/1/2015 to 7/31/2017; $196,404

Yang, Ping; *Research Effort Contributing To Uncertainty Reduction In Assessing Radiative Forcings of Contrails and Contrail-Induced Cirrus Clouds*; Science Systems and Applications, Inc.; 5/27/2015 to 1/31/2016; $34,000

Yang, Ping; *Research In Support of NASA’s IceCube Project*; NASA-Goddard Space Flight Center; 6/1/2015 to 5/31/2017; $80,000

Yang, Ping; *VIIRS RTM Support*; University of Wisconsin; 8/18/2015 to 8/17/2017; $59,820

Zhang, Renyi; *2016 AMS Mario J. Molina Symposium*; National Science Foundation; 10/1/2015 to 9/30/2016; $10,000

Zhang, Renyi; *Research In Support of NASA’s IceCube Project*; NASA-Goddard Space Flight Center; 6/1/2015 to 5/31/2017; $80,000

Zhang, Renyi; *Roses-2015/Tropical Workshops, Symposia, and Conferences - 2016 AMS Mario J. Molina Symposium*; NASA-Washington; 10/30/2015 to 10/29/2016; $15,000

**2014**

Bowman, Kenneth; *Development and Evaluation of an Interactive Sub-Grid Cloud Scheme for the CAMx Photochemical Model*; University of Texas at Austin; 5/21/2014 to 7/31/2015; $39,774

Brooks, Sarah; *The Optical Properties of Ice Crystals Nucleated on Soot Particles*; Sandia National Laboratories; 10/3/2014 to 7/31/2015; $30,100

Collins, Donald; *Environmental Persistence of Biological Aerosols In Outdoor and Simulated Environments*; Sandia National Laboratories; 2/24/2014 to 2/23/2017; $254,268

Collins, Donald; *Tandem Differential Mobility Analyzer/Aerodynamic Particle Sizer Support*; UChicago Argonne, LLC; 10/1/2014 to 9/30/2015; $65,000

Dessler, Andrew; *Understanding Transport of Mass, Water Vapor, and Tropospheric Pollutants into the Stratosphere*; NASA-Johnson Space Center; 4/1/2014 to 3/31/2017; $656,585

Lemmon, Mark; *Aerosol Studies with the Mars Environmental Dynamics Analyzer*; NASA - Jet Propulsion Lab - Pasadena, CA; 11/5/2014 to 9/30/2020; $199,400
Nasiri, Shaima; *Historical Droughts over Texas and Murray-Darling Basin: Their Initialization, Duration, and Cessation*; University of Texas at Austin; 6/1/2014 to 9/30/2014; $7,051

Nasiri, Shaima; *IPA Agreement*; Department of Energy; 7/1/2014 to 10/31/2015; $238,622

Nielsen-Gammon, John; *Development and Evaluation of an Interactive Sub-Grid Cloud Scheme for the CAMx Photochemical Model*; University of Texas at Austin; 5/21/2014 to 7/31/2015; $40,979

Nielsen-Gammon, John; *High-Resolution Integrated Drought Monitoring*; DOC-NOAA-Climate Program Office; 9/1/2014 to 8/31/2017; $256,000

Nielsen-Gammon, John; *Improving Modeled Biogenic Isoprene Emissions under Drought Conditions and Evaluating Their Impact on Ozone Formation*; University of Texas at Austin; 6/25/2014 to 11/30/2015; $58,160

Orville, Richard; *Lightning Mapper Array Operation In Oklahoma and the Texas Gulf Coast Region to Aid Preparation for the GOES-R GLM*; University of Oklahoma; 5/2/2014 to 7/31/2016; $28,500

Patricola, Christina; *Conditional Probabilistic Event Attribution*; Lawrence Berkeley National Laboratory; 12/22/2014 to 7/31/2015; $10,137

Patricola, Christina; *The Impact of Canonical and Non-Canonical El Niño and the Atlantic Meridional Mode on Atlantic Tropical Cyclones*; National Science Foundation; 2/1/2014 to 1/31/2017; $185,064

