THE UNIVERSITY OF UTAH

May 28, 2019

Approved
R Watkins
6-9-19

Daniel A. Reed
Senior Vice President for Academic Affairs
205 Park Bldg.
Campus

RE: Graduate Council Review
Department of Atmospheric Sciences

Dear Vice President Reed:

Enclosed is the Graduate Council's review of the Department of Atmospheric Sciences. Included in this review packet are the report prepared by the Graduate Council, the Department Profile, and the Memorandum of Understanding resulting from the review wrap-up meeting.

After your approval, please forward this packet to President Ruth Watkins for her review. It will then be sent to the Academic Senate to be placed on the information calendar for the next Senate meeting.

Sincerely,

David B. Kieda
Dean, The Graduate School

Encl.

XC: John D. Horel, Chair, Department of Atmospheric Sciences
Darryl P. Butt, Dean, College of Mines and Earth Sciences

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Department of Atmospheric Sciences

The Department of Atmospheric Sciences is well-known for such research topics as mountain meteorology and air chemistry, and faculty have an impressive record of external funding. The student-run Ute Weather Center is an initiative that benefits current students and increases visibility among prospective students. The Department aims to build on strengths to further improve student experience and increase enrollment. Increasing diversity as the department grows is an important priority and the college now has a Diversity Coordinator adding support to these efforts.

The Graduate School - The University of Utah

GRADUATE COUNCIL REPORT TO THE SENIOR VICE PRESIDENT FOR ACADEMIC AFFAIRS AND THE ACADEMIC SENATE

April 30, 2018

The Graduate Council has completed its review of the **Department of Atmospheric Sciences.** The External Review Committee included:

Jonathan Martin, PhD
Professor
Department of Atmospheric and Oceanic Sciences
University of Wisconsin

Kimberly Prather, PhD
Distinguished Chair in Atmospheric Chemistry
Scripps Institution of Oceanography
University of California, San Diego

David J. Stensrud, PhD
Professor and Head
Department of Meteorology
Pennsylvania State University

The Internal Review Committee of the University of Utah included:

Thomas Cheatham, PhD
Professor
Department of Medicinal Chemistry

Kenneth Golden, PhD
Professor
Department of Mathematics

Abbie Griffin, PhD
Professor
Department of Marketing

This report of the Graduate Council is based on the self-study submitted by the Department of Atmospheric Sciences, data from the Office of Budget and Institutional Analysis (OBIA), reports of the external and internal review committees, and responses to the external and internal reports from the Department Chair and College Dean.

DEPARTMENT PROFILE

Program Overview

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The department's mission is to "discover, advance, and disseminate knowledge about weather and climate for the benefit of the people of Utah and the wider national and international community." To achieve its mission, the department offers an undergraduate minor and bachelor's, master's and PhD degrees in Atmospheric Sciences. Each year the department grants approximately 1 minor, 9 bachelor's degrees (range: 6-12), 7 master's (range: 4-9) and 3 PhDs (range: 1-5).

The Department of Atmospheric Sciences, founded as an offshoot of the Department of Physics, awarded its first BS, MS, and PhD degrees in 1947, 1950, and 1962, respectively. It is the top-rated program of weather and climate-related research and education in the Intermountain West and is recognized internationally for its expertise in cloud-climate interactions, remote sensing, mountain meteorology, climate physics and dynamics, weather and climate modeling, air quality, and tropical meteorology. Research and teaching address the major scientific 21st century challenges posed by inclement weather and climate change in the field of Atmospheric Sciences. They are a highly productive department, with research expertise and active engagement in policy implications and scientific investigation and discovery. While the department lists a focus and interest in 6 specific sub-domains within Atmospheric Sciences, it is most known for research excellence in mountain weather and climate, tropical meteorology, and hurricanes. Their formidable funding history is tied to a longstanding reputation in mountain meteorology. They are well known in air chemistry, which has application to the emerging environmental problem of air pollution, "especially its potential economic impact from health or business disincentives." Several faculty have won prestigious awards and have been able to garner significant research funding in their areas, averaging $5.2 M per year the last two years, notable given the diminutive size of the department.

The number of department faculty with tenure has grown since the last review, primarily through interdisciplinary cluster hires at the tenured level and no attrition of senior faculty. The size of the career-line (non-tenure-track, research-focused faculty supported only by grant monies) has doubled in the last 7 years. The tenure-heavy and older faculty distribution, along with a research-focused agenda, has contributed to an uneven distribution of responsibilities. The Chair and small administrative staff have singlehandedly absorbed non-research duties of faculty and, while their efforts are commendable, this is not viewed as desirable or sustainable. This workload should be reallocated and re-incentivized in the future, to optimize operations throughout the upcoming administrative transition, to enhance overall quality of the teaching program, create a unified culture, and foster departmental expansion. Although they have hired two male diversity hires, gender diversity of students and faculty could be improved. Unfortunately, the department has not resolved the fundamental overall financial problems, which were noted in the last Graduate Council review and the reports.

