Program Planning Report

Meteorology & Climate Science

1. EXECUTIVE SUMMARY

1.0 Timing of this Report

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last self study submitted by this department (on file at UGS)</td>
<td>Fall 2000</td>
</tr>
<tr>
<td>Last external review submitted for this department (on file at UGS and attached in Appendix A)</td>
<td>February 12, 2001</td>
</tr>
<tr>
<td>Last letter from the Program Planning Committee to Provost Sigler accepting our plan without modification (on file at UGS)</td>
<td>March 8, 2006</td>
</tr>
<tr>
<td>Delay between submission of our review package and its acceptance:</td>
<td>Five years</td>
</tr>
<tr>
<td>Current self-study submission</td>
<td>Spring 2011</td>
</tr>
<tr>
<td>Next Program Planning Cycle (five years starting from March 2011)</td>
<td>AY 2015-2016</td>
</tr>
</tbody>
</table>

1.1 Description of the Department and its Programs

1.1.a Overview

The Meteorology Department at SJSU was founded in the early 1960’s. In December 2009, we changed our name to the Department of Meteorology and Climate Science. Thus, the review period for this self-study covers both the old and the new. We are the only Meteorology/Atmospheric Science/Climate Science program in the CSU\(^1\), and we cherish our uniqueness. There is a nationwide organization of Meteorology/Atmospheric Science programs\(^2\). As a non-PhD-granting university, we are affiliate members, and of all US affiliate programs, SJSU’s is the only stand-alone Meteorology department west of the Rockies\(^3\).

We offer: a BS in Meteorology (125 units); a new BS in Meteorology, Concentration in Climate Science (120 units); a minor in Meteorology (17 units); a minor in Atmospheric and Seismic Hazards (jointly with Geology, 14 units); a new minor in Climate Change Strategies collaboratively with Environmental Studies (18 units); and an MS in Meteorology (30 units). The core BS Meteorology degree program includes a large number (30) of “support units” in math, physics and chemistry. These, combined with required GE units, make it very challenging for us to squeeze enough meteorology curriculum into the remaining units to satisfy BS external guidelines\(^4\). The MS degree is the standard 30-unit “in-house” degree. We are seeing more and more requests for an online MS degree, but currently have no resources to develop a parallel online degree option.

As of Spring 2011 our numbers (per OIR website) are as follows: FTEF = 6.0 (Fall 2010), major FTES = 46.0 (Fall 2010, undergrad & grad), total FTES (includes GE) = 143.8, degrees awarded = 12 (AY 09/10, BS and MS). The research record of the current faculty is impressive. We are particularly strong in fund-raising, as evidenced by the following numbers (from SJSURF) on the dollar amounts awarded just to current faculty during the period 1/1/06-11/1/10: Professor Bridger, $799,566; Professor Clements, $873,218; Professor Cordero, $590,638; Professor Jin, $467,256. Just think how much more we could generate with more faculty!!

1.1.b Changes since last review

The main structural change since the last review has been our Department name change, new Concentration in Climate Science, and new minor offered with Environmental Studies.

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\(^1\) A Meteorology concentration is available in the Geosciences program at SFSU. In the UC system, both UCLA and UC Davis offer undergraduate Meteorology/Atmospheric Science programs.

\(^2\) University Corporation of Atmospheric Research (UCAR); see [www.ucar.edu](http://www.ucar.edu)

\(^3\) The Geosciences Department at SFSU is also an affiliate member of UCAR.

\(^4\) As outlined by the American Meteorological Society (AMS) at: [www.ametsoc.org](http://www.ametsoc.org)
1.2 Synopsis of the Previous Program Review Recommendations
A copy of the response from the external reviewer in the last review cycle is attached in Appendix M. The main recommendations made were embedded within the text. We reproduce the recommendations and our comments below at length since we believe they indicate that we continue to make a good faith effort to “improve our product”, as informed by a number of sources, including the last review.

1.2.a Recommendations of Last Review and Progress
1.2.a.i “Faculty” section
ER Recommendation: The external reviewer (hereafter, ER) noted in 2001 that efforts needed to be made to retain junior faculty. He noted the high cost of living, the absence of low-interest housing loans, and the potential for junior faculty to be lured away.
Response: Since then, SJSU put a low-interest housing program in place jointly with the city. Following a CFA-CSU agreement, some salary increases were awarded on paper, but the full increases promised over several years were interrupted by the global recession. Our faculty are aware that other CSU campuses – most notably SFSU – have found ways to offer higher starting salaries, whereas SJSU has not.

ER Recommendation: Another faculty position should be awarded to “relieve stress”. Such a hire would very likely benefit the college via increasing our fund-raising. Note that at that time we had six tenured/tenure-track faculty on board: today, we have four (see §5).
Response: We are grateful to have been given a recruitment “slot” in the current semester, Spring 2011. This was based 100% on our inability to offer core curriculum (i.e., weather forecasting). We have made faculty hires during the review period (either 2000-2010 or 2005-2010), but we have had an overall drop in TT faculty (see §5).

1.2.a.ii “Curriculum - GE” section
ER Recommendation: Expand our GE enrollments. He specifically highlighted low enrollments in the SJSU Studies Air Pollution class (METR 113), and suggested modification of the course to increase enrollments.
Response: With the retirement of the instructor for METR 113, we have found that the last four or so semesters, with new instructors enrollments in that class have risen from about 15-20 per year to 40+ per semester. Second, we have a class in Global Climate Change (METR 112), and we have expanded section offerings for that class. At one time we would have offered one section per semester; now we may offer six-eight “live” sections and two online sections per semester. All sections regularly fill, including when offered (online) in winter and summer. Third, we have recently developed a core GE Climate Change class (METR 12, Global Warming: Science and Solutions). We have solid enrollment in this, but its popularity has yet to expand to beyond one section. Enrollments in our other core GE class (MET 10, Weather & Climate) remain solid. We believe this is due to the quality of the course offerings as well as expanded interest current students have in Climate Change and Air Pollution, as well as Weather.

1.2.a.iii “Curriculum - undergraduate” section
ER Recommendation: Initiate changes in the curriculum to reflect the growth of students going into the “private sector”, as opposed to government forecasting careers. Specifically, the reviewer suggested: a de-emphasis of Fortran, with other material taught instead (no reduction in units); business management courses; communications courses.
Response: There are serious constraints on our meteorology curricular offerings due to the number of “support” units our students have to take (MATH, PHYS, CHEM), and the number of mandated GE units. As a result, we have relatively few units into which required curriculum must be fit (as “mandated” by the AMS per footnote #1 on page 1 above). First, Fortran is still taught but remains under consideration for change. Second, students who express a desire to go into business can be directed into the appropriate electives or GE courses. However – this has never happened. There is a move to introduce business concepts to science students via an experimental course (led by Mike Cheng), and we will strongly consider directing our students to take this class. Third, we have made strong efforts to make our curriculum more practical with the revitalization of our instrumentation lab and fieldwork and via the addition of an exciting new field trip class to
study the summertime Arizona monsoon (METR 166). Our students tend to prefer these “practical” activities over “theoretical” activities which are consistent with their career goals.

1.2.a.iv “Students” section
ER Recommendation: Improve recruitment. His main suggestion: improve our web page, and include pictures/movies, career information, links to graduate students, outreach to alumni.
Response: The department conducted a major upgrade to its web page just over five years ago. We used department funds to hire an external company to design and create something snazzy. Everything suggested is included (except for a movie, which is in progress). From time-to-time, something on the web page breaks (e.g., the webcam picture over Christmas), and we immediately get feedback from students, and/or alumni, and/or outside users of our products informing us of the breakages! So people do look at it! There is a wealth of information on the page, and we work to keep it up-to-date, informative, and relevant. As an example, about a year ago we added a widget showing rising global CO₂ levels. We did this in support of our department’s name change. We have seen an increase in enrollments!

1.2.a.v “Research” section
ER Recommendation: “The university should continually recognize and reward this superb record that has benefited SJSU by providing excellent visibility of the program on the national scene and has also resulted in a large amount of indirect funds to the University and College”.
Response: Agreed.

1.2.a.vi “Facilities” section
ER Recommendation: The state of disrepair and lack of cleanliness in our 8th floor lab space was noted. The Computer facilities were in excellent shape, and that it was vital to keep our meteorological IT staff member to ensure the continued well-being of our IT functions.
Response: First, due to the addition of Dr. Clements to the faculty, the 8th floor situation has turned around. The lab is in a good state of operation through his hard work and that of his students. However, we note once again that the 8th floor is inaccessible to disabled students since the elevators in Duncan Hall only go to the 7th floor. We reiterate that FD&O could “easily” install a “granny chair lift” from the 7th to the 8th floors (the stairwell is very wide; see §6.1.b.1.A). A disabled student would also require access to our rooftop laboratory. Second, our meteorological IT staff member left in August 2010, and we have not been allowed to replace the position. This is of grave concern to the well being of our computing intensive curricula and research activities.

1.2.b Rationale for “Abandonment” of Recommendations
The only thing suggested by the ER that we have not acted upon is to drop teaching Fortran; this is simply a disagreement between him and us.

1.2.c Pending Issues
None (beyond what could be accomplished with increased funding and allocation of resources and faculty and staff positions).

1.3 Summary of Current Program Planning Recommendations
The recommendations listed below are culled from the current self-study (Sections 2 -6 of this document), and also from faculty discussions at a one-day retreat in November 2010.

1.3.1 Curricular Recommendations (section 3)
None. In the past three years we have made a large number of curricular changes including: new courses; revisions to existing courses; a new minor; a new concentration (which we hope will become a new major). Associated with these have been significant curricular revisions. We are currently satisfied with our undergraduate curriculum. At the graduate level, we will be adding new courses to better reflect faculty expertise, as well as curricular changes (e.g., Climate Change Modeling).
1.3.2 Student Recommendations (section 4)

- We are slowly growing. Our goal is to double our undergraduate and graduate majors in a five-year period. Growth in the MS program is solid, so the growth goal is focused on the BS program. A way in which SJSU could help is to provide names/emails of BS applicants at a much earlier date, so that we could contact and recruit them.
- We need access to larger lecture rooms. We currently “own” only one lecture room (DH 515, capacity 50). There are larger lecture rooms in Duncan Hall, but historically the larger programs (e.g., CHEM, BIOLS) get first access to these and they are booked before we have seen them.
- We need long-term support for our newly-established field trip. This provides excellent hands-on opportunities and job skills for students. We believe it is a good recruiting and retention tool. A minimal amount of roughly $10K is needed to cover costs annually.
- Graduate Teaching Assistants (GTAs) receive a fee-waiver from SJSU. In addition of course they get paid for teaching. We strongly urge SJSU to provide a fee-waiver for Graduate Research Assistants (GRAs). The criteria need to be defined: for example, a fee waiver could include any graduate students being paid at least $10K annually from a research grant.