Rapp, Anita; *Detection of Precipitation Onset with Implications for Passive Microwave Rainfall Retrievals*; NASA-Johnson Space Center; 7/30/2014 to 7/29/2017; $264,156

Saravanan, Ramalingam; *The Impact of Canonical and Non-canonical El Niño and the Atlantic Meridional Mode on Atlantic Tropical Cyclones*; National Science Foundation; 2/1/2014 to 1/31/2017; $17,625

Schade, Gunnar; *Improving Modeled Biogenic Isoprene Emissions under Drought Conditions and Evaluating Their Impact on Ozone Formation*; University of Texas at Austin; 6/25/2014 to 11/30/2015; $58,160

Zhang, Renyi; *Development and Evaluation of an Interactive Sub-Grid Cloud Scheme for the CAMx Photochemical Model*; University of Texas at Austin; 5/21/2014 to 7/31/2015; $39,774

2013
Brooks, Sarah; **Collaborative Research: Why Does Oxidation Improve Freezing? Using Laboratory Measurements and Molecular Simulations to Investigate Heterogeneous Ice Nucleation on Carbon Surfaces**; National Science Foundation; 9/1/2013 to 8/31/2016; $220,000

Collins, Donald; **Collaborative Research: Sensitivity of Gas and Aqueous Phase Production of Secondary Organic Aerosol to Chemical and Environmental Perturbations**; National Science Foundation; 2/1/2013 to 3/31/2016; $228,342

Collins, Donald; **Experimental Study of the Production of PM2.5 In Southeast Texas Clouds**; Texas Air Research Center (tarc); 9/1/2013 to 7/15/2015; $82,930

Collins, Donald; **Tandem Differential Mobility Analyzer/Aerodynamic Particle Sizer Support**; UChicago Argonne, LLC; 10/1/2013 to 9/30/2014; $61,219

Dessler, Andrew; **Understanding Long-Term Variations In Stratospheric Water Vapor**; National Science Foundation; 4/1/2013 to 3/31/2017; $259,112

Dessler, Andrew; **Using Trajectory Calculations to Study Mass and Trace Gas Transport into the Stratosphere**; NASA-Johnson Space Center; 6/15/2013 to 6/14/2017; $527,177

Nasiri, Shaima; **Collaborative Research: Understanding Relationships Between Dual-Polarimetric In-cloud Microphysics and Satellite-Observed Cumulus Cloud Properties to Predict Lightning Character**; National Science Foundation; 8/15/2013 to 7/31/2017; $151,528

Orville, Richard; **Digital High-Speed Spectroscopic Recording In the Upward Lightning Triggering Study (UPLIGHTS)**; National Science Foundation; 4/1/2013 to 3/31/2017; $442,903

Rapp, Anita; **Collaborative Research: Understanding Relationships between Dual-Polarimetric In-cloud Microphysics and Satellite-Observed Cumulus Cloud Properties to Predict Lightning Character**; National Science Foundation; 8/15/2013 to 7/31/2017; $80,170

Rapp, Anita; **Local and Remote Effects of Subtropical Cumulus Convection**; NASA-Washington; 2/11/2013 to 2/10/2017; $296,035

Schumacher, Courtney; **Cash Balance In Atmospheric Sciences - Schumacher**; Texas A&M Research Foundation; 1/4/2013 to 8/31/2013; $7,052

Schumacher, Courtney; **Multi-Scale Interactions In the Tropics: TRMM PR Observations + 8 Reanalysis Data Sets**; NASA-Washington; 2/11/2013 to 2/28/2017; $242,455

Wilheit, Thomas; NASA - **Consistent Radiances for GPM**; NASA-Goddard Space Flight Center; 2/5/2013 to 8/31/2016; $401,856

Yang, Ping; **Development of Rigorous Computational Capabilities Based On the Invariant Imbedding Principle for the Simulation of the Optical Properties of Dust and Ice Crystals**; National Science Foundation; 9/1/2013 to 8/31/2017; $565,425

Yang, Ping; **Improvement and Validation of JCSDA’s Community Radiative Transfer Model (CRTM)**; DOC-National Oceanic and Atmospheric Administration; 8/1/2013 to 7/31/2015; $111,642