The reviews emphasize that as the Chair transitions, a redistributed department administrative structure and more collaborative culture must be developed. Adding an Associate Chair would distribute the administrative burden and serve as "a testing ground for potential new chairs" (external report). A top priority in the external report is the development of "a strategic plan that lays out 1) a vision for the future (which could then be used as a driver for resource requests), 2) diversity goals and plans, 3) succession plans, 4) leadership development, 5) methods to enhance visibility on campus and within the state, 6) fundraising targets, 7) student enrollment numbers, and 8) needed department committees that meet multiple times each year to more broadly distribute the administrative burden and increase faculty participation in governance and shared scholarly activities (e.g., curriculum, outreach, career-line)."

Faculty

The department consists of 12 tenured or tenure-track faculty (11.1 FTE), 11 career-line faculty (totaling 6.3 FTE) and a number of honorific adjunct faculty. Since the last review, there have been no retirements and two new faculty have been hired at the associate professor level by leveraging alternative funding sources via cluster hiring (Global Change & Sustainability; Society, Water, and Climate). The tenure-heavy and older faculty demographics, consisting of tenured full professors (who generate scholarship and commendable grant monies and are engaged only in research and uninvolved in governance and student extracurricular required seminars), was noted as a concern by the external review. Addressing issues related to gender diversity, the concomitant lack of assistant professors to fill retirements, and reduction in governance should be a priority. Strategic hiring was noted by the external reviewers as an area that needs "desperate attention to avoid major gaps that could lead to a loss of momentum and reputation in critical areas."

The faculty are extremely effective in obtaining external funding for their research, with research grant funding close to $5M each of the past few years. All of the faculty, according to the self-study, are supported by major external research grants. Departmental research expenditures were > $4M in each of the last 6 years. For the 2011-2014 period, this equated to 33.7% of the College of Mines and Earth Sciences research expenditures. Career-line faculty contribute 15% of the research expenditures for the department. Fifty-eight percent of the research expenditures for the department were generated by four faculty members (Horel, Mace, Lin and Zipser). Notably, two of these faculty members received major awards from the American Meteorological Society in 2016 (one received the Francis W. Reichelderfer Award for development and leadership of the MesoWest observational network in support of operations, research, and education to improve understanding and forecasting of mountain meteorology; the second received the Carl Gustaf Rossby Research Medal for fundamental contributions to tropical meteorology through insightful analysis of observed moist convective systems, and for sustained leadership in airborne field programs).

In terms of diversity, two of the 12 tenure-line faculty are women. This is below the national average for PhD students in this area (17% vs 35%), according to the external report. The top-heavy age structure with regard to rank and ethnicity are also of concern. The internal report stressed the need for a clear strategic plan to "help shape the future profile and research and teaching focus of the department." There has been one gender diversity hire; however, reviewers urged the establishment of a faculty hire diversity plan as a priority.

Generally, the department was reported to be collegial. Tenure-track and tenured faculty focus solely on their research. As a result, as noted above, the load falls on the Chair "in terms of teaching, representation at campus events, planning activities, fund raising, increasing visibility, administration, etc." (external report). Redistribution of responsibilities and broader contributions beyond research and grant writing should be encouraged if the department intends to diversify resource management, administration, and increase visibility. In terms of administrative organization, an Associate Chair would scaffold this load burden. Moreover, the "silo situation" leads to a lack of efficiency and coherence around teaching, student research opportunities, and long-term expansion.

In terms of faculty governance and workload, again problems were cited, such as lack of faculty meetings, no faculty retreats, and no regular strategic planning process. In order to ensure a smooth transition in the future, it is imperative that the department address this precarious management culture. The Chair noted that a retreat had taken place last year, with plans to reconvene on a regular basis. Other suggestions for social and administrative cohesiveness relate to bringing the department together on a more regular basis through formal, informal and outreach activities. A comprehensive strategic plan could thoughtfully guide these needed changes.

Utah's growing population demands and land management development pressures position the department as a key resource for policy and analysis of water utilization and conservation, the skiing industry, weather impact, and air quality. As an important local community resource, faculty may have to become involved in fundraising and engaged in non-research activities to promote the department's future. The external report detailed some suggestions for each stakeholder in this regard: "1) all faculty and students could use social media, 2) students could be sent to local ski resorts to talk about their latest research and impacts on the public, 3) effectively persuade and engage the Dean and upper administration by giving presentations on the important research conducted so the department is perceived as a useful partner in fund raising, and 4) outreach to local pipeline schools in Utah."

