

GRADUATE STUDENT GUIDE
Department of Atmospheric Science
Colorado State University
Fort Collins, CO 80523-1371

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I. THE COLORADO STATE UNIVERSITY DEPARTMENT OF ATMOSPHERIC SCIENCE

The Department of Atmospheric Science was established in the Walter Scott, Jr. College of Engineering at Colorado State University in 1962 and the Ph.D. degree program was authorized in 1963. 404 Ph.D. and 800 M.S. degrees have been awarded by fall of 2022. The B.S. degree is not offered in the Department of Atmospheric Science; however, several undergraduate courses are available.

The department enjoys a modern facility dedicated to research in the atmospheric sciences. Located on the Foothills Campus, the four-story Atmospheric Science Building and supporting structures provide 30,000 square feet of research and office space. A 3-story addition, the Atmospheric Science-CIRA Research Center (ACRC) provides approximately 10,000 additional square feet of office, lab and classroom space in the department. A 13,000 square-foot Atmospheric Chemistry Building consolidates the department's activities in atmospheric and aerosol chemistry into a modern, single facility located adjacent to the main department building. This facility provides additional office space, chemistry laboratories, walk-in cold chamber, dynamic cloud chamber, and a vertical dilution tunnel. In 2009, ATS West was added to house the NSF Science and Technology Center, CMMAP (Center for Multi-scale Modeling of Atmospheric Processes). ESMEI (Earth Systems Modeling and Education Institute) is now the institutional legacy of CMMAP and continues to engage in earth system modeling with an atmospheric focus. A reading room resides in the department, containing a selection of the department's 8,000 volumes and 5,000 technical reports. The department has its own computer facilities, but also has direct access to the computing facility at the National Center for Atmospheric Research.

The Department of Atmospheric Science was designated as a Center of Research and Scholarly Excellence for consecutive four-year periods in 1991, 1995, 1999, 2004, 2008, 2012, and 2016. In 2012 and 2016 the department was recognized jointly with Cooperative Institute for Research in the Atmosphere (CIRA). This selection was made by the university administration and is based upon a consistent record of superior accomplishments in research and graduate education. Key elements in the nomination were: the department maintains a strong, federally funded research program; over the past eight years 43% of the department's Ph.D. graduates have accepted positions at other universities; nine atmospheric science faculty members are fellows of the American Meteorological Society; eight atmospheric science faculty members have served or are serving as editors of major scientific journals; several faculty have received major awards in the past decade; many ATS students have received best paper awards at AMS conferences; and many students have received AMS scholarships and fellowships.

Real-time conventional weather data are available for use in the classroom, particularly for weather lab instruction. Other facilities include a 10 cm dual-Doppler polarization radar (the CSU-CHILL national radar facility), a laser ceilometer, surface and boundary layer observing systems, a Doppler-DIAL lidar, a mobile rawinsonde receiving system, an acoustical radar, meteorological towers, and a sizable inventory of meteorology, physics, and chemistry instrumentation for conducting field programs. The department maintains two weather stations – one each on the main and foothills campuses – and is also the home of the Colorado Climate Center. The department also supports a weather laboratory.

The department is currently engaged in cutting-edge research across a broad spectrum of the atmospheric sciences. The sponsors of these research projects include the National Science Foundation, National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration, Office of Naval Research, State of Colorado, Department of Interior, Department of Defense, Department of Health and Human Services, Department of Transportation, Department of Energy, and the Environmental Protection Agency.

Through research to develop and strengthen programs of inclusion, excellence in earth science education is also firmly supported by the department. Research focuses broadly on mentoring historically marginalized scientists, broadening participation via formal and informal learning settings, and developing leaders that are better prepared to address representation and inclusion challenges in the earth and environmental sciences.

At present the staff consists of 21 academic faculty members, 48 research associates/scientists/postdoctoral fellows, and 12 supporting technical and clerical personnel. 74 graduate students were enrolled for the 2021 spring semester, with a fall incoming class of 26. A vigorous affiliate faculty program is maintained; affiliate faculty are selected from among distinguished scientists in the academic and research communities. Included among the research faculty participating in ongoing department research programs are individuals recognized internationally as authorities in the following fields:

- Aerosol Science
- Air Quality
- Atmospheric Chemistry
- Atmospheric Radiation

Atmospheric Transport Processes
Causal Discovery
Climate Change
Climate Dynamics
Climate Futures and Sustainability
Climate and Societal Dynamics
Cloud Dynamics
Cloud and Precipitation Physics
Cumulus Convection and Cloud Dynamics
Data Assimilation
General Circulation Modeling
Global-Scale Circulations
Global and Regional Climatology
Machine Learning
Mesoscale Meteorology
Mesoscale Modeling
Physical Oceanography
Radar Meteorology
Radiation Theory
Remote Sensing
Satellite Meteorology
Theoretical and Dynamic Meteorology
Tropical Meteorology and Tropical Cyclones

II. GRADUATE STUDY

The department offers graduate programs of study leading to the degrees of Master of Science and Doctor of Philosophy. Students typically complete the M.S. program within 24-30 months of enrolling in the program. The Ph.D. is typically completed within 36 months of the M.S. degree.

A. The Master of Science Degree

Completion of the Master of Science degree assures that students will have acquired basic knowledge and be proficient in a specialty. This is accomplished through completion of a required core curriculum, advanced graduate courses chosen by students in consultation with their advisers and graduate committees ([See Appendix A](#)), and by participation with their advisers as co-workers in research.

Today, a wide choice of professionally satisfying work exists for M.S. graduates; these include positions in private industry, the consulting field, and many government agencies. A student is eligible to advance to the Ph.D. I level after they have successfully completed all requirements for the M.S. degree. Students holding M.S. degrees from institutions other than CSU may be directly admitted into the Ph.D. program. These students follow the normal application procedures to our program.

B. The Doctor of Philosophy Degree

The Doctor of Philosophy degree is the highest academic degree offered by Colorado State University. Those who earn the Ph.D. must demonstrate significant intellectual achievement, high scholarly ability, and great breadth of knowledge. A more specific listing of the departmental expectations of each successful Ph.D. candidate is given below.

1. A demonstrated breadth of knowledge and command of basic principles underlying the field of atmospheric science together with a demonstrated aptitude for research.
2. Command of background, methods, and current works that apply to the specific area(s) encompassing the candidate's proposed research topic; demonstration of a creative ability for research.

Evaluation mechanisms for (1) and (2):

- a. Successful completion of an M.S. degree with thesis
 - b. Successful completion of the Ph.D. preliminary examination
 - c. Successful research topic proposal presentation
3. A Ph.D. dissertation prepared under the mentorship of the student's adviser and graduate committee that meets the following criteria:
 - a. Displays original and creative scholarship
 - b. Contributes new knowledge to the field
 - c. Expresses good literate style
 4. Successful defense of the dissertation before the candidate's graduate committee ([See Appendix A](#)) and any other members of the academic and scientific communities who desire to attend the dissertation defense.

Ph.D. students are prepared for careers as leaders of independent research in their chosen fields. Recipients of the Ph.D. degree are therefore required to demonstrate an exceptional research capability for which readiness is developed by carrying out noteworthy components of their advisor's research program. A means for acquiring the breadth and depth of knowledge expected of Ph.D. candidates is provided by the large selection of course offerings from which students, with their advisor's assistance, may structure a program of study that best serves their own needs.

The necessary steps to advance to the Ph.D. I level:

In all cases, the student applies to the department for admission to the Ph.D. program. This may be done at any time after the M.S. defense (current ATS students), or during the regular admissions cycle (students obtaining M.S. degrees outside the department). A student cannot advance to the Ph.D. I level until this application process has been completed. For students applying from outside of the department, the standard Graduate School admissions process applies (See III.A. Admission.) Application materials for current ATS include:

1. A nomination letter, written by the proposed Ph.D. adviser, indicating that the faculty member agrees to advise the student and indicating the means of financial support.
2. A statement of research interests / goals prepared by the student.
3. The student's official academic record (M.S. coursework, breadth and grades; standardized test results, as applicable).
4. A recommendation by the student's M.S. committee, which evaluates the M.S. thesis, defense (presentation skills), and perceived research aptitude. This recommendation is normally in the form of a memo to the department, submitted after the defense.
5. A statement indicating the expected completion date of the preliminary exam, including a rationale for deviating, if necessary, from the 12/18-month guideline established for continuing/new graduate students, respectively.

Each application is screened by the department head, the associate department head, and a representative from the Departmental Graduate Committee (DGC). The Ph.D. advisor cannot be the DGC representative. This group comes to a consensus decision whether the applicant will be admitted to the Ph.D. program. The DGC representative documents this decision with a brief memo, to be placed in the student's file.

Upon admission, the student's status becomes that of Ph.D. I.