Yang, Ping; **Support for the JPSS Cloud Team**; DOC-National Oceanic and Atmospheric Administration; 9/4/2013 to 5/31/2014; $59,413

Zhang, Renyi; **Analysis of Particulate Matter Chemistry**; Houston Advanced Research Center; 1/16/2013 to 1/31/2015; $150,000
Zhang, Renyi; *Chemical Kinetics and Mechanism of Hydrocarbon Oxidation Reactions*; Robert A. Welch Foundation, the; 6/1/2013 to 5/31/2019; $233,649

Zhang, Renyi; *Chemical Kinetics and Mechanism of Hydrocarbon Oxidation Reactions*; Robert A. Welch Foundation, the; 6/1/2013 to 5/31/2019; $231,351

2012

Bowman, Kenneth; *NSF Reu Site: Atmospheric Sciences In the Gulf Coast Region At Texas A&M University*; National Science Foundation; 9/1/2012 to 8/31/2016; $148,795

Brooks, Sarah; *Component Based Particulate Matter Risk Assessment for Texas Air Quality*; Lamar University - Texas Air Research Center; 7/1/2012 to 7/15/2013; $26,428

Collins, Donald; *Anl Tandem Differential Mobility Analyzer/Aerodynamic Particle Sizer Support and Attachment NO. 1* - Arm Climate Research Facility; UChicago Argonne, LLC; 10/1/2012 to 9/30/2013; $41,585

Conlee, Don; *NSF Reu Site: Atmospheric Sciences In the Gulf Coast Region At Texas A&M University*; National Science Foundation; 9/1/2012 to 8/31/2016; $148,794

Conlee, Don; *Ucar - High Impact Forecasting In the Southeast Texas Upper Air S Parse Region*; University Corporation for Atmospheric Research; 1/25/2012 to 8/31/2014; $9,950

Dessler, Andrew; *NRS / NASA Earth and Space Science Fellowship (NESSF) Program - 2014 (Prev title: Nasa-Earth and Space Science Fellowship 2012)*; NASA-Washington; 9/1/2012 to 8/31/2015; $60,000

Khalizov, Alexei; *Lamar Univ - Tarc - Implementation of Particle Size Magnification for Analysis of Sub-4 Nm Nanoparticles and Secondary Organic*; Lamar University - Beaumont; 7/1/2012 to 7/15/2013; $22,271

Lemmon, Mark; *Anl Tandem Differential Mobility Analyzer/Aerodynamic Particle Sizer Support and Attachment NO. 1* - Arm Climate Research Facility; UChicago Argonne, LLC; 10/1/2012 to 9/30/2013; $19,585

Lemmon, Mark; *Jhu - Planetary Atmospheric Modeling and Photometry for the Mars Data Analysis Program (mdap)*; Johns Hopkins University; 1/3/2012 to 8/31/2015; $28,302

North, Jerry; *Lans-Detection of Climate Signals From Millennial Length Ice Core Records*; Los Alamos National Security, LLC; 2/21/2012 to 9/30/2014; $145,397

Rapp, Anita; *Quantifying the Water and Energy Budgets of Marine Subsidence Regions*; NASA-Washington; 12/1/2012 to 11/30/2015; $137,107

Saravanan, Ramalingam; *DOE - Collaborative Research: Impacts of Aerosols and Air-Sea Interaction On Community Earth System Model (CESM) Biases In the Western Pacific Warm Pool Region*; DOE-Chicago/Argonne National Laboratory; 9/1/2012 to 8/31/2016; $623,272

Schumacher, Courtney; *DOE - the 3-D Convective Cloud Spectrum In Amie Radar Observation and Global Climate Simulations*; DOE-Chicago/Argonne National Laboratory; 9/1/2012 to 8/31/2015; $361,854

Szunyogh, Istvan; *Coupled Global-Regional Data Assimilation Using Joint States*; DOD-Navy-Office of Naval Research; 5/14/2012 to 8/15/2015; $442,396