The career-line faculty, who play key roles in teaching (having the burden of teaching the two most popular courses) and acquiring funding, describe themselves as "second class citizens" yet are the fastest growing segment. The external report suggested providing career-line faculty "longer term security than just one year appointments, providing them a guarantee of one semester of teaching per year, offering them a voice on committees that report to the Chair and Dean, allowing them to mentor students (i.e. having more than 1 per thesis committee) and offering opportunities for gap funding." If they do assume a greater role as mentors to graduate students, this would streamline the experience for both students and mitigate the perceptions of marginalization of adjunct faculty. The department could benefit from this positive support for their career-line faculty.

The external reviewers noted a "systemic lack of nurturing a scholarly culture" within the department. This is manifest in poor to no attendance at weekly seminars; and even at thesis defenses, students who are required to attend expressed frustration at the marked absence of full-time faculty.

Funding research is crucial, and the department has garnered some top prizes in the field. However, the internal report encouraged turning inward toward the University (University faculty awards, Distinguished Professor, Distinguished Teaching Award, etc.) as well as seeking other national awards for both research and teaching. Furthermore, participation in national rankings metrics would bolster their reputation, especially given their expertise.

Students

The department self-study highlights that Atmospheric Sciences is a "student centered department with faculty who are dedicated graduate student mentors and classroom instructors." This statement is not entirely true across the board, as noted in some sections below. However, the internal report notes that the undergraduate and graduate programs appear to be well served and that students are generally satisfied with the educational and research opportunities received. The external report further noted that student groups expressed broad satisfaction with their experiences in the department.

The number of undergraduate majors since the last review has increased from 43 to 48. With respect to diversity, the undergraduate student population is quite homogeneous. In this regard, the internal report suggested participation in the ACCESS program for entering female first-year undergraduates. The creation of strong ties that have been developed with SLCC is to be commended, and are anticipated to make positive contributions to diversity and recruitment in general over time. In particular, the 2+2 program with SLCC was commended by the Dean. Apparently, no online offerings are available; developing online courses might be another way to benefit recruitment and strengthen the student pipeline.

At the graduate student level, career prospects are strong in certain fields; internal reviewers recommended bringing back the career mentoring group for graduate students. Attention should be paid to improvement of the overall undergraduate program, which the internal reviewers refer to as an "underutilized asset." This is indicated by the small number of majors and minors who are active, a relatively long-standing issue (internal and external reports). Nevertheless, the internal reviewers also point out that "the undergraduate and graduate experience can be transformative, with outstanding mentors who lead by example in conducting cutting edge research on topics important not only to other atmospheric scientists and weather aficionados, but to society at large."

The self-study noted that important facets of the department's retention and recruitment plans for students had been targeted in the establishment of the Ute Weather Center (UWC). The external committee commended this center as well, and noted its potential for outreach and increasing visibility.

Curriculum

The primary goal of the undergraduate major, according to the self-study, is to provide a foundation of knowledge about the atmosphere. In addition, the program seeks to develop technical skills (writing, speaking, computing) needed for productive careers in the atmospheric sciences and other environmental fields. The undergraduate curriculum also prepares students for advanced degrees in atmospheric and related sciences for those intending to pursue graduate work. The program of study is designed to satisfy the requirements of the federal government for employment as a meteorologist. All undergraduate students are required to take ATMOS 3000: Professional Development in the Atmospheric Sciences.

The Atmospheric Sciences undergraduate curriculum and programs of study, though generally effective, could benefit from being expanded and diversified. Certain elements are more successful, like the capstone project for undergraduate majors. The half-semester undergraduate courses are neither successful nor liked by either students or faculty. The opportunities for "hands-on" experience in the Atmospheric Sciences are excellent, in particular through the Ute Weather Center.

The undergraduates expressed that the "course catalog is oversold to them." They also expressed frustration at the large number of half-semester courses that "are given to a mixed class of undergraduates and graduates, often at a pace and a density of material that compromises the learning of both groups." However, needed changes to the curricular plan that could be alleviated by teaching precisely these "mixed graduate/ undergraduate classes in certain subjects" common at other institutions was noted as a solution in the external report. This strategy must clearly be used judiciously and with care and attention.

Although positive comments abounded, a comprehensive review of the undergraduate curriculum, the major, and overall course offerings would augment efforts to diversify and grow majors. In particular, expansion of course offerings at the introductory level, to increase 1000-2000 level courses if taught with the objective of enticing students to the major, might attract a wider range of students and bolster numbers. In addition, strategic supervision of the instructors of those introductory classes and prioritization teaching effectiveness could also increase utilization of and participation in the undergraduate program. Appointment of a Director of Undergraduate Studies would streamline this realignment of the undergraduate program and help reduce the burden on the Chair. Reorganization of the minor by considering multiple tracks within the major could further highlight other options aside from traditional meteorology.

The internal report identified some "inexplicable aberrations with regard to the requirement of MATH 2210 Calculus III (Multivariable Calculus) for the major, but not for either of the core classes, and that only MATH 1220 Calculus II (single variable calculus) is a prerequisite." This is considered odd, and counter to the canonical foundations needed in the field, according to the report. They identified creation of a Mathematical Methods of Atmospheric Sciences class as a potential stepping stone. Consistent with this, external reviewers suggested the development of a course "focused on use of high level mathematics skills such as statistics or modeling applications in the atmospheric sciences."