The necessary steps to advance to the Ph.D. II level:

1. Upon successful completion of the preliminary examination, a student is eligible to move to the Ph.D. II level and to receive an accompanying increase in stipend if a GRA.
2. Advancement to the Ph.D. II level is initiated by a specific request from the adviser in the form of a memo requesting that the student's appointment be changed to Ph.D. Level II.

C. Academic Honesty

Students are expected to adhere to a high standard of ethics and conduct during their graduate program of study and in their professional careers beyond. Academic dishonesty will not be tolerated. Students guilty of academic dishonesty may be subject to immediate dismissal or appropriate lesser penalty. Academic dishonesty includes, but is not limited to, such acts as cheating, plagiarism, and falsification of data or documents. (For a more complete discussion of procedures related to Academic Dishonesty refer to the [Graduate and Professional Bulletin](#)).

III. PROCEDURES

A. Admission

1. U.S. Students

- a. Master of Science: Prospective students holding a bachelor's degree in mathematics, physics, chemistry, meteorology, engineering, or a related field from an accredited college or university are invited to apply through the [Graduate School](#). A personal statement, responses to all supplemental questions, three letters of recommendation, and official copies of **all** previous college transcripts should be submitted to the [Graduate School](#) as early as possible, but not later than four months prior to registration for the semester in which studies are to begin. The admissions committee begins reviewing completed applications as early as January 1 of the previous year for the fall semester, and as early as October 1 for the spring semester.
- b. Doctor of Philosophy: Same as for M.S., except that prospective students must have completed a M.S. degree **with thesis**. Published scientific papers in recognized professional journals may be submitted in lieu of a thesis.

2. Students from Outside the U.S.

The same rules as above apply to students from countries outside the United States. In addition, applicants whose official language of their native country is not English must submit official test scores of either the [TOEFL exam](#) (Test of English as a Foreign Language), [IELTS exam](#) (International English Language Testing System) or [PTE exam](#) (Pearson Test of English) with a high score prior to admission. A minimum score on the TOEFL of 550 for the paper exam, 80 for the Internet exam, is required for unconditional acceptance by the Graduate School. A score of 6.5 or higher is required if the IELTS exam is taken and 58 if the PTE exam is taken. The Graduate School maintains a list of countries that are exempt from this requirement. That list and additional information can be found on the Graduate School's [website](#).

3. Admission Prerequisites and Recommendations

Students with backgrounds in atmospheric science or meteorology, physics, math, chemistry, or engineering are encouraged to apply. Undergraduate courses in math and physics are required. Math courses should include the basic calculus sequence for physical scientists and/or engineers, differential equations, and vector analysis. Physics courses should include the basic physics sequence for scientists and/or engineers. This normally consists of classical mechanics, thermodynamics, electricity and magnetism, optics, and an introduction to modern physics. Depending on their area of specialization in atmospheric science, students may find course work in one or more of the following areas helpful: fluid mechanics, statistical thermodynamics, kinetic theory, modern physics, physical and/or analytical chemistry, statistics, applied math, numerical analysis, and computer programming.

In the screening of candidate applications, the following information provided by or on behalf of the candidate is used:

- prior academic transcripts
- letters of recommendation
- student's personal statement and responses to supplemental questions
- GRE scores **ARE NOT** accepted or used

In our graduate program students have access to a broad spectrum of classes in the atmospheric sciences and other disciplines; however, a dominant part of the graduate education experience is performing research under the guidance of an adviser and the student's graduate committee. In order to ensure a quality educational experience for each student, an adviser is pre-assigned to each admitted student. As a result, the limiting factor on our admission of students into the program is the availability of advisers. It follows that many qualified students cannot be admitted because of the limited number of faculty advisers.

B. Admission Requirements

1. Master of Science:

Students must have completed the bachelor's degree in an appropriate field with a cumulative grade point average of 3.0 or higher (4.0 = A).

In exceptional cases, students whose grade point average is between 2.70 and 3.00, or whose academic backgrounds are deficient, may be admitted if they are able to show evidence of ability to complete an advanced degree in a reasonable time. Examples of the kinds of evidence that can be considered in evaluating applications of those with grades below 3.0 are: excellent letters of recommendation, relevant work experience, and a steadily improving academic record.

2. Doctor of Philosophy:
Students must have completed the master's degree in an appropriate field with thesis or must show evidence of research capability.
3. Study Options:
For M.S. students only, both Plan A (with thesis) and Plan B (without thesis) degree programs are offered. Students are generally admitted with the Plan A. However, a thesis, or equivalent, must be written before an M.S. graduate may continue toward the Ph.D. Plan A is strongly encouraged. Very few students follow the Plan B option.