  - In Meteorology/Atmospheric Science programs across the country, grad students expect to be financially supported by their advisors. This is one way in which it is difficult to be competitive with PhD schools, and another reason it is vital to ensure faculty have time for research and grant-writing.
  - To support a grad student at the minimal level of $20K per year, a faculty member has to garner that $20K, plus roughly $6K for tuition, plus over $10K for foundation overhead (F&A), for a total of $36K. This amount needs to be raised annually to support a single graduate student. The fee waiver for GRAs would help ameliorate this situation.
  - There is also a fairness issue with some students supported by teaching in which case their fees are waived and the faculty working with these students enjoy the benefit of not having to pay fees costs. The faculty who directly support students via GRAs have to come up with fees in addition to the research support. This is perceived as unfair.

1.3.3 Faculty Recommendations (section 5)

- As is the case campus-wide, we need more faculty positions. We appreciate having been allocated one of a dozen faculty slots in Spring 2011, and we hope to hire a dynamic new faculty member to energize our forecasting curriculum.
- At the same time, retirements have left us unable to offer other core curriculum elements. These include cloud physics, tropical meteorology, urban meteorology, regional modeling, and radar meteorology.

  - Cloud physics is of particular concern since: (i) clouds are our most visible determinants of atmospheric behavior, and are a source of interest to both our students and the public; (ii) clouds are the single largest “unknown factor” in global climate change. Models with different representations of clouds respond in different ways to increases in greenhouse gases. A faculty member with expertise in cloud physics could help both our core Meteorology program, and our growing Climate Change program.
- Faculty MUST be recognized for the research they are doing (as must the department as a unit). Faculty load is 15 units per semester: 12 for teaching, 3 for service – and ZERO for research. And yet roughly 50% of the dossier is in the “research” side. Faculty engaged in active research (working with students; writing proposals; writing papers; making presentations at conferences) should be given 3 units assigned time per semester at a minimum. Specifically, the chairs must be allowed (and encouraged) to make these allocations. More specifically, SJSU should include a category reflecting faculty student-related research in the Assigned Time allocation process. We appreciate the various internal funding opportunities and our faculty apply for and receive these internal funds.
- Faculty should be recognized for advising work they do in working with research students, both undergraduate and graduate. It takes an enormous amount of time to guide a student in his/her research, especially at the start of the project. Faculty are expected to do this – and indeed they want to do this.

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5 In May 2011, we have been ranked #5 (of 10) in the College in new faculty recruitment; we hope to receive permission to recruit in this area in Fall 11.
recently, there was no institutionalized way to account for this as part of the “15 units”. We are very pleased at the new requirements that these advising/research activities must now be recognized as part of the faculty assignment. As a result in Spring 2011 and onward, the chair will be able to factor this into faculty member’s teaching loads. This is especially timely since our graduate enrollments (and requirements for directing graduate-level research) are increasing.

- Although not specifically mentioned, administrative assigned time (FTEA) is inadequate. The current chair is finding it impossible to administer the program and its growth, faculty recruitment in all phases, alumni fund-raising, requests for paperwork (assessment, program planning) etc., all at the same time as teaching two lecture courses. Research of the chair has been sacrificed. SJSU needs to recognize the increased workload of chairs by having a 50% FTEA floor for all chairs.

1.3.4 Resource Recommendations (section 6)
In no particular order of importance:
- We need more resources. We are given an annual allocation (“OE&E”) of about $8K to cover costs of: Xeroxing, telephone, postage, office supplies. Whatever the exact amount is, it gets a little smaller every year. We get zero equipment allocation. About a decade or more ago, science departments were each given an OE&E allocation AND an equipment allocation. This latter went away, so there are now zero state allocations to purchase new and upgrade old equipment. Our curricular and research equipment needs have been entirely met by aggressive, successful proposal submission by the faculty.
  ➢ Of immediate concern is the need for resources to support our air quality lab (AQL) on the 8th floor, specifically calibration gases, at an estimated cost of $5K per year. “Air quality” is an issue of universal concern. Products from the AQL are used in teaching and research, and are also a potential public resource.
- Access to the 8th floor and to the roof-top weather observatory needs to be provided for all, including the disabled. It is the function of FD&O to provide this. We note that FD&O’s input to the management and use of the upper level floor space has been to allow the installation of cell phone towers on the roof – towers which emit radiation. There are warning signs up on the roof.6
- Meteorology is an extremely computing-intensive field, and yet there are zero resources allocated by SJSU in support of this aspect. This covers not just computers and workstations, but the associated paraphernalia (high-end power supply protection; backup protection; terabytes of memory etc.)
- By far our most urgent non-faculty need is for the re-establishment of in-house meteorological IT support. This involves two things: (i) resources; (ii) recognition of the need.

2. CONTEXT AND SCOPE

The Meteorology Department at SJSU was founded in the early 1960’s. We offer both the BS and MS in Meteorology. The BS degree currently consists of 125 units; a significant number of these units are “support units” in math, physics and chemistry (a total of 30 such units as of 4/2011). When combined with the required GE units, it is difficult for us to squeeze enough meteorology into the remaining units to satisfy external guidelines7. The MS degree is the standard 30-unit “in-house” degree. We are seeing more and more requests for an online MS degree, but currently have no resources to develop a parallel online degree option.

Recently, we changed our name to the Department of Meteorology and Climate Science in December 2009. With the name change, we have introduced a new 120-unit concentration, the BS Meteorology Concentration in Climate Science. We plan in the coming year to submit paperwork to the Chancellor’s office requesting this be elevated to a new major (provisionally: CLIM). The new concentration went into effect for Fall 2010, and includes five new classes developed for this concentration (all outlined in §3.1). One of these new classes, METR 12 (Global Warming: Science and Solutions), a core GE class, was offered for the first time in Fall 09.

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6 Our laboratory has been there for about 40 years – long before cell phones were invented.

7 As outlined by the American Meteorological Society (AMS) at: www.ametsoc.org
A second of these new classes, METR 173 (Global Climate Modeling) was offered for the first time in Fall 2010, and we plan to offer a third (METR 135 on the Global Carbon Cycle) for the first time in Spring 2012.

Finally, we offer a minor in Meteorology (17 units), a minor in Atmospheric and Seismic Hazards (jointly with Geology, 14 units), and a new minor (18 units) in Climate Change Strategies collaboratively with Environmental Studies.

Alignment of Meteorology and Climate Science programs with University and College Missions, College Goals, and University Strategic Planning Goals

The University mission is to enrich the lives of its students, to transmit knowledge to its students along with the necessary skills for applying it in the service of our society, and to expand the base of knowledge through research and scholarship. Associated with this are the following goals for both undergraduate and graduate students: In-depth knowledge of a major field of study; Broad understanding of the sciences, social sciences, humanities, and the arts; Skills in communication and in critical inquiry; Multi-cultural and global perspectives gained through intellectual and social exchange with people of diverse economic and ethnic backgrounds; Active participation in professional, artistic, and ethnic communities; Responsible citizenship and an understanding of ethical choices inherent in human development.

Our department and programs clearly meet these goals by virtue of: the scientific nature of our discipline; the in-depth knowledge we provide in our core curriculum; the communications and critical inquiry skills our students develop via “public” forecasting activities, together with the METR 100W class and the senior thesis activity; student and faculty participation in relevant professional activities. Further, the goals of providing global and multicultural perspectives are accomplished by our recent curricular emphases on global climate change issues (scientific and sociological), and through the university General Education program.

The mission of the College of Science can be found at: http://www.sjsu.edu/science/about_us/Mission/

Our programs meet the College of Science goals via: delivery of meteorology content in our classes, as well as the over 90% success rate of students (BS and MS) in gaining employment (or going on to graduate studies) upon completion of their studies at SJSU; delivery to the wider campus community of a set of both core and SJSU Studies General Education classes, especially those that are global climate change-related; the dedication of our faculty to research, and the provision of opportunities for both graduate and undergraduate student involvement in research activities.

Lastly, the goals established in the university strategic planning process are: enhancing academic quality, enriching the student experience, improving the campus work environment and infrastructure, and strengthening community alliances. Our programs address the first goal via our delivery of high-quality content in both theoretical and applied meteorological arenas, and by our commitment to continued improvement of our curriculum and delivery methods, as discussed in the body of this document. We meet the second goal by fostering an environment in which students can learn through outreach (e.g., to a local elementary school in association with CommUniverCity8), through collaborations with outside groups (such as NASA-Ames and LLNL), and through our encouragement of and participation with our student group. The third goal – improving the campus work environment and infrastructure – is met partially (“work environment”) through the friendly and cooperative climate established in the department. The other part - improving the campus infrastructure – is in the purview of FD&O.

In summary, we are a small but very high quality program (as we demonstrate in the following sections). Our faculty maintain a very active research profile, and are in the top echelon on campus in terms of securing funds. Almost all of our graduate students complete their MS degree, and many go on to PhD programs. In the last few years, such students have gone on to Colorado State University and the University of Washington, two of the top 3-4 programs in the US. Our graduates in the last ten years have also gone on to complete PhDs at

8 http://www.communivercitiesanjose.org/
Stanford and Harvard. Once they have made it to the junior year, almost all of our undergraduates complete their BS, and almost all go straight into jobs or graduate school. Recently, we have noticed more job opportunities than graduating seniors, so there is clearly room for growth. Ideas about and plans for growth are outlined in the following sections.

3. CURRICULUM AND ACHIEVEMENT OF STUDENT LEARNING OUTCOMES

3.1 Curriculum

3.1.a Current curriculum

3.1.a.i BS Meteorology program

The BS Meteorology program has been in existence since the early 1960’s. Current senior faculty have institutional knowledge back to the 1980’s. Over the years we have made a number of curricular changes, always aimed at strengthening the final product (i.e., the graduating senior). Regarding the quality of our graduating seniors (our chief outcome), and how our curriculum can be modified to improve the quality of our students, we have had focused discussions and retreats throughout our program’s existence.

Per the catalog, BS students take 39 units of GE (science core GE requirements are waived) and two units of Phys Ed. They take 30 “supporting units”, including MATH classes (13 units), PHYS classes (12 units), and a CHEM class (five units). Students then take 48 required units (20 classes) and six units of METR electives. Of the METR classes currently offered, 25 are upper-division, while six are lower-division. We also had nine new majors courses approved for Fall 09 – these are discussed below in §3.1.b. Senior students are required to complete a senior thesis (METR 179) as a graduation requirement. This also serves as a culminating experience.