Changes to the graduate student program in the student guide, alternative format, and changes to qualifying exam procedures have been positive. However, graduate students complained that a two-year MS degree is difficult to navigate in the department as courses are cancelled with "disheartening frequency" (external report). Mountain Meteorology and Instrumentation falls on adjunct faculty, yet these courses are only offered every two years to graduate students.

Professional development for graduate students has traditionally been undertaken through the mentoring relationship between the student and faculty advisor. Faculty provide guidance on the skills necessary for success in the field, including professional ethics and standards. Informal training by way of graduate seminars and the Mountain Meteorology Practicum series has also occurred, though these received poor reviews from students and the internal/external reports. The department recently created a new course (ATMOS 6910: Scientific Writing and Oral Presentation) to address this issue.

For the MS program, the internal review advocated development of a paid, focused master's program with emphasis on placing students in financial firms focused on vulnerable commodity futures (e.g., Morgan Stanley) and agricultural firms (e.g., ADM). Designing a "weather certification" program might be a good marketing and recruitment tool.

Program Effectiveness and Outcomes Assessment

The Department of Atmospheric Sciences has proven great capacity to produce research and advance its mission. It is, however, under-resourced from a budget perspective and has limited support from outside of the department. In general, students are satisfied, and annual graduation rates reflect roughly 10 undergraduate and 10 graduate students. Although majors have increased in the undergraduate pool, specific measures in the future strategic plan must address this issue. The Ute Weather Center was a strategic initiative with excellent returns on student recruitment, retention and public profile. Students express a liking with faculty open-door policy. This atmosphere can be galvanized to help the department "develop success outcomes for their endeavors and to transform the culture towards embracing a rigorous process for outcomes assessment" (internal report).

The department self-study states they will develop success outcomes for their activities. There are no formal accreditation processes for Atmospheric Sciences and similarly no rigorous outcomes assessment processes exist. The department will have to design metrics and processes for evaluating success in research and teaching. The transformation of culture toward greater burden sharing could augment the efficacy and expediency of the creation of those metrics and other issues identified. Continued compliance with consistent and regular 5-year reviews of tenure-line faculty is commended. In addition, the department strives to identify and utilize campus initiatives to bridge disciplinary boundaries.

The department's stated long-term objective is to be a top-tier Atmospheric Sciences department. With high research output, strong publications and external funding already cemented, their strategic plan must shift emphasis to the operations of the department, especially since the Chair will transition soon and retirements will occur. Teaching must be prioritized. Creation of "effective metrics of performance and standing relative to peers across research and teaching need to be developed and tracked. Formal outcomes assessment for teaching should be embraced, both at undergraduate and graduate levels, and this should be done in collaboration with the college-wide efforts in this area" (internal report).

The Dean recommends "establishing a Director of Undergraduate Studies" to remedy the issues regarding the underutilization and low enrollments in the undergraduate population. This could be impactful with enhanced communication between "department, EpiCenter, the Dean's Office, and Admissions."

In relation to student outcomes and demonstrating student program efficacy, tracking undergraduate and graduate student placement could identify areas (strengths and weaknesses) for recruitment.

Facilities and Resources

Facilities are considered of high quality, but proportional to the size of the small department. The Center for High Performance Computing (CHPC) is respected, and has played an essential role in supporting the department computing efforts for faculty and student endeavors.

The physical separation of the department between two different locations has augmented the sense of isolation both between faculty in different research domains and between the faculty and other members of the college, as well as students (internal report). Furthermore, additional facilities for securely storing large equipment are needed.

The student-run Ute Weather Center facility has unified students and faculty. With strategic resource allocation, it is "very professional and provides undergraduate students with significant hands-on weather forecasting and broadcasting experience" (external report). Several minor initiatives around the facility could highlight its local and national importance, for instance by providing links to this facility from myriad web pages and outreach. Formerly underutilized space in the William Browning Building (WBB) was transformed by the Chair "into value-added facilities and laboratories for the department" with an additional dedicated undergraduate lounge space. Better access to a college joint-use conference room in WBB for meetings and functions has alleviated many problems. However, the external report suggested "the faculty and graduate students would be strongly benefited by a physical location in which they could routinely interact and socialize as a group to facilitate communications and cross-pollinate research ideas."

Due to recent hires and increased research on air quality, investment in instruments and in-house maintenance is essential. Coupling the identification of the needed instrumentation and its maintenance to engineering projects on campus, with a shared engineer to design, build, and maintain instruments cross-campus would be an excellent investment. "A cost share structure between administration, the department, and the faculty who use such services by pooling funds (i.e., $5k per year) would ensure better instrumentation" (external report).