Szunyogh, Istvan; *NSF: the Effect of Model Uncertainty and Error On the Forecast Uncertainty*; National Science Foundation; 8/1/2012 to 7/31/2016; $363,677

Yang, Ping; *Developing Optical Datasets and Modeling Capabilities To Assess the Radiative Forcing of Contrails and Contrail-Cirrus Opt Yr 2*; DOT-Research & Innovative Technology Administration; 1/1/2012 to 3/31/2013; $210,615

243
Yang, Ping; Development of Algorithms To Retrieve Ice Cloud Properties From Calipso Imaging Infrared Radiometer (iir) Observations; NASA-Langley; 1/10/2012 to 1/9/2013; $40,000

Yang, Ping; Development of Fast Multiple-Scattering Computational Capabilities In Support of Nasa Clarreo Mission; NASA-Langley; 9/1/2012 to 8/31/2017; $181,710

Zhang, Renyi; Investigation of Cloud and Precipitation Processes Using WRF with A Two-Moment Microphysics; Brookhaven National Laboratory; 12/21/2012 to 12/31/2013; $25,000

Zhang, Renyi; NSF-Travel Support for the 2013 Ams Robert A. Duce Symposium, Austin, Tx; January 6-10,2013; National Science Foundation; 10/15/2012 to 9/30/2013; $10,000

2011

Collins, Donald; Anl Tandem Differential Mobility Analyzer/Aerodynamic Particle Si Zer Support; UChicago Argonne, LLC; 10/1/2011 to 9/30/2012; $61,279

Collins, Donald; Ucar Cloud Aerosol Interactions and Precipitation Enhancement Exp Eriment (caipex); University Corporation for Atmospheric Research; 10/1/2011 to 8/17/2012; $56,349

Epifanio, Craig; The Effect of Surface Roughness On Wind Speed Modeling Errors in Urban Cities; Texas Commission On Environmental Quality; 5/20/2011 to 6/30/2012; $44,308

Hsieh, Jenshan; A Study of Frontal-Scale Air-Sea Interaction Along the Gulf Stream Extension Using A High-Resolution Coupled Regional Climate; National Science Foundation; 8/15/2011 to 7/31/2015; $179,528

Korty, Robert; Collaborative Research: Tropical Cyclones in a Warming Climate: Lessons from Model Simulations of the Last Glacial Maximum and; National Science Foundation; 4/15/2011 to 3/31/2016; $255,776

Lemmon, Mark; Atmospheric Imaging Investigation for the Mars Science Laboratory Imaging Science Team; Malin Space Science Systems; 6/1/2011 to 9/30/2016; $660,950


Nielsen-Gammon, John; Development of A High-Resolution Drought Trigger Tool (hidrtt) for the United States; USDA-National Institute of Food And Agriculture; 7/1/2011 to 12/31/2014; $496,336

Rapp, Anita; Rapid: Evaluation of Climate Models in the Southeast Pacific Marine Stratocumulus Region; National Science Foundation; 5/1/2011 to 4/30/2013; $29,996

Saravanan, Ramalingam; A Study of Frontal-Scale Air-Sea Interaction Along the Gulf Stream Extension Using a High-Resolution Coupled Regional Climate; National Science Foundation; 8/15/2011 to 7/31/2015; $179,528

Saravanan, Ramalingam; Collaborative Project: Ocean-Atmosphere Interaction from Meso-TO Planetary-Scale: Mechanisms, Parameterization, and Variability; DOE-Chicago/Argonne National Laboratory; 9/15/2011 to 9/14/2015; $191,412

Schumacher, Courtney; Convective Precipitation and Heating Structures Observed by the Smart-Radar During Dynamo; National Science Foundation; 4/15/2011 to 3/31/2015; $723,498

Schumacher, Courtney; Doppler Radar Observation In Gan, Maldives Islands; Japan Agency for Marine-Earth Science and Technology; 5/16/2011 to 3/1/2012; $142,948