The total number of units required to graduate is 125. This exceeds 120 due to the heavy MATH & PHYS requirements of the discipline. BS Meteorology students take only 54 units of METR classes in their studies (i.e., just 43.2% of their units are in their chosen discipline).

In Fall 2010 a new Concentration in Climate Science was approved. This program of study provides students with in-depth understanding of climate using our meteorology courses as a technical foundation coupled with five new METR courses (Metr 12: Global Warming – Science and Solutions; Metr 71: Intro to Climate Science; Metr 135: The Carbon Cycle; Metr 173: Global Climate Modeling and Metr 174: Global Climate Change: Implications) and courses from other departments. Students in this new concentration will take a variety of classes that include: working with instrumentation and data, which will provide skills to analyze a variety of types of data (from the atmosphere, ocean, cryosphere and biosphere) to look for indications of climate change; classes in “climate science”, which will cover topics including the Global Carbon Cycle, Climate Modeling and Remote Sensing; and electives from a range of disciplines across campus including Environmental Studies (water and energy resource and policy issues), Geography (food supply, agriculture and population issues, and GIS studies), Engineering (life cycle analysis) and Communications (environmental communication). We are able to offer a 120 unit Concentration by reducing the supporting course work in Math and Physics. See Appendix E for a full catalog description of the BS Meteorology program.

3.1.a.ii MS Meteorology program

MS students take 30 units in order to graduate. This consists of: three required graduate-level classes (nine units), two additional graduate-level elective classes (six units), nine additional elective units at either the graduate or undergraduate level (usually METR classes, but can be in other fields), and finally six units total of seminar (METR 285), research (METR 298) and thesis (METR 299). See Appendix E for a full catalog description of the MS Meteorology program.

“Plan A” students conduct original research under the guidance of a faculty member, and write a thesis at the conclusion of their studies. The student is also required to make a graduate-level presentation (45-55 minutes) in the department seminar series (METR 285). Several of our students have gone on to write up their research
results for submission to peer-reviewed journals. A “Plan B” option is available, but is seldom used. Students may not choose this option (i.e., it is occasionally offered to a student by the faculty).

3.1.b Curricular Changes in the Review Period

The faculty have initiated a large number of changes to the undergraduate curriculum in the last two years, and all are summarized below. Our rationale in making these changes was three-fold: (i) to continue the unending process of refining our curriculum to provide the best possible educational experience for our students in a changing world; (ii) to pave the way for the creation of a new major (BS in Climate Science currently a Concentration in the BS Meteorology degree); and (iii) to create a new minor (Climate Change Strategies, developed jointly with Environmental Studies).

(i) Our non-stop review of our undergraduate classes (and resulting curricular changes) is necessitated by the changing landscape of today’s students (less prepared for college, required to work more hours outside SJSU to support themselves, more distracted by media). In addition, the needs of the workforce have changed and continue to change. For example, computing skills have become vital for our graduating seniors, necessitating putting more computing “components” into our majors classes.

(ii) The new major is discussed more fully in §3.4, but we note here that our approach has been to: (A) develop a roadmap for the new major (see section 3.4); (B) develop any new courses for the new major per the roadmap (C) adapt existing courses as needed; and (D) develop the new concentration in climate science to pilot our new degree program (approved and started in F10) and (E) prepare paperwork to go to Chancellor’s Office to request the new major (planned for AY 2011-12).

(iii) The new minor is an outgrowth of discussions with Environmental Studies, and responds to unmet needs of both ENVS and METR students. ENVS students are typically graduating with deficiencies in “hands on” scientific work. At the same time, these skills are increasingly being required in the job market. METR students are taking classes with a slant towards topics such as forecasting, leaving them with deficiencies in “environmental” subjects at a time when “environmental” job opportunities are expected to increase. The new minor has been approved, and our first students started in Fall 10.

ENVS students in the minor will take three METR classes: (A) MET 12 (new core GE class on Climate Change: Science and Solutions) or MET 112 (SJSU studies course on Global Climate Change), where either of these courses would provide the required Atmospheric/Climate Science background; (B) METR 136 (Statistical Climatology), a “hands-on” lecture-lab course in which we teach the statistical analysis of real data (i.e., climatological data, thus giving students an opportunity to analyze data indicating climate change); and (C) METR 163 (Instruments), a “hands-on” lecture-lab course in which students work with instruments both in the lab and out in the field. These latter two classes will give ENVS students practical skills (e.g., setting up instrumentation, gathering and analyzing data, all in relation to, for example, wind energy potential). ENVS students will take nine units of METR classes ((A)-(C) above) and nine units of ENVS classes (12 unique units).

METR students in the minor will take nine units of ENVS classes, including ENVS 119 (Energy and the Environment), ENVS 130 (Energy Policy), and either ENVS 116 (Solar Applications) or ENVS 133 (Alternative Energy Strategies). METR students would also take METR 112 (see above) to complete their 12 unique units.

Below, we include a table showing all recent curricular changes.

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<th>Title (descriptive exposure)</th>
<th>Action</th>
<th>Curricular actions</th>
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<td>Weather &amp; Climate (GE)</td>
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<td>Re-certified as a GE course, AY 07-08</td>
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<td>Global Warming: Science and Solutions core (GE)</td>
<td>New class</td>
<td>New GE class; approved and certified for Fall 09</td>
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<td>Meteorology I (majors)</td>
<td>New class First half of old MET 61; approved for Fall 09</td>
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<tr>
<td>113</td>
<td>Atmospheric Pollution</td>
<td>Re-certified as a GE course, AY 03-04 (next submission delayed due to current re-examination of the process)</td>
<td></td>
</tr>
<tr>
<td>121A</td>
<td>Dynamic Meteorology I (majors)</td>
<td>Pre-reqs. modified</td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>Global Carbon Cycle (for the new major)</td>
<td>New class New upper-division course for the new concentration; will also serve as an elective for METR majors.</td>
<td></td>
</tr>
<tr>
<td>136</td>
<td>Statistical Climatology (majors, minor)</td>
<td>Pre-reqs. modified specifically in connection with the new minor</td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>Remote Sensing (majors)</td>
<td>New class New class for METR majors to be first offered in Fall 11 (developed by a new faculty member).</td>
<td></td>
</tr>
<tr>
<td>163</td>
<td>Meteorological Instrumentation (majors, new minor)</td>
<td>Pre-reqs. modified specifically in connection with the new minor</td>
<td></td>
</tr>
<tr>
<td>164</td>
<td>Introduction to Fire Weather (majors)</td>
<td>New class New elective for METR majors (developed by a new faculty member).</td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>Mountain Meteorology (majors)</td>
<td>New class New elective for METR majors (developed by a new faculty member).</td>
<td></td>
</tr>
<tr>
<td>166</td>
<td>Field Studies in Meteorology (majors)</td>
<td>New class New upper-division required METR class; a field trip class. Federally-funded for first three years. First offered summer 09.</td>
<td></td>
</tr>
<tr>
<td>168</td>
<td>Global Climate Change</td>
<td>New class That cross-listed SJSU studies class nine unit/two semester class on Climate Change. Co-developed in our department.</td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>Global Climate Modeling (for the new concentration)</td>
<td>New class New upper-division course for the new major; will also serve as an elective for METR majors. (First offered Fall 10)</td>
<td></td>
</tr>
<tr>
<td>174</td>
<td>Climate Change Solutions (for the new concentration)</td>
<td>New class New upper-division course (and capstone course) for the new concentration.</td>
<td></td>
</tr>
<tr>
<td>179</td>
<td>Senior Thesis (majors)</td>
<td>Curriculum broadened to include a “service-learning” option</td>
<td></td>
</tr>
<tr>
<td>209</td>
<td>Advanced Fire Behavior</td>
<td>New class New graduate course for MS students.</td>
<td></td>
</tr>
</tbody>
</table>
3.1.c Variations from the “Standard” Curriculum
For US Meteorology/Atmospheric Science departments, the “standard” curriculum is usually defined as one that satisfies posted American Meteorological Society (AMS)\(^9\) and National Weather Service (NWS)\(^{10}\) civil service standards. Our BS program meets these requirements. As a result, graduating students can go straight into NWS jobs.

The “standard” curriculum defined above is in a constant state of flux, as is our discipline. This is one of the considerations we have when making curricular changes. A new revision of the “standard” curriculum from the AMS is due out in 2011. As mentioned in §1, we are the only such department in the CSU system, so comparisons are not available. Similar BS- and MS-granting institutions in the US also set their curricula in order to meet the AMS/NWS criteria, so in this sense we do not deviate from the national “standard” curriculum.

3.1.d Bottlenecks in the Curriculum
Assuming that a bottleneck is defined as a situation where a required class is offered each year to N students, and required by M students, where M > N, then we do not have this situation in our major due to our small size (majors classes do not fill). Our majors classes are offered once per year (i.e., one section per year), so a student who gets a “D” or lower in a majors class – and thus has to repeat the class – is delayed by one full year. One increasing obstacle for our students is getting into supporting classes in Math, Physics and Chemistry. As budget and staffing (faculty and technical) cuts have reduced sections of these courses, students with low registration priority are finding it difficult to get classes. In some cases, frustrated students have taken these courses at local community colleges. For our students, supporting classes are the bottleneck, especially if they have to retake.

3.1.e Interdisciplinary Aspects of Curriculum
Meteorology majors classes are fairly specialized, and thus our major at the moment is not very interdisciplinary. However, as outlined above, we are beginning to move in a more interdisciplinary direction. This is being driven by global climate change, and our efforts to expand our curriculum to cover this broad area in collaboration with other programs. Students taking the new Climate Change Strategies minor and in the new Concentration in Climate Science (and the new major assuming it gets approved) take classes in a much wider array of fields (Biology, Business, Communications Studies, Environmental Studies), and we believe our new classes will be of interest to and more accessible to students in other majors.