The previous review noted the serious budgeting and financial exigencies of the department as needing to be addressed. The biggest issue is around the low returned overhead in relation to the research expenditures from the highly productive faculty. The previous review urged increased university support, with high returns on the investment most likely.

The internal report recommended "seeking sources of funding for named professorships and endowed Chairs." Furthermore, the need for significant additional staff help is required for executing student, research, teaching and administrative tasks. Staff to help with fundraising, grant writing, and administration -- for instance an Associate Chair -- will provide support in those areas, as well as the Dean's Office resources.

The Dean's letter addresses the many challenges facing the department with regard to resources and suggests leveraging the Dean's Office's resources recently added to alleviate some of the identified problems. In particular, the Dean's Office hired a grant writer for college projects, and "a portion of a technical staff line was provided to support department's collaborative research associated with GCSC/WEO" (Dean's response).

COMMENDATIONS

1. Faculty research productivity is high, consistent, and well-positioned vis-a-vis local, national and global Atmospheric Sciences occurrences. The funded research grants, awards, graduate student supervision, and publications are at excellent levels for a department of this size.

2. The department administration (Chair and two administrative staff members) have done an outstanding job in operation and management of the department, supporting increased faculty research and grant writing, and centralizing responsibilities. However, over the long term it is unsustainable, particularly with the anticipated transition of the Chair and the need to align with the University's mission in all areas, not just scholarship.

3. The Ute Weather Center initiative for undergraduates provides coherence, professional development, student activities, recruitment and retention incentives, and augments department visibility. Given the renown of the department in mountain meteorology and evolving concentration in air quality, courses in these timely areas of expertise and local significance are highly valued and offer added value to this program.

4. The Center for High Performance Computing facilitates and supports faculty and student projects and classes, bringing benefit to the department.

5. The department has made some strides in gender diversity, although there is a need to continue these efforts.

RECOMMENDATIONS

1. The department should draw up a strategic plan to address the external report's recommendations of: diversity and hiring, comprehensive review of the curricular programs, identification of critical growth areas in research and teaching, recruitment/enrollment, and increasing the reputation and profile of the department. Integration and alignment with the college strategic plan is vital.

2. Transform the culture toward a model of shared governance. More equitable and inclusive participation will bolster the upward trajectory of the department toward top tier ranking in all areas. An Associate Chair and/or Director of Undergraduate Studies would strengthen the underutilized undergraduate studies, distribute burden, benefit leadership development, and support the teaching mission.

3. Resolve concerns regarding both career-line and tenure-track faculty. Specifically, clearly define procedures and guidelines for career-line faculty and address their need for more security and stability through longer-term contracts and integration into the department. During the RPT process and subsequent reviews of tenure-line faculty, place value on service and education in addition to scholarship. To stimulate a culture that has an overarching student-centered focus on teaching, scholarly performance and outcomes, tenure-line faculty must become more involved in curriculum revision, attendance at student thesis defenses, and teaching.

4. Seek to leverage resources in the Dean's Office such as grant writing support, proposal submissions, marketing, development activities and other centralized support. Hire staff for fundraising and budget preparation, if not available through the Dean's Office.

5. Seek creative ways to obtain funds to be utilized to support highly productive faculty, endowed professorships, the collaboration with the Center for High Performance Computing, among other needs. These monies could be provided by the University, partnerships with industry, or other sources.

6. Diversity must be a priority both in hiring and retention of faculty, as well as recruitment and training of students.

7. Develop a plan for formal outcomes assessment at both the undergraduate and graduate level, working in collaboration with college-wide efforts in this area.

Submitted by the Ad Hoc Committee of the Graduate Council:

Isabel Dulfano, (Chair)
Associate Professor, Department of World Languages and Cultures

James A. Agutter
Associate Professor, School of Architecture

Richard R. Paine
Associate Professor, Department of Anthropology

Debra J. Mascaro (Undergraduate Council)
Associate Professor (Lecturer), Department of Mechanical Engineering

College Name
All

Department Name
Atmospheric Sciences

Program
All

Faculty Headcount

		2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
With Doctoral Degrees Including MFA and Other Terminal Degrees	Full-Time Tenured Faculty	8	9	8	9	10	10	10
	Full-Time Tenure Track	1	1	1	1	0	1	1
	Full-Time Career Line/Adjunct Faculty	4	4	4	4	6	5	6
	Part-Time Tenure/Tenure Track	1	1	2	1	1	1	1
	Part-Time Career Line/Adjunct Faculty	1	1	1	2	3	1	1
	Total	15	16	16	17	20	18	19
With Masters Degrees	Full-Time Tenured Faculty							
	Full-Time Tenure Track							
	Full-Time Career Line/Adjunct Faculty							
	Part-Time Tenure/Tenure Track							
	Part-Time Career Line/Adjunct Faculty							
	Total							
With Bachelor Degrees	Full-Time Tenured Faculty							
	Full-Time Tenure Track							
	Full-Time Career Line/Adjunct Faculty							
	Part-Time Tenure/Tenure Track							
	Part-Time Career Line/Adjunct Faculty							
	Total							
Total Headcount Faculty	Full-Time Tenured Faculty	8	9	8	9	10	10	10
	Full-Time Tenure Track	1	1	1	1	0	1	1
	Full-Time Career Line/Adjunct Faculty	4	4	4	4	6	5	6
	Part-Time Tenure/Tenure Track	1	1	2	1	1	1	1
	Part-Time Career Line/Adjunct Faculty	1	1	1	2	3	1	1
	Total	15	16	16	17	20	18	19