C. CSU Health Insurance

The following information has been obtained from the [CSU Health Network](#).

The Student Health Insurance Plan (SHIP) is designed to work in conjunction with the student fee funded services provided by the CSU Health Network to ensure students have access to comprehensive high-quality care. This program provides benefits both within the CSU Health Network and when services are provided outside of the network.

All domestic graduate CSU students taking six or more resident instruction credits are required to have health insurance and are eligible to enroll in the CSU SHIP. All international and INTO students are automatically enrolled in the SHIP regardless of credit level.

2022-2023 Student Health Insurance Costs

	Domestic Student	International Student	Health Fee (all Students)*
Fall	\$1,585	\$740	\$215.67
Spring/Summer	\$1,850	\$815	\$215.67
Summer Only	\$901	\$432	\$135.26

* For full-time students taking 6 or more credits, fee is included in general fees; please note that students not enrolled in credits during the summer will have to pay this fee as well as a counseling fee of \$54.95

Coverage Dates and Enrollment Deadline for 2022-2023

Fall	August 1, 2022 – December 31, 2022	Enroll/cancel by September 7
Spring/Summer	January 1, 2023 – July 31, 2023	Enroll/cancel by February 1
Summer Only	May 1, 2023 – July 31, 2023	Enroll/cancel by 1 st day of 1 st summer session

If you have equivalent coverage from another source, you can request a waiver. More information concerning the waiver process for domestic students can be found [here](#), and for international students [here](#).

More information regarding benefits and the waiver process can be found at the [CSU Health Network website](#).

D. Outside Employment

A full-time graduate student in the Department of Atmospheric Science is expected to direct their full professional energies to the successful and timely completion of the M.S. or Ph.D. program. In accordance with this expectation, outside employment is discouraged for atmospheric science graduate students on GRA appointments. If extenuating circumstances require that a student have outside employment, the department head and adviser must be notified and concur prior to such employment.

E. GRADUATE COMMITTEES (See Appendix A)

A graduate committee will supervise each student's educational program and research activities. Advisers will be appointed prior to the first registration. The associate department head serves as interim adviser to those students who do not yet have an appointed adviser. The graduate committee, selected by the student in consultation with their adviser, must be appointed before the fourth regular semester registration.

Inasmuch as all graduate student research is degree oriented, the adviser of a student appointed as a graduate research assistant will normally be the principal investigator of the project(s) under which they are supported. The adviser of an

independently supported student normally will be the faculty member whose areas of expertise are most nearly related to the field in which the student desires to specialize. Hence, independent students should take the initiative in discussing adviser possibilities with the associate department head and in contacting faculty members regarding service as their adviser. In the event that the faculty member preferred by a student should already have too many advisees, the department head may appoint another member of the faculty as adviser.

One faculty member in addition to the adviser from within the department and one faculty member from outside the department are required for the M.S. committee. The Ph.D. committee must consist of at least four members: the adviser, two additional faculty members from the department, and at least one faculty member from outside the department. Here again, the student is expected to take the initiative discussing prospective committee membership with their adviser and in contacting those faculty members with respect to their availability for service (subject to appointment by the department head) on their graduate committee. When affiliate faculty are involved, they are appointed as additional members of the committee.

Each student is expected to assemble their graduate committee at least once per year to review progress toward their degree. In addition, each student is asked to provide a detailed progress report to their committee each semester.

F. GS6 Form (Program of Study)

M.S. and Ph.D. Students: As soon as the graduate committee has been established, the program of study (GS6 Form) should be initiated on RAMweb and electronically signed by the graduate adviser, adviser(s), and department head. This process must be completed before the fourth regular semester registration.

List only the courses needed to complete an M.S. degree (30 credits) on the student's program of study (GS6 Form). Under certain circumstances and with department head, adviser, and instructor approval, students may be allowed to retake a departmental course. If a course is retaken, the second grade may be used on the GS Form 6. However, both grades are used to compute a cumulative GPA.

The following regulations are governed by the university and are required of all graduate students.

Graduate credit is not granted for completion of courses numbered at the 100 and 200 level. Graduate students may take such courses for general enlightenment or to satisfy a background requirement as specified on the program of study. Grades earned in such courses will not be considered in computing the graduate grade point average described in the "Quality of Work" section of the catalog. Students may also take 300 and 400 level courses as part of their degree program. These classes will NOT replace any ATS required class.