3.2 GE & service courses
3.2.a Summary of GE courses offered
We currently offer five GE courses. These courses are:
- MET 10 (“Weather & Climate”; core GE class; typically 4-6 sections per semester; one section online)
- MET 12 (“Global Warming: Science and Solutions”; new core GE class; first taught Fall 09)
- MET 112 (“Global Climate Change”; SJSU Studies class; recently 6-8 sections per semester; with additional online section offered for the first time in summer 2009, and now offered regularly (1-2 sessions per semester) and during winter and summer)
- MET 113 (“Atmospheric Pollution”; SJSU Studies class; one section per semester; enrollments have grown in the past two years – see §1.2.a.ii)
- MET 100W (“Writing Workshop: Meteorological Reports”; our 100W course; one section per year)

With MET 112, we have found in the last two years that we can continue to add sections and still have unmet demand. This is partially related to a campus-wide shortage of area “R” SJSU Studies classes. We have expanded during the review period to as many as eight sections per semester, and have now introduced a

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\(^9\) www.ametsoc.org
\(^{10}\) www.opm.gov/qualifications/standards/IORs/gs1300/1340.htm
much-desired online section. We have been lucky to attract a number of area scientists (mostly PhD-holders) who have been willing to teach sections. One potential bottleneck could occur if this supply dries up.

With regards to MET 100W, we strongly prefer to have our students take this class in-house, since in the past they have not fared well in sections taught elsewhere (e.g., Geology, Chemistry). Of note is the fact that we require most graduate students to take the class in order to satisfy the GWAR requirement. Additionally, all MS students are expected to write a thesis in American Meteorological Society (AMS) format, and all BS students are expected to write a senior thesis in AMS format, so both groups benefit from having 100W taught in-house.

3.2.b Summary of service courses offered
We currently offer one service course, as follows:
- MET 110 (“Aviation Meteorology”; offered to Aviation majors only; limited to 24 students due to the limitations of the lab space; one section per year)

As far as we know, this course is meeting the needs of the Aviation program11. The main challenge we face is in finding an instructor who knows meteorology and has flying experience, since this is better-received by the aviation students. None of the current faculty satisfy this criterion, so this class is typically taught by PT faculty. This course would be high on the list of courses to cancel in the event of severe budget cuts. However, at present we have an excellent part-time faculty who satisfies the requirements.

3.2.c Resource “challenges”
As with many other programs on campus, our GE enrollments support our much smaller BS and MS programs. As long as the current models of FTEs targets and T/TR and PT salary allocations persist, we must strive to continue to maximize enrollments in our GE classes. We can do this by making the classes relevant and appealing (and clearly the Global Climate Change class satisfies this criterion), and staffing these classes with skilled and dedicated teachers.

3.3 Assessment of Student Learning
3.3.a Summary of Department Review Process
Several years ago, we established a set of student learning outcomes (SLOs) for both the BS and MS Meteorology programs (shown at the Undergraduate Studies website and in Appendix D). These were developed at an all-day retreat. We mapped these SLOs to specific classes in which relevant material was presented (“Introduced”, “Reinforced”, and “Advanced”). Assessment data for the BS program so far has been gathered in those classes in which the material is taught at an advanced level. Since our MS program is small (on average roughly five new students per year), we gather assessment data for the MS program in all required graduate classes. The SLOs themselves have been revisited and modified, and in spring 2011 we made a significant change to the SLOs12. Faculty are asked to gather assessment data according to the mapping mentioned above, and per the overall schedule we have established for which SLOs are assessed during a given year (Appendix D).

We hold faculty meetings every 3-4 weeks, and once a semester the bulk of a meeting is devoted to a discussion of assessment. This includes discussion of: (a) the most recently gathered data: what it implies, and what steps we might take to improve student learning for that SLO; (b) for SLOs discussed in previous semesters, we discuss what changes have been made, and whether they have been successful. With some SLOs, the assessment data has suggested that no changes were needed; in other cases there have been thoughtful discussions regarding changes either within individual classes, or in more global aspects (e.g., the

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11 In a recent voicemail exchange with Prof. Seth Bates, chair of Aviation and Industrial Technology, Dr. Bates indicated that he had no complaints.
12 Due to retirements, we had more SLOs than faculty. In spring 2011 we rewrote the set of SLOs for both BS and MS programs to be more global (as opposed to being highly specific to a particular class/faculty member).
order in which classes must be taken, pre-requisites etc.). In addition, we have provided regular (semi-annual at first, and then annual) assessment reports, as required by Undergraduate Studies and/or WASC.

3.3.b Evaluation of Data Processing Process
We believe that the mechanisms by which we are assessing our BS and MS programs via SLOs is working well. We have a small program with small classes. As a result we have small amounts of assessment data to work with. As we all know, results from statistical analyses based on small samples are of limited usefulness.

We have a long history of continual attention to and consideration of our curriculum with respect to student learning. We have made adjustments to the curriculum on a continuing basis for decades. At an almost glacial speed, faculty are coming around to an acceptance of formalizing the process via what is known as “assessment”.

3.3.c Results of Assessment Efforts
Guidance from the administration has been that each program SLO be assessed at least once per Program Planning cycle (i.e., once per five years). For small programs such as ours, this might result in a certain SLO being assessed in a certain class once per cycle, yielding something like ten pieces of raw assessment data gathered every five years. This is unlikely to be enough data on which to base a critical curricular decision.

As an example, data relating to BS SLO#1 was gathered in Spring 08, and the data suggested that 2/3 of our students did satisfy the criteria of the SLO, whereas 1/3 did not. In this particular year, we had only three seniors, and one had a learning disability. That student showed little improvement over the year in assessed areas such as public speaking (e.g., students are required in the class to make a “public” oral weather forecast). This case highlights the problem with relying too heavily on statistical analyses of small datasets. That said, we have made a number of changes to the overall curriculum, all in the firm belief that they will enhance student learning (even if we cannot back this up with believable statistics).

3.4 Goals and Plans
We have a long history of continual attention to and consideration of our curriculum with respect to student learning. We have made adjustments to the curriculum on a continuing basis for decades.

The largest changes to our program as a result of program planning and assessment concern the preparation of our students for junior and senior level courses. Historically during the sophomore year, students took a four-unit introductory meteorology course intended to prepare them for upper division courses. Our assessment data in both junior-level Atmospheric Dynamics and senior-level Weather Analysis & Forecasting classes indicated that students were having trouble with important concepts and were entering these courses underprepared. We have now modified the sophomore year by splitting the introductory material into a two-semester sequence (METR 60/61) with additional course time (1 extra unit) to help better prepare students. We also moved a junior-level “instruments” course (METR 163) into the sophomore year and modified the content to more closely align the theory with practical hands-on meteorology. This was also a result of our self study since about half of the junior-level Atmospheric Radiation students didn’t understand some important concepts that are now covered in our “Instruments” course at the sophomore level. We realized that our students need to see important concepts at multiple places in their education, so we have increased this exposure in the sophomore year. The first cohort of students after these modifications are graduating now, so we do not yet have assessment data to evaluate if these changes have indeed helped. However, anecdotal data suggests an improvement in student learning in junior and senior years.

Since we have made so many curriculum changes in the latter part of the review period, at the present we feel there are very few obvious changes that need to be made to the BS Meteorology program. The new concentration has yet to produce any graduates, so it is too soon to tell. In the forthcoming year, we will
introduce graduate elective classes\textsuperscript{13} to better reflect faculty expertise and curricular developments (e.g., in fields such as climate modeling).

4. STUDENTS

4.1 Analysis of Student Data

4.1.a Status and Trends

BS Applications. The number of applicants to the BS program over the past six years (Fall 05 – Fall 10) has been 41 (30:11 first-time-freshman (FTF) to transfer ratio), 41 (25:16), 36 (28:8), 50 (40:10), 42 (29:13), and 39 (27:12), respectively. Corresponding spring applications numbered: 0:2, 2:8, 0:3, 0:3, 0:4, 0:4, indicating that we receive a small trickle of transfer applications each spring. We are attempting to grow our undergraduate enrollments (as discussed elsewhere), so we took the growth from 36 (Fall 07) to 50 (Fall 08) to be a good indication that our efforts were bearing fruit. The dip to 42 (Fall 09) and 39 (F10) occurred when stringent admissions rules were being imposed by the CSU. The uncertainty among applicants has potentially ruled out a large group of applicants from outside of the county\textsuperscript{14}. We expect admissions numbers to pick up again in Fall 2010, since the department has been given dispensation to recruit from throughout the state due to its uniqueness in the CSU.

BS Admit and Show rates. Of the 30 students who applied in Fall 2005, 83\% were admitted, and the show rate was 28\%. Similar numbers for the following four years are: 24, 88\%, 28, 61\%, 24\%; 39, 69\%, 37\%; and 28, 72\%, 14\%. Show rates are consistently lower for FTF vs. transfer students. Show rates for FTF fall applicants are in the 14-36\% range (average 24.4\%), while those for transfers are 33-50\% (average 43.8\%). We speculate that transfer applicants have “done their homework”, and are fairly confident that they intend to enroll here. For FTF applicants, this is not so much the case. A number of applicants have indicated that they apply to multiple programs – the rest being out of state – and many obviously choose the latter. Our efforts to appeal to these applicants in order to improve our show rate are discussed below in §4.6.

BS Majors. The resulting number of majors in our BS program over the last five falls has been: 36, 30, 40, 38, and 46. Clearly we would like these numbers to be higher, and our efforts to improve enrollments are discussed in §4.6. We are encouraged that numbers are trending upwards.

BS Graduation rate. Once they are into their junior year, the vast majority of our majors successfully graduate with the BS Meteorology (perhaps 1-2 every five years do not). OIR data on enrollment per class level is not useful here, since to us a “senior” is a student in our senior-level classes, whereas to OIR a “senior” is a student with > 90 units.

The number of students graduating over the period is: 6, 2, 5, 12, 1. What this shows more than anything else is the difficulty of the early years of the major. In their first two years, students must take three calculus classes, three calculus-based physics classes, and general chemistry. A significant percentage of students “wash out” at this stage. The same is true at other US meteorology programs. Indeed, this was a driver for our decision to increase student exposure to the meteorology-specific curricula in the lower division part of the program.

BS Student Gender/Ethnicity data. The OIR data shows the ration of female: male BS students in the six year period to have been: 12:15, 16:12, 12:11, 13:22, 12:20, 13:23. Back in the day, almost all students were male, and then gradually more female students showed up. In the first three years of the reporting period the numbers

\textsuperscript{13} Under the current college associate deans, the curriculum development and modification process is essentially dead. No calls go out for curricular improvements, no deadlines are announced, no meetings are held. Our plans to make continued curricular changes assume this situation will improve or that Undergraduate Studies communicates with departments directly.

\textsuperscript{14} At one time (Fall 09?), a quick check revealed that over 90\% of our undergrads are NOT from the local area.
were close, but in the last two years we have swung back to having more male students. It is not clear if this is part of a longer-term trend. The current senior class is 100% female, whereas the current junior class is 100% male: go figure.