Cost Study

	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Direct Instructional Expenditures	1,190,691	1,420,860	1,469,149	1,515,533	1,536,743	1,752,789	1,791,121
Cost Per Student FTE	13,902	16,848	18,703	18,905	16,784	20,526	20,193

FTE from Cost Study

	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Full-Time	13	13	13	12	16	16	15
Part-Time	0	1	1	1	3	2	2
Teaching Assistants	1	1	1	0	0	0	0

Funding

	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Total Grants	4,397,336	4,195,901	4,088,453	4,535,230	4,957,577	4,569,857	5,113,772
State Appropriated Funds	1,142,113	1,179,033	1,356,309	1,424,964	1,480,535	1,665,838	1,790,684
Teaching Grants	0	26,000	29,991	29,951	29,234	29,830	34,393
Special Legislative Appropriation							

Differential Tuition

Student Credit Hours and FTE

		2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
SCH	Lower Division	987.0	948.0	972.0	855.0	726.0	783.0	957.0
	Upper Division	424.5	349.0	435.0	587.0	646.0	540.5	579.0
	Basic Graduate	377.0	401.0	311.0	296.0	528.5	402.5	338.0
	Advanced Graduate	395.0	421.0	322.0	346.0	388.0	423.0	412.0
FTE	Lower Division	32.9	31.6	32.4	28.5	24.2	26.1	31.9
	Upper Division	14.2	11.6	14.5	19.6	21.5	18.0	19.3
	Basic Graduate	18.9	20.1	15.6	14.8	26.4	20.1	16.9
	Advanced Graduate	19.8	21.1	16.1	17.3	19.4	21.2	20.6
FTE/FTE	LD FTE per Total Faculty FTE	2	2	2	2	1	1	2
	UD FTE per Total Faculty FTE	1	1	1	1	1	1	1
	BG FTE per Total Faculty FTE	1	1	1	1	1	1	1
	AG FTE per Total Faculty FTE	1	1	1	1	1	1	1

Enrolled Majors

	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Undergraduate Pre-Majors	2	4	1	1	3	1	0
Undergraduate Majors	47	41	47	50	57	48	45
Enrolled in Masters Program	20	22	20	19	25	16	13
Enrolled in Doctoral Program	21	23	15	13	18	23	25
Enrolled in First-Professional Program							

Degrees Awarded

	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Undergraduate Certificate							
Graduate Certificate							
Bachelors	10	9	6	6	10	12	11
Masters	6	3	8	9	4	8	10
Doctorate	2	4	9	5	1	4	5
First-Professional							

Memorandum of Understanding
Department of Atmospheric Sciences
Graduate Council Review 2017-18

This memorandum of understanding is a summary of decisions reached at a wrap-up meeting on February 20, 2019, and concludes the Graduate Council Review of the Department of Atmospheric Sciences. Daniel A. Reed, Senior Vice President for Academic Affairs; Darryl P. Butt, Dean of the College of Mines and Earth Sciences; John D. Horel, Chair of the Atmospheric Sciences Department; Kevin Perry, Former Chair of the Atmospheric Sciences Department; David B. Kieda, Dean of The Graduate School; and Katharine S. Ullman, Associate Dean of the Graduate School, were present.

The discussion centered on but was not limited to the recommendations contained in the review summary report presented to the Graduate Council on April 30, 2018. The working group agreed to endorse the following actions:

Recommendation 1: The department should draw up a strategic plan to address the external report's recommendations of: diversity and hiring, comprehensive review of the curricular programs, identification of critical growth areas in research and teaching, recruitment/enrollment, and increasing the reputation and profile of the department. Integration and alignment with the college strategic plan is vital.

College-wide strategic planning provides an important framework for the Department. Moreover, Dean Butt pointed out that the 2017 plan undergoes regular refreshing, with focus on particular areas. Recent scrutiny has been on student recruitment/retention and diversity, topics that are also department priorities. Given the small size and cohesive nature of the College, being fully integrated with college-wide strategic planning will accomplish many goals of this recommendation. Currently, Dean Butt and Barbara Nash, the College's Associate Dean for Research, are working on a college-wide summary of research that is intended to catalyze discussion at the college level in terms of strategic research plans and will also be central to departmental planning. Another consideration is an assessment of funding opportunities in the field. Professor Perry, the former chair, noted that the Department has a fairly diverse portfolio of grants, but National Science Foundation (NSF) funding may be an opportunity for expansion. While efforts are currently underway in this area, this type of analysis, along with the larger picture of research in the discipline, should help the Department set strategic priorities for hiring.