Yang, Ping; Cash Balance in Atmospheric Sciences - Ping Yang; Texas A&M Research Foundation; 2/8/2011 to 8/31/2013; $42,114
Yang, Ping; *Determination of the Aspect Ratios of Airborne Dust Particles from the Aerosol Polarimetry Sensor (aps) Measurements*; NASA-Washington; 6/20/2011 to 6/19/2015; $415,056

Yang, Ping; *Developing Optical Datasets and Modeling Capabilities to Assess the Radiative Forcing of Contrails and Contrail-Cirrus - Opt Yr1*; DOT-Research & Innovative Technology Administration; 2/8/2011 to 12/31/2011; $184,090

Yang, Ping; *Development of New Modeling Capabilities and Improvement of Existing Computational Software Resources for Simulating the*; NASA-Washington; 6/20/2011 to 6/19/2015; $373,451

Yang, Ping; *Development of the Optical Properties of Soot, Dust, Aerosols and Ice Crystals in Support of the Goes-R Research Project of the*; University of Wisconsin; 4/1/2011 to 3/31/2012; $30,000

Yang, Ping; *Evaluation of the Cloud and Aerosol Look-UP Tables and Relevant Parameterizations Utilized in Viirs Cloud Property Retrievals and*; NASA-Washington; 7/29/2011 to 7/28/2015; $431,875

Yang, Ping; *Ice Cloud Bulk Scattering and Absorption Models: Refinement Through Intercomparison of Hyperspectral, Narrowband, and*; University of Wisconsin; 2/16/2011 to 2/15/2014; $174,076

Yang, Ping; *Support for Cloud and Aerosol Retrieval in the Goes-R Mission*; DOC-National Oceanic and Atmospheric Administration; 9/23/2011 to 9/30/2012; $136,046

Yang, Ping; *Uwisc-Investigation of Ice Particle Characteristics Through Compa Rison of Aps and Modis Measurements*; University of Wisconsin; 8/26/2011 to 8/25/2015; $199,179

Zhang, Renyi; *2011 Iyc Symposium On Stratospheric Ozone and Climate Change*; NASA-Washington; 7/19/2011 to 7/18/2012; $49,130

Zhang, Renyi; *2011 Iyc Symposium On Stratospheric Ozone and Climate Change*; National Science Foundation; 7/15/2011 to 6/30/2012; $25,000

Zhang, Renyi; *Investigation of Cloud and Precipitation Processes Using Wrf with a Two-Moment Microphysics*; Brookhaven National Laboratory; 10/1/2011 to 9/30/2012; $15,349

Zhang, Renyi; *Investigation of Cloud and Precipitation Processes Using Wrf With a Two-Moment Microphysics*; Brookhaven National Laboratory; 12/14/2011 to 9/30/2012; $25,000

**2010**

Bowman, Kenneth; *Dynamical and Chemical Diagnosis of Stratosphere - Troposphere Analyses of Regional Transport 2008 (start08) Data*; National Science Foundation; 9/1/2010 to 8/31/2014; $477,158

Brooks, Sarah; *Eager: Marine Biogenic Aerosols as Cloud Condensation Nuclei Over the Pacific Ocean*; National Science Foundation; 3/15/2010 to 8/31/2012; $71,232

Brooks, Sarah; *Improved Assessment of Texas Air Quality: Aerosol Composition By Raman Microspectroscopy*; Texas Higher Education Coordinating Board; 7/1/2010 to 5/31/2013; $148,125

Collins, Donald; *Cloud Droplet Number Closure Study Based On Isdac Observational Data*; Environment Canada; 10/1/2010 to 3/31/2013; $70,335
Collins, Donald; *Tandem Differential Mobility Analyzer/Aerodynamic Particle Sizer Support;* Argonne National Laboratory; 10/1/2010 to 9/30/2011; $61,390

Collins, Donald; *The Effects of Atmospheric Processing On the Properties and Transport of Biological Aerosols;* Johns Hopkins University; 5/12/2010 to 2/25/2013; $208,730

Dessler, Andrew; *Analysis of the Radiative Response of Clouds to Enso Climate Fluctuations;* National Science Foundation; 12/15/2010 to 11/30/2013; $150,218