By ethnicity, most of our students self-report as white, with some Hispanic as well. In F05, students declared themselves as: Hispanic (4), White (17), Other (4), Asian (1), and Filipino (1); in F06: Hispanic (5), White (17), Other (3), Filipino (2) and Foreign (1); in F07: Hispanic (4), White (15), Other (1), Filipino (2), and Asian (1); in F08: Hispanic (8), White (20), Other (1), Filipino (1), Pacific Islander (1), Asian (2), AmInd (1), and Foreign (1); and in F09: White (11), Filipino (1), Asian (1) and other (19) – did the reporting criteria change? It is uncertain what to make of these numbers. However, we are more diverse than 20 years ago, when our students were principally male and white.

Quoting from the Justice Studies sample study posted online, “The most recent data for the university as a whole (Fall 2006) indicates that 54% of the SJSU student body is female, 39% is Asian/Filipino/Pacific Islander, 28% are white, 15% are Latino/a, 5% are African American and less than 1% are American Indian/Alaskan.” Our meteorology student demographics have more males than their proportion in the student body. We have more white students as well as having less Asian/Filipino/Pacific Islander students than the overall demographics of SJSU students.

**MS Applications.** Graduate applications are received through the year. Some students are accepted in Fall, most in Spring, but the separation is artificial since there is really only one cohort of applicants/arrivals per year. The total number of applicants to the MS program in each of the five years was 9, 17, 15, 17, 16, and 16 (14 in Spring 2011 for Fall 2011 start). These numbers indicate that the appeal of our MS program has remained strong, and has shown growth since the start of the period.

**MS Show rate.** Show rates are indicated as: 0% (Spring 05), 0% (Fall 05), 0% (S06), 62% (F06), 25% (S07), 50% (F07), 50% (S08), 27% (F08), 0% (S09), 20% (F09). Cumulative fall-spring numbers are: F05-S06=12 applied, 8 admitted, 0 enrolled (see footnote 15); F06-S07=17, 12, 6; F06-S07=13, 6, 3; F07-S08=15, 11, 3; F09=15, 10, 3; F10=16, 12, 7.

**MS Numbers.** The resulting number of majors in our MS program over the last six Fall semesters has been: 7, 8, 7, 6, 7, and 12. A significant difficulty with growing our MS enrollment is that good students in this field can very often obtain offers of research assistantships for their MS studies at “richer” institutions (e.g., PhD-granting programs). Our ability to attract new MS students is thus influenced by the ability of our faculty to secure research funding. This is discussed further in §4.6.

**MS Graduation rate.** Again, the huge majority of our graduate students do complete the program, including the course work and thesis research. The number of MS students graduating over the period is: 2, 4, 0, 2, 4, 0.

**MS Student Gender/Ethnicity data.** The female:male MS student ratios in the five year period were: 2:5, 1:7, 3:4, 3:3, 2:5, 6:6. By ethnicity, our students self-report as Asian, Foreign, White, Hispanic, and Other. No clear trends are obvious from either datasets, largely because the statistic is small. Equally, it does not seem a reasonable exercise to compare these small numbers with campus averages.

**4.1.b Student success post-SJSU**

We do our best to track our students after they leave our BS and MS programs. With limited resources and staffing, this has been a somewhat informal effort. It is frequently the case that we assist graduating students in getting their first job or in getting into grad school. As a result, we have a very good idea of where students go.

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15 In this AY, decisions on graduate admissions were being made by a faculty member who resigned on June 1 of that year. Once the new chair became the graduate advisor, it was discovered that the faculty member had abandoned the admissions process at some point in spring. We believe this contributed to the show rate of 0% that year.
right after SJSU. We have limited resources and opportunities to track them after about two years as they begin to move around. Two years ago we did an alumni outreach, and requested alumni addresses and emails from Advancement; we were given sheets with address labels (i.e., nothing electronic). It would be very helpful if we had easy access to the best available SJSU Meteorology alumni database.

Roughly, one in five graduating seniors enter graduate school somewhere (SJSU and elsewhere). Of our students completing the MS, perhaps two-three in five seek to continue their graduate studies in PhD programs. In the past decade, we have had students complete studies at SJSU, and go on to graduate from/enter PhD programs at Stanford, Harvard, U. Washington and Colorado State, the latter two being two of the pre-eminent Meteorology/Atmospheric Science graduate programs in the US. Some of these have gone into faculty positions (e.g., at Chico State), while others have gone into government research labs and the private sector.

For our graduating seniors who do not go on to grad school, and our grad students who stop at the MS level, these have recently found employment at: Applied Weather Technology (private sector forecasting company in San Jose), V-Bar LLC (private sector wind energy company founded by SJSU graduates), the National Weather Service, the NOAA Corps, the Mt. Washington Weather Observatory, Weather Underground (a national online private sector forecasting company headquartered in the Bay Area), NASA’s Jet Propulsion Laboratory, Southwest Research Institute (a non-for-profit research corporation), PG&E, and Sonoma Technology Inc. (a private sector air quality company headquartered in the north bay). In addition, several graduates in the last 10 years have gone on to do TV forecasting at various stations across the west. This is currently a “dying profession”, as TV forecasting is being outsourced to a few large companies (for example, NBC acquired the Weather Channel that now produces all their forecast products).

We post online (at http://www.met.sjsu.edu/alumni/byyear.html) a list of alumni. We give their job function as part of our outreach to prospective students (as in “Look! You can get a degree here AND then go on to one of these amazing jobs!”).

4.2 Student Experiences
4.2.a Student advising
We have long had a practice of requiring advising for ALL undergraduates. We used to withhold class code numbers to force students to come in for advising. This has now been supplanted by college-level advising holds etc. Our current practice is that one faculty member is designated as the undergraduate advisor (Dr. Cordero has served in this capacity for a few years), and another faculty member is designated as the graduate advisor (Dr. Bridger has served in this capacity for a few years). The undergraduate advisor performs these tasks: meets with each undergraduate once per semester (more if needed/desired); reviews progress to graduation, including a review of course progress in support classes (especially math) and in GE; assists students in finding help (e.g., directions to COSAC, Writing Center etc.); assists students in finding employment (e.g., in-house research opportunities with faculty, as well as post-SJSU). The graduate advisor performs these tasks: meets with each graduate student once per semester (more if needed/desired); reviews progress towards graduation, including review of progress in graduate school (especially math) and in GE; assists students in finding employment (e.g., in-house research opportunities with faculty); assists students in finding help (e.g., directions to COSAC, Writing Center etc.). The chair performs these additional advising-related tasks: reviews/signs major forms; meets with prospective students and their families who drop in either unexpectedly or by appointment (often from out of the Bay Area); attends the various events put on to welcome prospective students, as well as transfers and incoming freshmen; meet with Science 2 students to advertise our program. Degree Roadmaps are included in Appendix F.

4.2.b Student tutoring
Our students (via the student club SCAMS) provide a tutoring service every semester. The chief users of this service are students taking our GE classes (especially MET 10 & 12, but also 112 & 113), but our lower division students are encouraged to use the tutoring service too (including for their math and physics classes). We also encourage our students to use various campus resources. For example, students in the freshman class MET 40 visit the COSAC center, and students are made aware of the LARC and Writing Centers.
4.2.c Student surveys
We do not conduct formal exit interviews or surveys of our graduating seniors. Since we have small classes, we feel we have a good informal sense of student levels of (un)happiness with various aspects of the curriculum, and with teaching performance etc. to the extent possible, we try to fix problems as and when they arise.

We have one-two alumni per semester come in and give talks in our seminar series, and we give these speakers the opportunity to speak with current students. Among other things, we ask our alumni to help current students understand the importance of various curricular topics in preparing them for a career in our field. A very good example of this concerns MET 100W, a course disliked by many of our students. Our alumni visitors are almost always happy to reinforce to the students the importance of writing etc. skills in the workforce. We always take the opportunity to ask our alumni (informally) how they are doing and how well (or not) our program prepared them for their job function.

We are considering a formal alumni survey. At the time of writing (Spring 11), we are dealing with sharply diminishing resources, depleted faculty ranks, a hiring freeze, furloughs, and more cuts on the horizon, so a formal alumni survey will probably not get started soon.

4.3 Student Recruitment and Detention
4.3.a Recruitment
Given that our numbers are quite small, especially in the senior year, we have made a number of recruitment efforts in the period. These include: (1) we purchase a list of high school students who show an interest in meteorology when applying to colleges. This list includes names from all western states. We send a letter to all students, encouraging them to consider SJSU. (2) We hired an outside firm to redesign our website. The purpose was to enable the use of our website in recruitment through delivery of weather products and information, including: faculty and grad student research profiles; alumni profiles; class descriptions and the roadmap.

As discussed above in §4.a.1, we saw growth in applicants from 36 in F07 to 50 in F08. We believe that after the following years’ dips to 42 and 39 (due, we think, to CSU application restrictions), our numbers will continue to grow. We believe our name change together with the introduction of a new Concentration in Climate Science will aid in our recruitment and growth. At the moment, we believe that our recruitment efforts are “colorblind”. Most of our current students are from outside the Bay Area. It could be argued for instance that we could recruit in area high schools to bring in more students and also increase the ethnic diversity of our student body. However, given recent numbers, this would involve a prohibitively huge ratio of faculty/staff input time to expected return.

4.3.b Retention
Our main retention hiccups occur in the first two years of our program. Once students reach our junior-level classes, they almost all graduate. The main retention problem in the early years occurs in the three math/calculus classes, and to a lesser extent in the three physics and one chemistry course. Many students come into our major with little concept of how math-heavy this major and this science actually is. Many students need to take MATH 19 (pre-calc), thus adding units and time to the major, and some even need to take the pre-MATH 19 class. For many of these students, math continues to be a struggle. The SJSU Mathematics department is working towards improving passing rates for these classes, and the reader is referred elsewhere for this information.

In our program, we meet regularly with students at all levels, and encourage them to do well in their math classes (which includes admonitions to seek help when students are struggling). We offer a freshman class (METR 40) in which we: introduce freshmen to our program and faculty; show the students ways in which math and physics are involved in our science; and encourage students to push themselves to do well in their math etc. courses. In an informal analysis of METR 40 enrollments over the past five years, the chair could
find no clear trend regarding who does/does not continue into the sophomore-level class from this freshman class. We believe that our retention efforts are “colorblind”.