A student who wants to attend a class but does not wish to earn credits may register as an auditor. Auditing a course requires prior approval of the student's adviser and the instructor of the course. When computing course loads and assessing fees, audited courses are counted the same as if taken for credit. Audited classes do not count toward total credit requirements recognized by Graduate School in order to earn a degree. Required courses listed on the program of study may not be taken on a "Student Option, Pass Fail" basis. Courses which are offered "Pass Fail only" or "Instructor Option, Pass Fail" are acceptable. Background courses may be taken "Student Option, Pass Fail" in accordance with the provision of the following paragraph.

Courses taken by a graduate student on a pass fail basis are subject to the limitations imposed by the student's committee and the department with regard to acceptability for meeting degree requirements. Registration for pass fail should be approved by the advisor prior to enrollment. Choice of audit status and pass fail must be made during the registration or schedule change period.

G. Minimum Credit Requirements

In addition to meeting the formal credit requirements for the M.S. and Ph.D., described below, all graduate students enrolled in the department are expected to attend the weekly department colloquium series. These colloquia are an important part of the total instructional program. Colloquia are normally held on Thursdays at 2:30pm during the school year.

1. M.S. Degree

a. Plan A (Thesis Plan)

A minimum of 30 semester credits plus thesis is required. At least 19 credits must be earned in structured academic courses.* 11 credits may be in special studies, graduate seminars, and research. Of the total 30 credits, 20 must be Department of Atmospheric Science courses (i.e., courses with the ATS prefix).

*A structured class includes classroom instruction. All classes taught in the Department of Atmospheric Science are defined as structured except the following: ATS 695, ATS 699A-V, ATS 784, ATS 795, and ATS 799A-V.

All M.S. students must complete the following required courses (required courses account for 13 credit hours):

- 601 Atmospheric Dynamics I (2 credits)
- 606 Introduction to Climate (2 credits)
- 620 Thermodynamics and Cloud Physics (2 credits)
- 621 Atmospheric Chemistry (2 credits)
- 622 Atmospheric Radiation (2 credits)
- 693 Responsible Research in Atmospheric Science (1 credit)

One of the following:

- 640 Introduction to Synoptic Dynamics (2 credits)
- 641 Introduction to Mesoscale Dynamics (2 credits)

All M.S. students also must complete 6 elective credit hours in structured classes. Electives may include any structured class at the 500/600 level. With *written* instructor and adviser approval, electives also may include structured 700 level classes and/or structured graduate courses in other departments. The written approval should be in the form of an email to the graduate adviser. Audits do not count toward the M.S. degree.

A student may substitute a required class for an alternative course if:

- i. a course similar to the required class already has been completed at the graduate level with a grade of B or higher
- ii. the student's adviser, the department head, and the instructor of the required course approve the substitution in writing

b. Plan B (Non-thesis Plan)

The student must complete a minimum of 30 semester credits. The 30 credit hours must include:

1. The 13 required credit hours listed in G1a (including ATS 693)
2. A minimum of 11 elective credit hours in structured classes. Electives may include any structured class at the 500/600 level. With written instructor and advisor approval, electives also may include structured 700 level classes and/or structured graduate courses in other departments. The written approval should be in the form of an email to the graduate advisor.
3. The remaining six credit hours may be in independent studies (695). Research credits (699, 799) and audits do not count toward the non-thesis M.S. degree.

Of the total 30 credits, 20 must be Department of Atmospheric Science courses (i.e., courses with the ATS prefix). A scholarly paper, as defined by the graduate committee, must be prepared and presented to the committee. This paper and presentation comprise the final examination.

c. National Weather Service Basic Requirements

For those students interested in employment as an operational meteorologist with the National Weather Service, adherence to basic education requirements is important. Requirements implemented in October 1992, and revised in 1998, follow:

1. At least 24 semester (36 quarter) credits in meteorology/atmospheric science including a minimum of:
 - a. 6 semester credits of atmospheric dynamics and thermodynamics (from ATS 601, 602, 604, 620, and 623, as well as appropriate 700-level courses)
 - b. 6 semester credits of analysis and prediction of weather systems (synoptic/mesoscale) (from ATS 640, 541, 605, and 655, as well as appropriate 700-level courses)
 - c. 3 semester credits of physical meteorology (from ATS 606, 621, and 622, as well as appropriate 700-level courses)
 - d. 2 semester credits of remote sensing of the atmosphere and/or instrumentation (from ATS 650 and 652, as well as appropriate 700-level courses)
2. Semester credits of physics, with at least one course that includes laboratory sessions

3. 3 semester credits of ordinary differential equations
4. At least 9 semester credits of course work appropriate for a physical science major in any combination of three or more of the following: physical hydrology, statistics, chemistry, physical climatology, radiative transfer, aeronomy, advanced thermodynamics, advanced electricity and magnetism, light and optics, and computer science

There is a prerequisite or co-requisite of calculus for course work in atmospheric dynamics and thermodynamics, physics, and differential equations. Calculus courses must be appropriate for a physical science major.