Khalizov, Alexei; *ON-Line Chemical Analysis of Ambient Organic Aerosols;* Lamar University - Beaumont; 9/1/2010 to 8/31/2011; $10,000

Lemmon, Mark; *Understanding the Vertical Distribution of Water Vapor At the Phoenix Landing Site;* Jet Propulsion Laboratory; 11/30/2010 to 9/24/2017; $71,820

Nasiri, Shaima; *Midlevel Cloud Characterization Using A-Train Observations and the Giss Gcm;* NASA-Goddard Space Flight Center; 8/1/2010 to 7/31/2015; $308,081

Nielsen-Gammon, John; *Wind Modeling Improvements With the Ensemble Filter;* University of Texas at Austin; 12/1/2010 to 11/30/2011; $63,375

Rapp, Anita; *Investigation of Precipitating Marine Stratocumulus Clouds In the Southeastern Pacific Using Cloudsat;* NASA-Washington; 7/1/2010 to 6/30/2014; $168,561

Schade, Gunnar; *Anthropogenic and Biogenic Carbon Fluxes From Typical Urban Land Uses In Houston, Texas;* DOC-National Oceanic and Atmospheric Administration; 5/1/2010 to 4/30/2013; $254,179

Schade, Gunnar; *Improving Emission Inventories Using Direct Flux Measurements and Modeling;* EPA-Washington; 4/1/2010 to 3/31/2014; $499,992


Schumacher, Russ; *Career: Multiscale Investigation of Warm-Season Precipitation Extremes;* National Science Foundation; 8/1/2010 to 7/31/2012; $209,682

Schumacher, Russ; *Drought Decision Making Tool for Agricultural Producers;* USDA-National Institute of Food And Agriculture; 11/15/2010 to 11/14/2014; $166,507

Schumacher, Russ; *Identifying and Understanding Displacement Biases In Numerical Forecasts of Elevated Convective Systems;* University Corporation for Atmospheric Research; 6/22/2010 to 7/1/2011; $11,979

Wilheit, Thomas; *Participation In Gpm Intersatellite Calibration and Radar Enhanced Radiometer Algorithm Working Groups;* NASA-Goddard Space Flight Center; 4/1/2010 to 9/30/2014; $281,865

Yang, Ping; *Data Analysis and Modeling Simulation In Support of Nasa's Far- Infrared Spectroscopy of Troposphere (first) Project;* NASA-Langley; 6/3/2010 to 6/2/2012; $52,190

Yang, Ping; *Development of An Algorithm To Retrieve the Habit and Relative Size Distribution of Ice Crystals In Cirrus Clouds;* NASA-Langley; 6/1/2010 to 5/31/2013; $178,739
Zhang, Renyi; *Collaborative Research: Characterization of Sources and Processes of Primary and Secondary Particulate Matter (pm) and Precursor*; National Science Foundation; 7/15/2010 to 6/30/2012; $181,000

Zhang, Renyi; *Investigation of Cloud and Precipitation Processes Using Wre With a Two-Moment Microphysics*; Brookhaven National Laboratory; 11/3/2010 to 8/31/2011; $24,999

Zhang, Renyi; *ON-Line Chemical Analysis of Ambient Organic Aerosols*; Lamar University - Beaumont; 9/1/2010 to 8/31/2011; $10,000

**2009**

Collins, Donald; *Airborne Measurement of Cloud Condensation Nuclei and Ice Nuclei Over Saudi Arabia*; University Corporation for Atmospheric Research; 7/1/2009 to 12/26/2010; $287,972

Collins, Donald; *Analysis of the Atmospheric Aerosol Over Queensland, Australia*; National Center for Atmospheric Research; 4/16/2009 to 9/30/2009; $40,000

Collins, Donald; *Collaborative Research: Hygroscopic Properties of Aerosol Organics*; National Science Foundation; 9/1/2009 to 8/31/2012; $100,150

Collins, Donald; *Differential Mobility Analyzer*; Weather Modification, Inc.; 10/16/2009 to 10/15/2010; $122,056