4.3.c Progress to Graduation
As discussed above, once our students are into junior-level classes, they almost all graduate and in a timely manner. The latter is because our roadmap is very structured – students take only two elective classes in the major, and both are taken in the senior year – all other classes are mandated via the roadmap. Student progress to graduation is generally impacted by the following factors: some students need to re-take some of their math/physics/chemistry classes, which adds time to their studies here; a few students need to re-take a meteorology class. Since our majors classes are offered once per year, an “F” or “D” grade in a METR class automatically adds a year to a student’s time at SJSU. Aside from these factors, we encourage our students to “move along” in their studies, so we believe “time to graduation” is not a problem in our program.

4.3.d Samples
We used to have a brochure for outreach, but these days everything is web-based. We invite you to visit our web page (www.met.sjsu.edu) and view the various recruitment items.

4.4 Student Scholarly and Creative Achievements
All BS Meteorology undergraduates are required to conduct a research project for their Senior Thesis (METR 179). We have a significant collection of senior theses as a result of student research work over the years; a list of titles is included in Appendix F. Additionally, some of these undergraduate students have presented their work at the annual College of Science Research Day.

At the start of the review period, the senior thesis would have been described as: a “classical” research project, conducted under the guidance of a faculty member, and lasting for two semesters (1 unit credit each semester). At the end of the review period, it is now described as: a “research” project, which may or may not be “classical”, conducted under the guidance of a faculty member. Students now may choose to conduct/participate in a “service-learning” activity instead of a “classical” research project. In AY 08-09 for the first time two students chose this option. They worked together to create weather-focused activities for presentation to an after-school program at a nearby elementary school in the Five Wounds district. According to city data, the majority of residents in this district have not completed high school, so this project is viewed as a program outreach to a minority community in which college is not generally an option. The experiment was sufficiently successful that the student group (SCAMS) asked to make similar presentations in Sp 10 and Sp 11.

All graduate students are required to conduct an independent and original research project as part of their studies here. A list of students graduating with the MS is given in Appendix F. Increasingly over the years, these students have attended professional conferences during their course of study, and have presented their work in both preliminary and final form in both poster and oral form. As an example, three graduate students in the Clements group attended the 8th Annual Symposium on Fire and Forest Meteorology in Kalispell, MT in Oct 09, and all made presentations. One (Daisuke Seto) received the Best Young Scientists Award based on his work, beating our PhD students at the symposium. It is usually the case that students and faculty collaborate to submit results of the thesis research to peer-reviewed journals at the end of the study. The list of graduate students in Appendix F also contains this information.

4.5 Student Engagement Activities
4.5.a On-campus
There is an active Meteorology student club (SCAMS) which meets regularly. The club had become rather quiet about three years ago (a result of a very quiet batch of students), but the current students have energized the club. In the past year, they had a booth in the student faire, ran a “CO2-BBQ” event on campus to raise awareness of our program, had movie nights, set up weather equipment on the beach, and organized day trips to local labs. Many students also participate in the annual campus service day. One of our seniors (Amanda Short) was very active in student affairs, and served on the Dean’s Advisory Committee.
4.5.b Off-campus
Several students have engaged in off-campus activities associated with our field. Senior Amanda Short was selected to attend a prestigious five-day Leadership Workshop at the National Center for Atmospheric Research in Boulder, and was also selected to conduct research work over summer in a local lab. Several students volunteered in December 2008 and again in December 2009 at the American Geophysical Union’s Fall Annual Meeting in San Francisco. In most years, several students travel to attend the American Meteorological Society’s Annual Meeting (New Orleans, Jan 2008; Phoenix, Jan 2009; Atlanta, Jan 2010; Seattle, Jan 2011). If we had more students, we/they would be happy to respond to outside requests for events such as Boy Scout visits etc.

4.6 Goals and Plans
An overriding goal for the BS program is to attract more students into our pipeline. At the start of the review period, a number of our upper-division classes were low-enrolled (under 10 students), although the current junior/senior and sophomore/junior cohorts are larger. A modest five-year goal is to double our enrollments at the freshman level. As discussed above, a significant number of students “wash out” during the first two years due to the heavy math requirements. The college has made some strong efforts to reduce the math dropout, and we will benefit from those efforts. We currently feel quite confident that, once our students are into their junior year, almost all will graduate and gain employment. Thus our efforts are focused on the earlier years.

For the MS program, we continue to aggressively seek new students. In part this is driven by small graduate classes, but equally all faculty benefit from having graduate students engaged in their research activities. As mentioned above, our main difficulty in attracting new graduate students lies with our ability to offer funding. This, in turn, depends on: (a) the number of tenure/tenure-track faculty (see §5); and (b) their ability to secure external research funding, which is influenced by our ability to reduce their teaching loads. We continue to seek ways to enable our faculty to “do research”, and thus improve our ability to recruit new graduate students.

5. FACULTY

5.1 Faculty Profiles
5.1.a Tenured/tenure-track faculty (T/TR)
The department has had six T/TR faculty for decades. It has been frequently discussed internally that this represents a “critical number” in that we would not be able to cover all fields of our subject with fewer faculty (so it would become imperative to hire part-time faculty to “fill the gaps” with fewer than six faculty). At the moment, we have four faculty as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Status</th>
<th>Gender</th>
<th>Ethnicity</th>
<th>Retirement Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alison Bridger</td>
<td>Tenured Full professor</td>
<td>F</td>
<td>White</td>
<td>~10 years</td>
</tr>
<tr>
<td>Eugene Cordero</td>
<td>Tenured Associate Prof.</td>
<td>M</td>
<td>Hispanic</td>
<td>~15-20 years</td>
</tr>
<tr>
<td>Craig Clements</td>
<td>Tenure-track Assistant Prof</td>
<td>M</td>
<td>White</td>
<td>~20+ years</td>
</tr>
<tr>
<td>Menglin Jin</td>
<td>Tenure-track Assistant Prof</td>
<td>F</td>
<td>Asian</td>
<td>~20+ years</td>
</tr>
<tr>
<td>Vacant</td>
<td>Tenure-track Assistant Prof.</td>
<td>search underway</td>
<td>Spring 2011</td>
<td></td>
</tr>
<tr>
<td>Vacant</td>
<td>Position requested for Fall 2011</td>
<td>recruitment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Initiated by retirements, we have made a series of hires over the past decade. Unfortunately the majority of our assistant professor hires have left. One (KP) left for Utah (University of Utah) where he could support a family on a single income (and buy a house); one (SR) left for Boulder (Southwest Research Institute) where he could support a family on a single income (and buy a bigger house); one (TR) left for the east coast (East Carolina University) where his wife could also get an academic appointment (and the cost of living was more favorable); and the latest (JA) left after just one year for Idaho (University of Idaho) where his wife could also get an academic appointment, and where they could immediately buy a house. One of our hires over the period (Eugene Cordero) is now tenured, and we have two assistant professors on the faculty right now. Additionally, we hired a senior faculty member (VS) to come in as chair, but he left due to personal issues.

Due to the departure of an assistant professor (JA) in Summer 2009, and the retirement in Spring 2010 of two senior full professors at the conclusion of FERP (Bornstein & Goodman, together accounting for one faculty position), in AY 10-11 we have only four T/TT faculty. Therefore, our department is “down” two faculty positions relative to the number of the past four decades, a 33% drop. This is a cause for great concern. We were given permission in Fall 2010 for a faculty search, and are currently searching for a faculty member to cover the fields of synoptic meteorology and forecasting.

5.1.b Part-time faculty (PT)
As of May 2010, we had two part-time (PT) faculty who have been part of our faculty team for over a decade, and were considered part of the core faculty. One (JS: male, white) had a Ph.D. in the field and started teaching with us in 1992. The other (MV: male, white) had a M.S. in the field, and had been with us over 15 years. JS retired at the end of the Spring 2010 semester, and MV left for the private sector in August 2010. In the review period, we have also hired other PT faculty to teach these courses: Aviation Weather class (male, white); computing classes (male, white); sections of our SJSU studies classes (mostly male, white); sections of our core GE class (mostly male, white); and some undergrad electives (male, white). We keep track of professionals in the Bay Area who contact us for opportunities to teach, and also advertise on our web site when we anticipate PT teaching opportunities. Of the qualified applicants over the past five years, almost all have been white males.

5.1.c Issues
Currently, our department is facing two critical issues, similar to many other programs on campus. The issues are: (1) how can we continue to maintain the unique reputation of our program (required courses, electives, GE and service classes, research and fund-raising) with insufficient T/TT faculty to cover all curricular areas, and without hiring new faculty? (2) How can we continue to offer our program in the near future under the threat of starkly reduced funding for PT faculty?

We can only hope that these are short-term concerns. Equally we must hope that additional system-level funding will be developed very quickly to allow for additional hiring of faculty (T/TR and/or PT) for the next year. Finally, we continue to strive to grow and expand (e.g., into Climate Science), and we will continue to seek for support from SJSU in our efforts (support in the form of permission to hire and/or PT faculty funding support).

5.2 Faculty Scholarly and Creative Achievements
5.2.a Summary of Faculty Scholarly Achievements
5.2.a.1 Research and Publications
5.2.a.1.i Peer Reviewed Publications
During the review period, faculty have published in these peer-review journals:

In total, our faculty have published 15 peer-reviewed papers during last three years. These papers not only prove the quality of our faculty’s research, but also provide research opportunities to undergraduate and graduate students, and inspire their interest in developing scientific careers. Equally importantly, these papers form a solid base for our faculty to continue to seek research funding from major federal funding agencies (NSF, NASA, DOE, EPA, etc).

5.2.a.1.ii Conference Presentations
Faculty have actively participated (made oral and poster presentations, chaired sessions, and served on panels) in the following national and international conferences:


Attending these conferences, often with students, enhances our program’s visibility and encourages interactions with the broader research community. In addition, chairing sessions and serving on panels showcases the leadership of our faculty on various research topics including fire, air quality, urban meteorology issues, and climate change.

5.2.a.1.iii Invited Talks
During the review period, faculty have given invited talks at/to:

The University of Utah; NASA-Ames; the California Center for Innovative Transportation; the Santa Clara County Fire Safe Council; the Stanford Wind Energy Project; LLNL; The Joseph W. Jones Ecological Research Center in Ichauway, GA; a 4th grade class at Croce Leo R. Elementary School in Livermore, CA; the Japan International Workshop on Urban Modeling in Japan.

5.2.a.2 Books and Book Chapters
Professor Cordero published his book entitled “Cool Cuisine”, and has given 30+ talks on this book. Professor Jin has published two book chapters on the subjects of urban modeling and urban aerosols. Professor Clements is completing a book chapter on the subjects of fire weather.