2. Ph.D. Degree

There are two general course requirements for Ph.D. students:

- a. Ph.D. students are required to take two structured courses per academic year. Students must register for the courses, and only one may be taken as an audit. The structured courses can be selected from the 500, 600, or 700 level. With written adviser approval, the courses also may include structured graduate classes from other departments. When the student is within one semester of graduation, the student and adviser may petition the Department Head, in writing, for a waiver of the "two courses per year" requirement. While ATS 784 (Supervised College Teaching) is not considered a structured academic course, it is allowed to count toward the two courses per academic year Ph.D. requirement.
- b. Ph.D. students must take a minimum of 42 semester credits beyond the (thesis option) master's degree (or 72 semester credits beyond the bachelor's degree). At least 21 credits beyond the master's degree (or 37 credits beyond the bachelor's degree) must be earned in courses numbered 500 or above. ATS 784 does not count toward the 42 required credits.

Audits count toward the department's requirement that all graduate research assistants enroll for at least 15 credit hours each semester (section L). However, audits do not count toward the Graduate School's total required course credits for the Ph.D. and may not be listed on the GS 6 Program of Study form.

The student's graduate committee is charged with ensuring the student gains breadth in atmospheric science during their tenure in the program. Accordingly, the graduate committee may make recommendations on course work to be completed prior to graduation.

ATS 799 and ATS 784 are graded as S/U.

All Ph.D. students entering the program after August 2013 must take ATS 693 (1 credit), Responsible Conduct of Research, offered every spring semester.

*A structured class includes classroom instruction. All classes taught in the Department of Atmospheric Science are defined as structured except the following: ATS 695, ATS 699A-V, ATS 784, ATS 795, and ATS 799A-V.

H. Continuous Registration Policy for Graduate Students

All graduate students at Colorado State University are required to be continuously enrolled in their degree programs. In the department, all domestic and international students on a Graduate Research Assistantship (GRA) must enroll for 15 credits each semester, fall and spring. This total may consist of both structured and thesis/research credits. Tuition costs for students on a GRA are typically borne by the research project.

Prior to the final semester of a student's program, a student's adviser may petition the department to reduce the student credit load. Such petitions should be received at least 2 weeks prior to the start of the semester and normally will be approved for one semester only. Students (through their advisers) can request approval for registration at either the 1-credit or 5-credit level. Students are encouraged to consult with their adviser and department staff about the advantages and disadvantages of choosing 1 credit vs. 5 credits. In general, students who subscribe to the CSU Student Health Insurance Plan (SHIP) and are on a GRA appointment likely will find most benefit in registering for 5 credits, since this will allow them to retain eligibility for the health insurance contribution from Graduate School. Students who have outside insurance coverage may prefer to opt for 1 credit due to greater savings in fees and tuition.

Enrollment requirements for part-time or non-resident students should be discussed with the department and may include a special Continuous Registration (CR - CONRG-001) status in which a Continuous Registration Fee (CRF) of \$150 is assessed rather than the regular tuition charge. In addition, reduced University fees will be assessed for on-campus students with CR status. Registration for CR status is accomplished in the same way as registration for courses. Section ID numbers appear in the class schedule under the CR prefix.

If graduating in the summer, a student must register for either a course or for CR. Most students in the department register for CR in this case. For these students, enrolling in CR will not preclude GRA status.

CSU Health Insurance when registering for CR - Continuous Registration:

- Domestic students are still eligible to purchase CSU health insurance if registering for CR, but will not be automatically enrolled
- International students will *still* be automatically enrolled in CSU health insurance and required to be enrolled unless a waiver petition is submitted prior to census for that semester

Graduate School stipulates that students are eligible for the Continuous Registration status if:

1. They will be actively working on degree requirements but do not require University resources. If a student is utilizing CSU facilities and resources for their research, they must enroll in the appropriate number of research, thesis, or dissertation credits.
2. They will not be working on their degree requirements but will be leaving the University for professional or personal reasons.