Collins, Donald; *Participation In the DOE Racoro Field Campaign*; Battelle Pacific Northwest Division; 2/4/2009 to 12/31/2010; $51,351

Collins, Donald; *Tandem Differential Mobility Analyzer/Aerodynamic Particle Sizer Support*; Argonne National Laboratory; 10/1/2009 to 9/30/2010; $61,276

Khalizov, Alexei; *Generation, Characterization, and Atmospheric Aging of Soot Particles From Diesel Combustion*; National Science Foundation; 9/1/2009 to 8/31/2013; $36,667

Khalizov, Alexei; *ON-Line Chemical Analysis of Ambient Organic Aerosols*; Lamar University - Beaumont; 9/1/2009 to 8/31/2010; $38,000

Korty, Robert; *Collaborative Research: the Role of Deep-Ocean Circulation In Greenhouse Climates: Integrating Numerical Simulations With*; National Science Foundation; 8/15/2009 to 7/31/2014; $69,395

Nasiri, Shaima; *Cloud Thermodynamic Phase Determination Using Airs Data*; Jet Propulsion Laboratory; 3/10/2009 to 8/31/2010; $50,000

Nasiri, Shaima; *Impacts of Cloud Type On Variability of Airs Radiances*; Jet Propulsion Laboratory; 8/10/2009 to 1/30/2011; $50,000

Nielsen-Gammon, John; *Analysis of Climate Data In the United States and Mexico To Determine the Past Record of Drought and Hydrological Stress*; World Wildlife Foundation; 5/15/2009 to 6/30/2010; $23,780

Orville, Richard; *Lightning Detection and Ranging (Idar Ii) Network Operation and Analyses Over a Highly Polluted City - Houston, Texas*; National Science Foundation; 9/1/2009 to 8/31/2013; $694,210

Schade, Gunnar; *Arra: Eager-Mixing Ratio and Flux Measurements of Volatile Organics Compounds During Bearpex 2009 Using A Portable, Self-Sufficient*; National Science Foundation; 6/1/2009 to 8/31/2010; $85,697

Schade, Gunnar; *Career: Using An Urban-TO-Rural Gradient As A Proxy for Global Change Effects On Selected Biosphere-Atmosphere Trace Gas*; National Science Foundation; 3/1/2009 to 1/31/2017; $611,357
Schumacher, Courtney; Radiative Heating Associated With Tropical Convective Cloud Systems: Its Importance at Meso and Global Scales; DOE-Washington; 7/1/2009 to 6/30/2012; $229,907

Szunyogh, Istvan; Assessing Atmospheric Predictability With A Global Analysis- Forecast System; National Science Foundation; 2/1/2009 to 1/31/2012; $223,163


Szunyogh, Istvan; Tropical Cyclone Ensemble Data Assimilation; DOD-Navy-Office of Naval Research; 6/1/2009 to 9/30/2012; $379,140

Yang, Ping; Developing Optical Datasets and Modeling Capabilities To Assess the Radiative Forcing of Contrails and Contrail-Cirrus; DOT-Research & Innovative Technology Administration; 12/9/2009 to 2/7/2011; $200,786

Yang, Ping; Enhancement of Crtm and Support for Cloud and Aerosol Retrieval In the Goes-R Mission; DOC-National Oceanic and Atmospheric Administration; 9/22/2009 to 9/21/2011; $442,548

Yang, Ping; Research In Light Scattering and Radiative Transfer for Improving the Retrieval of Ice Cloud Properties; NASA-Langley; 10/1/2009 to 9/30/2013; $183,568

Zhang, Renyi; Generation, Characterization, and Atmospheric Aging of Soot Particles From Diesel Combustion; National Science Foundation; 9/1/2009 to 8/31/2013; $36,667

Zhang, Renyi; Investigation of Cloud and Precipitation Processes Using Wrf With a Two-Moment Microphysics; Brookhaven National Laboratory; 12/16/2009 to 9/30/2010; $24,991

Zhang, Renyi; Investigation of the Asian Pollution Outflow On Winter Storms Over the North Pacific; NASA-Stennis Space Center; 9