5.2.a.3 Grant Activity
During the period 7/1/04–8/31/2010, a total of 72 proposals were submitted by meteorology faculty (a full list, provided by SJ Foundation, is included in Appendix Q). The total requested was over $13 million. Of these, 44 proposals were funded for a total of slightly under $3 million. The largest funded grant was for $590,000.

5.2.b Collaborative Achievements
Our faculty have active collaborations outside of SJSU including the USDA, NASA and LLNL. Additionally, faculty are working collaboratively at SJSU beyond our program. Activities include: Professor Cordero is working with Professor Anne Marie Todd of Communication Studies. They have co-written an NSF proposal, written a peer-reviewed journal article, and co-developed the new COMS/METR 168 SJSU Studies course. Professor Cordero has participated in team-teaching this course. Professor Cordero was involved in the campus Climate Solutions Initiative, and team-taught a 3-unit GE upper division course with six other faculty from different colleges. Professor Cordero has collaborated with Professor Margie Freedman from Nutrition & Food Science on a campus food waste project. He hopes that this ongoing work will result in a publication. Finally, Professor Cordero coauthored a peer reviewed paper and a conference publication with Professors Jinny Rhee of Mechanical Engineering and Lawrence Quill of Political Science in 2009.
Professor Clements is working with Professors Eugene Cordero and Tai-Ran Hsu of Mechanical Engineering on a study of Wind Energy on Buildings. This has resulted in a proposal submitted to NSF. Professor Clements has also worked with Professor Andrew Oliphant, of the Geography Department at SFSU in the preparation and submission of a major MRI proposal.

Professor Bridger participated with a group, led by Dean Parrish, which developed a proposal to produce K-12 educational materials focused on climate change. She was also a member of a campus-wide group considering a Green Building in collaboration with officials from Denmark, and has also participated in meetings regarding San Jose’s Climate Clock. She has also been involved with Professor Lynne Trulio of Environmental Studies in developing a new minor for both METR and ENVS students.

Professor Jin is working with Professor Gary Pereira of the Geography Department to publish a peer-reviewed paper.

5.2.c Resumes
See Appendix G.

5.3 Service and Community Engagement
5.3.a Faculty Service to the University
Each of our T/TR faculty serves on a college-level committee every year, and tenured faculty can expect to serve on RTP committees (department and college; until recently, this included Associate Professors). We encourage our faculty to NOT serve on university-level committees until they have gained tenure. In this college, such service is not well-rewarded (and probably not highly regarded), and certainly detracts from “research time”. Professor Bridger currently serves on the university Writing Requirements Committee. Professor Cordero regularly gives talks on campus related broadly to sustainability, his “Cool Cuisine” book, and global climate change; these talks have been well-attended.

5.3.b Faculty Service and Engagement Beyond SJSU
Our faculty have been invited to serve on several important community committees, including:

American Meteorological Society’s Urban Committee (Bornstein, 2010-2013);
American Meteorological Society’s Planned and Inadvertent Weather Modification Committee (Jin, 2010-2013, Bornstein 2007-2009);
American Meteorological Society’s Education Committee (Cordero, 2007-2013).

During the review period, Professor Bornstein (now Emeritus) was elected Fellow of the AMS, was honored with the Helmut Landsberg Urban Climate Award by the AMS, and was honored with the Luke Howard Urban Climate Award by the International Association for Urban Climate. Professor Bornstein served on the Bay Area Air Quality Management District Technical Advisory Committee, served as the US representative on the WMO’s Commission on Urban Meteorology, was an elected member of the board of directors of the International Association for Urban Climate, and was the Skyscraper Project advisor for the Liberty Science Center. Professor Bornstein continues to serve as editor of the journal Atmospheric Environment.

Professor Clements is a member of the National Wildfire Coordinating Committee/Fire Weather Subcommittee, and also a member of the NCAR WRF-Fire Steering Committee.

Faculty participate in a number of professional activities beyond SJSU. The most important of these are:


2) Reviewing proposals submitted to federal organizations including: USDA Forest Service-Tahoe Science Consortium, the California Air Resources Board, NASA Education Programs and other programs, NSF (various programs)

3) Serving (invited) on national proposal review panels for NASA (multiple programs).

5.4 Goals, Needs and Plans
One of our chief goals is to maintain our high quality teaching of meteorology at both undergraduate and graduate levels. In addition, we are working to build a strong program in Climate Science, and advance our reputation in this direction. A second goal is to keep active in research and maintain our successful record in getting external funding.

We urgently need to recruit new tenure-track faculty. Currently (Spring 2011) no one on staff is qualified to teach Weather Forecasting and Synoptic Meteorology\(^\text{16}\), which are required by AMS for a meteorology program. Furthermore, there are other areas of expertise which would benefit the program (e.g., climate change, tropical meteorology) but are now missing. Although three recruitment campaigns in the past three years had conducted, we need and anticipate two additional successful campaigns in the near future. We received permission to recruit in Spring 2011 for a Synoptic Meteorology and Forecasting faculty member, and that search is now wrapping up. The Provost put out a call for up to 70 recruitments on campus in AY 11-12, and we are ranked 5\(^{th}\) in the College for a Clouds and Climate Change hire.

The campus will need to step forward and find ways to offer/continue to offer funding for: (a) startup packages for new hires. Recent hires have been offered packages in the $5-10K range, and this is way under typical national values; and (b) reduced teaching load in the initial years. Our 4-4 teaching load is impossible in the context of requiring research for tenure and promotion. We must send this message to upper level administration of campus.

6. RESOURCES

6.1 Program Support
6.1.a Clerical, technical and instructional support
Our science is extremely computing intensive. Some of us work with codes which may be hundreds of thousands of lines long. Others work with a variety of huge weather and climate datasets from around the world (terabytes of data). The use of computers for weather forecasting was advocated in the earliest days of mainframe computing (1940’s). With the growth in computing power, the development of desktop “mainframe” computing technology, and the requirement that graduates of our program be well-versed in and exposed to a range of computing-related issues and skills, it has become essential to have a well-trained computing/IT staff person as a member of our department\(^\) (as is the case at most programs in the US and worldwide). When we look at “where we are today”, it is inconceivable that we could have arrived at this point without in-house support. The chances that the college could have provided such a level of specialized support are very small, and the idea that the university could provide such support is inconceivable. Therefore, it is vital that we retain an in-house IT position.

Our resident IT staff member was Mike Voss who initially joined the faculty as a PT lecturer over 15 years ago, and then was hired as our instructional support technician. He used his strong management and computing skills to develop the department’s outstanding computing position. His duties included managing and upgrading our computing facilities (over 50 CPUs running both Windows and Unix OS). The position Mike

\(^{16}\) Previously taught by Mike Voss and before that by permanent faculty.
held also included teaching the weather and forecasting portion of our curriculum, and leading the department’s student forecasting team. The team consists of all juniors and seniors, and some grad students, all of whom participate in daily forecasting activities, and are in competition with 40+ programs around the US. In the review period, the forecast team had one first-place finish and multiple top 10 finishes, and this was over 90% attributable to the efforts of Mike Voss. Mike also served on the national Advisory Board for the competition. He also did the department budget.

Mike left SJSU for a job at PG&E in August 2010. We were invited by the college to submit paperwork to hire a replacement. It was clear from the start that we would not be able to reproduce Mike’s IT and weather functions. In the end, presumably due to Human Resources and union contract issues (i.e., the requirement to hire back recently laid-off IT personnel), the replacement IT person had about 20% of the skillset we require. Most importantly, we have lost our specialized in-house unix-based meteorological computing support. This is as unique to our program as running a maintaining a lab would be to a Biology program. Also in Fall 2010, a college-wide IT reorganization took place, resulting in all IT personnel (including the new hire) organized into a “flying wedge” of support to go when and where needed. The loss of Mike has impacted not only our IT support for teaching and research, but also the department’s capability in providing state-of-the-science forecasting instruction. As an example, we recently submitted a proposal to an external body requesting $20K to upgrade some of our higher-end workstations. If funded, the college will be able to assist in setting up the hardware, but our expertise in installing and running unique software left with Mike Voss. We are confident that we can muddle through, but there will be a lot of time wasted in reinventing various wheels. Likewise, some of the weather products we put online have died (due to the death of server hardware), and even with new hardware, nobody in-house knows how to resurrect the programming.

It is shocking to us how frequently essential academic personnel (faculty and support staff) have NOT been replaced in the last two years. It is vital that we regain an in-house Meteorological IT position.

The department also had a full-time admin at the start of the review period. By the end of the review period, this had been reduced to half-time (mornings only), and in summer 2010 the position was eliminated in the campus-wide wave of layoffs. At the moment, the College has assigned a single admin to cover three programs, with our program assigned coverage just two mornings a week. Prior to the current AY, we were able to hire a work-study student to assist us in the afternoons. This provided support in answering student enquiries and phone calls, and making copies etc. However, with the recent loss of our admin staff we have had to reduce office coverage. Increasingly over the past few years, many of the functions SJSU admins perform are within the online mysjsu/CMS environment, and these cannot be handled by a student assistant since they do not have password access to the system. It is impossible to manage the many of the “secretarial” functions in any unit without an admin, given the aforementioned dependence on the mysjsu system.

On the issue of budget, Mike Voss did the department budget for many years (since a previous admin could not reliably keep the numbers). With his sudden departure, we went through a period of being completely in the dark about the budget (keep in mind that Mike Voss’ departure coincided with the elimination of the department’s admin position). We are slowly emerging from this situation, as both the chair and the new part-time admin figure out the intricacies of the budget process. At the same time, the College’s budget specialist has retired; previously she was able to assist with budget questions. Luckily, and as discussed further in §6.2 below, there are no ($$$) resources, so there is really no “budgeting” to be done!

6.1.b Equipment and facilities:
6.1.b.i Our “facilities” consist of:

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17 Recent representative questions have included: “How much OE&E money do we have left? How long do we have to spend it? Can we afford to purchase a new computer costing $550?” Nobody in the department knows how/where to get answers to these questions (might be one of those things one needs “training” for).
• one lab room (DH 614) which houses our student computing lab (12 workstations) and additional class seating for 24 students. As computers are increasingly used in our teaching, we are finding it increasingly difficult to squeeze more and more majors classes into this one room;

• a multi-purpose room (DH 615; holds about 10-12 students) for lectures, talks and meetings;

• a graduate student lab (DH 617), housing higher-end unix workstations for graduate student research;

• an 8th floor laboratory facility, which houses a wind tunnel and many smaller instruments, and which is used for our Instruments class (METR 163) and for faculty and grad student research. The 8th floor also houses our Air Quality Laboratory (AQL). This is an important resource (see §1.3.4);

• the “Arnold True Atmospheric Observatory” roof-top weather observation deck named for the founder of the department. This is located on part of the roof of Duncan Hall, housing a multitude of meteorological and air quality instruments;

• faculty office space on part of the 6th floor of Duncan Hall. Roughly half of the T/TR faculty have single offices, half of which are interior (no windows = not good for observing weather!). The rest of the T/TR and P/T faculty have shared office space.