Students in their 1st, 4th, or 8th semester of CR are required to submit a [Student Plan for Degree Completion](#) to their Advisers. Students are limited to a maximum of 10 semesters of CR. A Graduate Degree Progress Hold preventing registration will be placed on their record when 10 semesters of CR are exceeded. A student's adviser may petition this hold following the Graduate School's [General Petition Instructions](#). The Graduate School's [website](#) has additional information on CR requirements.

Students who are paid on a GRA and not graduating in the summer are not required to register during the summer session. Because students are not registered during the summer, they will lose library and gym privileges as well as need to pay the CSU Health Network fee if they use the network.

I. Transfer Credits

1. Master's Degree

A minimum of 24 semester credits must be earned at Colorado State University. Only credits earned within 10 years prior to graduation may be applied toward the degree. A maximum of 6 semester credits may be transferred with the student's graduate committee approval.

2. Ph.D. Degree

A minimum of 32 semester credits must be earned at Colorado State University. A master's degree from an accredited college or university may be accepted for a maximum of 30 credits. Only credits earned within 10 years prior to graduation may be applied toward the degree with the approval of the graduate committee. A maximum of 6 semester credits beyond the M.S. degree may be transferred.

3. Courses with grades below B (3.0) will not be accepted for transfer.

4. Transferring coursework from foreign institutions requires a written analysis from the student's adviser or department head for the basis of the request, which includes:

- a. The CSU course equivalency to the transfer course(s) and how the adviser or department head came to that conclusion.
- b. An explanation of how the advisor or department head is familiar with the course(s) being requested for transfer.

J. Residency Requirements

Students must register for each term they use University facilities including advising or adviser help with thesis preparation. Following admission to the Ph.D. degree program, the student must be on campus at Colorado State for at least two semesters. It will be the responsibility of the academic department head to certify the candidate's completion of the on-campus credit requirements.

K. Quality of Work

A minimum cumulative grade point average (GPA) of 3.0 is required in course work. If a student's cumulative GPA falls below 3.0 at the end of any semester, the student is placed on academic probation by Graduate School and their GRA is revoked immediately. A student may not hold a GRA with a cumulative GPA below a 3.0. If the cumulative grade point average is still below 3.0 at the end of the following semester, the student is dismissed by Graduate School. Grades for research, special studies, and seminars may not be used in computing the grade point average of course work. A minimum cumulative GPA of 3.25 is required to receive and hold a College Recruitment Supplemental Fellowship.

L. Course Load

1. Graduate Research and Teaching Assistants

Students on assistantships must register for an appropriate number of credits each semester. Students are required to register for 15 credits each semester.

Graduate teaching assistants who are GRAs are required to register for at least one credit in Supervised College Teaching, ATS 784, during the semester in which so appointed.

2. Fellowship Holders

Students should register for 15 credits each semester or the amount allowed by their fellowship unless otherwise instructed by their Research Project Manager.

3. Credit Load

Maximum load for all graduate students is 15 semester credits. Overloads must be approved by the Dean of the Graduate School.

M. Examinations ([See Appendix C](#))

1. Master's Degree Students

a. Plan A (Thesis Plan)

An oral examination, consisting of a seminar and a question session by the student's committee is conducted. The exam outcome is reported to Graduate School within 2 working days via the GS24 form.

b. Plan B (Non-thesis Plan)

The student is required to submit a brief research paper in AMS format. The student's committee decides on a topic. An examination also is given covering the student's course program. The exam outcome is reported to Graduate School within 2 working days via the GS24 form.

NOTE: An M.S. student is expected to demonstrate a breadth of knowledge in the fundamentals of atmospheric science. Students will be examined on their core program specifically in atmospheric dynamics, atmospheric physics and chemistry, atmospheric circulation systems, and atmospheric measurements.

2. Ph.D. Students

a. Preliminary Examination

A Ph.D. student must take and pass the preliminary examination generally within 12 months of defending the M.S. (or within 18 months of admission to the Ph.D. program, if the student completed the M.S. in another department). The outcome of the exam is reported to the department and Graduate School within two working days using the GS16 form.

The preliminary examination is administered by the student's graduate committee. The overall purpose of the preliminary examination is to evaluate the student's knowledge of the field and their ability to independently formulate and propose a research project.

A Ph.D. student, in conjunction with their adviser, should begin forming a graduate committee as soon as possible after their admission to the Ph.D. program, normally in the first semester. The GS 6 form is used to report the composition of the graduate committee and the proposed plan of study.