The Department is positioned to play a central role on campus, with the wide interest here in air quality and a theme of "safeguarding the environment" highlighted in the university's capital campaign. Building off of college-wide efforts, the Department is planning a retreat in Summer 2019 focused on creating a strategic plan that is integrated with college-wide efforts and incorporates feedback from the review process to map out departmental priorities. This will also address issues related to diversity, discussed in Recommendation 6. Dean Kieda requested a summary of the departmental vision and strategic plans in the first MOU update.

In the meantime, the Department is making strides forward in a number of areas. Specifically, the curriculum is undergoing significant revision, with changes on track for Fall of 2020. Curricular revision has also involved retooling of introductory courses for non-majors, and efforts already taking place with Honors classes are helping to raise the visibility of the Department. These changes are being made with the goals of improving student experiences and developing a platform that builds on departmental strengths to increase enrollment. It has been an effort that involves the faculty widely. In the area of outreach and student recruitment, the Department has successfully obtained an NSF Research Experience for Undergraduates (REU) award that brings in 8 students from underrepresented groups for summer research, which the College and Department will further supplement to bring the total to 10 students. Fund-raising to expand and sustain this program is on the longer-term horizon, with this activity likely to resonate with donors. This program will raise the visibility of the Department, as faculty plan to recruit widely, including from minority-serving institutions. The Department has also created a dual degree with National Taiwan University and has leveraged alumni connections at Salt Lake Community College to create a strongly integrated pathway for students at SLCC. A college-wide open house is also proving to be an effective opportunity for recruiting. It should be noted that the Ute Weather Center drew much praise during the review, serving multiple purposes that include department visibility. Future opportunities for drawing students to the Department may be possible through extension of new degree programs, the Earth Resource Management PMST and the Philosophy of Science degree, currently offered in collaboration with other scientific disciplines, including Geology and Geophysics (also see Recommendation 5).

Recommendation 2: Transform the culture toward a model of shared governance. More equitable and inclusive participation will bolster the upward trajectory of the department toward top tier ranking in all areas. An Associate Chair and/or Director of Undergraduate Studies would strengthen the underutilized undergraduate studies, distribute burden, benefit leadership development, and support the teaching mission.

Since the review site visits, several changes have been implemented that more widely incorporate faculty into departmental governance. Chair Horel has established a departmental Executive Council, which brings two additional experienced faculty members into leadership decisions. The council reviews the budget, personnel issues, and items that need to come before the full faculty. For example, as discussed below, they are working on revising RPT guidelines. A Director of Graduate Studies and a Director of Undergraduate Studies have also been appointed. Faculty meetings, which lapsed temporarily in the midst

of the review process, are again held regularly, and Town hall meetings, which have included students, are another forum being used for communication and collection of feedback. The rapid progress on responding to this recommendation is commendable. The Department is expected to continue these initiatives and to refine them over the next several years.

Recommendation 3: Resolve concerns regarding both career-line and tenure-track faculty. Specifically, clearly define procedures and guidelines for career-line faculty and address their need for more security and stability through longer-term contracts and integration into the department. During the RPT process and subsequent reviews of tenure-line faculty, place value on service and education in addition to scholarship. To stimulate a culture that has an overarching student-centered focus on teaching, scholarly performance and outcomes, tenure-line faculty must become more involved in curriculum revision, attendance at student thesis defenses, and teaching.

As a first step toward addressing the concerns of career-line faculty, the College charter has been revised in order to give this faculty group a greater voice, which had historically been lacking. These changes are in the final stages of approval. Building on this, the Department Executive Council is working on RPT/TFR guidelines broadly, including creating clearer pathways for career-line faculty, with a faculty vote on these policies expected in Spring 2019. Career-line faculty will then be counseled toward a pathway of promotion when merited. For career-line faculty who have been through initial years of review and re-appointment, additional steps such as letters that articulate an intention of multi-year commitment would help create stability. Overall, it was clear from this discussion that career-line faculty are making valuable contributions in the Department and finding ways to recognize this is important. Also vital to departmental culture are expectations of tenure-line faculty with respect to teaching, curriculum, and building a community that supports student scholarship. Curricular reform, appointment of directors to oversee undergraduate and graduate studies, and recent Town Hall meetings to gather feedback on stressors impacting students are all positive steps. It is expected that processes described here will be in place for the 2019-2020 academic year and will be revised as appropriate after some experience with the new policies and procedures.

Recommendation 4: Seek to leverage resources in the Dean's office such as grant writing support, proposal submissions, marketing, development activities and other centralized support. Hire staff for fundraising and budget preparation, if not available through the Dean's Office.