There are two problems with the lab space on the 8th floor and the roof top weather station. Both can be easily addressed via allocation of resources:

(A) Access above the 7th floor is via stairs only; this is an ADA liability. The department chair has proposed that a “wheelchair stair lift” be installed along the stairs leading from the 7th to the 8th floor (an example is shown at [http://www.ameriglide.com/](http://www.ameriglide.com/), and appears to be quite affordable). A second lift would have to be installed up to the rooftop observation lab. This could easily be described as a “shovel ready project”, and only needs to be noticed by somebody in FD&O and/or the administration, since this is an ADA compliance issue waiting to happen. Note that the lab has been up there since the 1960’s.

(B) Recently, some new/upgraded cell phone antennas were installed on the same roof area (beyond the railings that run around the edge). These were apparently installed by the Verizon wireless company who leases space up there from FD&O. I am concerned that FD&O appears not to know that we have equipment and a “working lab” up there (we have had equipment up there for decades). The “towers” come with radiation warnings. It seems only a matter of time before the facilities are upgraded again, posing a greater hazard to our students, faculty, and guests who visit and work on the roof top weather station. A very pleasant outcome of the program planning process would be to get recognition of, and fixes to, these problems.

6.1.b.ii We have two broad categories of “equipment”:

(1) Computers
We have about 50 desktop computers and twelve laptops located in classrooms, faculty offices, and for grad student use. All are used extensively. Our original computing labs (dual PC/Unix, located in DH 614) and graduate research lab (Unix, located in DH 617) were established via a grant from Dean Selter, since which time no such major allocations have been available in the college. We recently (summer 2010) were able to do a major upgrade (12 new machines and monitors) using CE funds. We note that there is no line item equipment funding for science departments in the college – our only allocation is within so-called OE&E funds. Beyond about 10 years ago there was a separate “equipment” line item in the budget.

(2) Meteorological equipment
(i) A portable Doppler sodar system ($40K), used for measuring winds in the lowest 200 meters of the atmosphere, purchased using grant funds. This is a key piece of equipment for proposed and ongoing winds energy studies, and for a potential “wind energy” professional science masters degree program we hope to develop;

(ii) Multiple portable, Remote Automated Weather Stations (RAWS) for teaching and research in the field ($10K each);

(iii) Two micrometeorological research towers used to measure turbulence, water vapor flux, and solar and terrestrial radiation at field sites ($25K each, purchased from research grants);

(iv) Air quality instrumentation in our Air Quality Lab located in DH 801B. These continuously monitor air quality at SJSU. The Air Quality Lab consists of both gas and particulate analyzers (total cost of
$120K purchased from a NSF grant awarded in 1999). These require annual maintenance and calibration supplies costing approximately $5K per year.

Much of the equipment described above was purchased following the hire of Prof. Clements, and is indicative of how the “instrumentation” part of our program has become re-energized following his arrival. At the same time, the department has never had any resources allocated from the college to support this part of our program. This includes funds (presumably under OE&E) for supplies (aforementioned calibration gases etc.), as well as support staff versed in instrumentation.

In spring 2010, Professor Clements received an NSF-MRI grant ($450K) to purchase a Mobile Atmospheric Profiling System (CSU-MAPS), a mobile system which includes a Doppler Wind Lidar which will be used to measure winds throughout the atmosphere, and in particular in association with wildfires. This particular lidar is the most advanced lidar system for meteorological research in the US. The lidar will be deployed on the roof-top observation deck of Duncan Hall for long-term studies, and as part of the CSU-MAPS. CSU-MAPS will be a shared facility jointly with SFSU who were co-I’s on the grant. The CSU-MAPS (which cost $700K in total) is the most advanced mobile profiling system in the US, and consists of a 32 meter high mobile tower trailer ($75K), meteorological sensors mounted at five levels along the tower ($65K), a microwave temperature/humidity profiler ($180K), an upper-air balloon sounding system ($80K), and the Doppler wind lidar ($300K). The CSU-MAPS will be at SJSU half of the year and at SFSU the other half. This joint facility will enable a new thrust of teaching and outreach for meteorology and climate science majors. Its first trip “in the field” involved a joint 24-hour field trip to Grant Ranch Park in April 2011 as part of our Instruments class, and involved about 30 students from both SJSU and SFSU.

c. **External funding to support instruction**: In 2009, a large endowment of $799K from the Walker family was given to the Tower Foundation in order to establish scholarships for our students. This fund allocated $25K in one-time money to support students for 2009, approximately $14K (interest) for 2010, and approximately $24K (interest) for 2011. Each year, a faculty committee reviews student records, and makes awards based on the criteria established in the award (including need, as well as GPA > 3.0). In the first year (2009) awards were made to current students, ranging from $5K for grad students, to $2.5K for seniors and $1K for sophomores. In the second year (AY 2010-2011), the faculty decided to make scholarships awards of $2K to each incoming graduate student. We currently plan to use these funds to continue to attract new students to our MS program via these $4K and $2K Walker Scholarships, which will be a wonderful resource for attracting future students. **Secondly**, we started a campaign to raise alumni donations to be directed towards either student fellowships, or towards new equipment purchases. Our first effort (Dec 2007) was moderately successful, and then the great global economic collapse happened (so we did not have the heart to do a follow-up “ask”). Recently, an alumna has made a pledge of a $5K per year for five years, and we are planning an “ask” in summer 2011 to invite alumni to match this pledge.

Lastly, Professor Bridger was the recipient of a federal “earmark” award designed to create and operate (for three years, ending in summer 2011) a new field trip class (METR 166). The class lasts for about two weeks, and students travel to northern Arizona to measure, analyze, and forecast weather associated with the Arizona Monsoon. This class is designed to hone a range of practical skills, and expose students to weather phenomena not experienced in the Bay Area. We will need resources (roughly $10K per year) to continue to offer this class.

d. **Library resources**: Library resources appear to be adequate to support the majority of our efforts in both teaching and research with one glaring exception: that regards access to the *Journal of Geophysical Research* (JGR). JGR publishes several monthly journals (in print and online), and one (JGR-Atmospheres) has become one of the most important journals in our science (which was not the case 20+ years ago). Our library representative has tried repeatedly to find funds for this, but has never succeeded\(^\text{18}\). This is a negative for

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\(^{18}\) The annual subscription is $4K.
faculty and grad student research, and for some instructional needs (e.g., advanced classes and literature searches).

6.2 Resource Management
6.2.a Distribution and allocation of resources within the program
Well, since there are basically no resources, there is nothing to allocate, so this is a straightforward process. The current chair (AFCB, in her 5th year as chair) does not recall ever having received a “budget” ahead of time for any semester, and in some years the fall budget is only available in the middle of the following spring. There is no college-wide information available on resource allocation (example: information on previous years’ allocations could be made available. Faculty and chairs are in the dark as to how college funds are allocated). In five year review period, we have been able to schedule classes in all areas (GE, service, undergrad, grad), assign and hire instructors, and eventually receive sufficient funding to back-cover what we had already spent. The college has allowed our FTEs to drift upward (i.e., the college has provided additional instructional funding), driven mostly by in-demand GE classes, and we are very grateful for this. There is a tiny allocation to cover phone, Xeroxing, and mail, and we seem to have enough. There is no obvious “travel” allocation, and certainly no “equipment” allocation.

6.2.b Resource utilization in relation to instruction
We believe we have done as good a job as we could have done in continuing to offer solid graduate, undergraduate, and general education programs, given the level of support and the huge uncertainties in year-to-year funding. One issue mentioned above regards our Meteorological Instrumentation class (Metr 163) which requires lab supplies for students and calibration gases, as well as tech support. In Spring 2010, these costs were covered by faculty grants, but a longer-term solution needs to be developed.

6.2.c Instructional support needs
Below are our top-priority resource needs:

6.2.c.i…IT needs.
It is imperative to retain our IT person (formerly Mike Voss) in-house, as opposed to consolidating all IT staff into the college. To be specific, there needs to be recognition from above the department level that our IT functions are highly specialized, and thus need in-house support. The same is true in other science departments (e.g., chemical supply needs in Chemistry; botany support needs in Biology). Perhaps a model for a shared position with the IT person primarily committed to the department with a meteorology background and secondarily committed to the college might be feasible. The college Unix support crew (Kevin Ross & Yue Wang) are good people willing to help, but they are unqualified to assist on the meteorological aspects of our needs.

6.2.c.ii…faculty needs.
We need new faculty hires. With retirements and departures of assistant professors, we are challenged in covering “core” classes (both undergrad and grad).

6.2.c.iii…equipment needs.
A significant portion of our computing equipment (especially workstations) is old and in need of replacement. Many of us update our home desktops and laptops on a 2-3 year cycle, not because we want to, but because of technological improvements, and because of software demands (e.g., upgraded operating systems and software packages demand increased RAM etc.). It is amusing to note that until Fall 2010, we could not open attachments from well-funded units on campus because we were limited to using Windows XP and Office 2003, as opposed to Windows 7 and Office 2007, because our hardware was so outdated. As stated above, our 12 student workstations in DH 614 were replaced in summer 2010 using CE funds. We currently have a proposal in to updated some of our higher-end Unix platforms. There are no current plans regarding the disposition of our other Unix-based workstations, some of which are about five years old.

6.3 Goals and Plans
A stated above, our main goal is to grow in enrollment. We currently have a small number of majors and grad students (see chapter 4). Our modest goal is to double student numbers within about five years (e.g., by 2015). With two exceptions (the Instruments lab class, METR 163, and the computing lab classes, 50 and 51), all of our majors classes can absorb this growth without having to open new sections etc. Further growth would necessitate more support in terms of added sections etc. We dream of the day we have to open two sections of a majors class! Our computing facilities would have to grow to support any growth: more high-end computers for grad student research, and an expansion of our teaching lab (DH 614). And as stated, we need to replenish our faculty – our main resource for instruction.

As stated earlier, there are more job opportunities than graduates from our programs and the prospects for the field continue to expand given the emphasis on climate change and the resulting weather fluctuations. So a goal of doubling our BS and MS students can readily be accommodated by an expanding job market.