Progress has been made on the pre-award front, with Jesse Pugh now working in the College, with support from the VPR's office. Having staff to help with post-award management is still a significant need, and support for staff who would provide accounting oversight is being requested in this year's budget. Marketing and development are additional areas to focus on in the years to come; Dean Butt mentioned the possibility that assistance with marketing may be available centrally, although at this point, this is a 1-year plan and options to support these efforts in the longer term still need to be explored.

Recommendation 5: Seek creative ways to obtain funds to be utilized to support highly productive faculty, endowed professorships, the collaboration with the Center for High Performance Computing, among other needs. These monies could be provided by the University, partnerships with industry, or other sources.

A major focus of the conversation revolved around the Center for High Performance Computing (CHPC) because the computing-heavy needs of faculty result in a significant fraction of the Department's returned overhead funds being devoted to this resource. SVP Reed strongly encouraged taking greater advantage of existing national resources, such as NERSC or XSEDE, which can provide computing infrastructure, rather than expanding usage at CHPC. Staff in CHPC may be able to facilitate such proposals. Although alleviating this growing stress on the budget would be highly beneficial, the Department still would face financial constraints for initiatives such as putting together competitive start-up packages, and so addressing this recommendation requires a broad look at how to obtain funds. Reviewers brought up evaluating whether a master's program, with an eye toward placing students in business settings, would be one way to generate revenue. Ideas discussed included a cross-disciplinary master's program in computational approaches to weather and risk assessment, including business logistics tied to weather. Further efforts on development that leverage the Department's renowned research on air quality and mountain meteorology to connect with individuals and potential industry partners may also be fruitful.

Recommendation 6: Diversity must be a priority both in hiring and retention of faculty, as well as recruitment and training of students.

One theme of this discussion was the importance of creating a culture of inclusivity that ultimately attracts a diverse spectrum of faculty and students. Having successfully secured an REU Program is a major step toward engaging more underrepresented students in department research and potentially creating a pipeline for the graduate program. Although not discussed in this meeting, the Graduate School Assistant Dean for Diversity, Araceli Frias, has additional tools and resources, which could bolster recruitment/retention efforts at the graduate level (https://gradschool.utah.edu/diversity/). Dean Kieda brought up the topic of diversity in seminar speakers, and this is something that the Department is taking seriously. At the undergraduate level, the Department is participating in programs on campus, such as ACCESS, that seek to support women entering science and math majors. As mentioned previously, the Department has a strongly integrated program with SLCC, and has plans to increase recruitment there as well as at more distant sites in the country, such as Houston. SVP Reed mentioned plans for a larger bridge program for incoming students that may also help recruitment of diverse students. Complementing these efforts, Dean Butt has used funds to support "Inclusive Earth," a student group built around the premise of inclusivity and wide-spread student support. Dean Butt has also hosted Project Implicit for workshops and training sessions aimed at overcoming unconscious bias. The importance of this topic at the college level is also underscored by the recent joint

hire, with the College of Science, of a Diversity Coordinator, who is anticipated to help grow further efforts. In the updates to the Graduate School, it will be important to report on participation of department faculty and students in university- and college-wide efforts, as well as their efforts in department initiatives.

In terms of increasing faculty diversity, highly competitive packages are required. SVP Reed emphasized that commitment to diversity requires financial trade-offs in other areas, but is a key investment. Despite a willingness to make trade-offs, financial constraints are present. Taking advantage of hiring initiatives on campus as well as the potential for collaborative hires are routes forward (and have already been used successfully), but further discussion of support for faculty hires, particularly those from underrepresented backgrounds, is likely required. Given the lack of assistant professors in this department, this is a very timely topic.

Recommendation 7: Develop a plan for formal outcomes assessment at both the undergraduate and graduate level, working in collaboration with college-wide efforts in this area.

The curricular revisions are being done with outcomes assessment in mind, and there are plans for more formal processes for review and feedback. Communication at the college level is helpful, since there are programs where this is already well-implemented. Dean Butt will be attending a faculty meeting to further facilitate this cross-talk. Overall, outcomes assessment should be seen as a way to encourage conversation centered on fundamental questions about what we are doing and how to improve what we are doing. University policy now requires submission of a 7-yr Learning Outcome Assessment plan as well as 3- and 5-year interim reports. Learning Outcomes Assessment interim reports can serve as updates to this recommendation (https://ugs.utah.edu/learning-outcomes-assessment/loa_reports.php), with a full 7-yr report completed *prior to* the next 7-yr Graduate Council Review.

This memorandum of understanding is to be followed by regular letters of progress, upon request of the Graduate School, from the Chair of the Atmospheric Sciences Department. Letters will be submitted until all of the actions described in the preceding paragraphs have been completed. In addition, a three-year follow-up meeting may be scheduled during AY 2020-21 to discuss progress made in addressing the review recommendations.

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May 28, 2019