The preliminary examination consists of the following.

i. Research Prospectus

1. Purpose of the Prospectus

The purpose of the prospectus is to evaluate the student's ability to independently formulate and propose a research project.

2. Prospectus Elements

- a. A clear statement of the problem and its broader significance
- b. A summary of the existing literature and its relevance to the specific problem being addressed
- c. A description of the tools, assumptions or understanding that represents the starting point of the proposed research
- d. A description of the planned research and an explanation of how each research step will contribute to the desired outcome
- e. A work plan that demonstrates a realistic understanding of the extent of the work involved
- f. A summary detailing the expected benefits that will result from the research
- g. A financial budget or statement of resources is not necessary

3. The prospectus should be submitted to the graduate committee three weeks prior to the scheduled written portion of the exam.

4. Prospectus Guidelines

- a. The prospectus should be no more than 10 pages long using single-spaced text with a 12-point font. The 10 pages do not include the title page or the references but otherwise include all text and figures. References should be listed separately at the end of the prospectus.
- b. The subject of the prospectus may be generally discussed with the advisor prior to writing the prospectus but the subject is ultimately at the discretion of the student.
- c. As stated above, the purpose of the prospectus is to evaluate the student's ability to independently formulate and propose a research project. While interactions with the advisor or other committee members are not forbidden during the writing process, it is incumbent upon the student to ensure that the main objective of the prospectus, the demonstration of independent capabilities, is not compromised by these interactions. For example, having the advisor or other students read the Prospectus and comment upon the content prior to submission is in clear contradiction of the objectives. Asking the advisor if a certain data set that might be useful for the research is available, on the other hand, would not be considered a problem. Interactions with the CSU Writing Center (intended to aid non-native English speakers) are permissible as long as they do not impact the scientific content of the prospectus.

ii. Written Questions

1. Purpose of the Written Questions

The primary purpose of the written questions is to test the student's ability to use their understanding of topics pertaining to their field of research to synthesize and process complex information by critically analyzing the research literature through the use of written arguments, appropriate equations and current theory.

2. Written Questions

- a. The graduate committee will meet and together develop three questions. The external graduate committee member is not required to attend this meeting.
- b. At least one of the three questions must be based on one or more journal articles from the literature that fall within the general research area(s) of the student. In the context of the journal article(s), the questions may require the student to, among other things, critically review the article(s), place the article(s) in the broader context of the field, perform back-of-the-envelope calculations, defend a statement

from first principles, discuss how to apply ideas in the article(s) to a different situation, etc.

- c. The student may use any reference materials required to answer the questions, but may not consult with other persons.
- d. The student has 48 hours to prepare and submit written answers to the questions.

iii. Oral Examination

1. Purpose of the Oral Examination

The purpose of the oral examination is to provide an opportunity for the students' graduate committee to ask questions about the student's prospectus, their responses to the written questions, and related topics in the student's area(s) of research.

2. Oral Examination Elements

- a. The oral examination will begin with a presentation of the prospectus by the student. If uninterrupted, the student's presentation should last 15-20 minutes (but no longer than 20 minutes).
- b. If the graduate committee chooses to ask questions during the presentation, the graduate committee chair is charged with ensuring that the student is able to finish their presentation in a reasonable amount of time.
- c. The graduate committee can then ask questions about the responses to the written questions and other questions in the student's area(s) of research.

3. Oral Examination Guidelines

- a. The total length of the oral examination cannot exceed 2 hours.
- b. An upper limit of 1 hour is placed on the discussion of the prospectus.

iv. Grading of the Exam

1. Each of the three portions of the exam (i.e., prospectus, written questions, and oral examination) are weighted equally and each will be graded by the graduate committee as either "satisfactory" or "unsatisfactory". Outcomes of the full exam may be PASS, FAIL or PARTIAL PASS.
 - a. Three "satisfactory" ratings will be given a PASS.
 - b. Two "satisfactory" and one "unsatisfactory" ratings will be given a PARTIAL PASS.
 - c. One or zero "satisfactory" ratings will be given a FAIL.
2. A PARTIAL PASS on the preliminary exam may require additional follow-up with the graduate committee as will be documented in a department memo - but will be considered a pass according to the Graduate School (as specified in the GS 16 form). Any follow-up requested by the graduate committee must occur within 6 months or less (to be specified by the graduate committee in the department memo) following the oral examination.
3. If a student FAILS the preliminary exam, s/he may be eligible for one re-examination. However, re-examination must be endorsed by the graduate committee on the GS 16 form and must be completed within six months of the first attempt. Conditions to be met before re-examination are documented on the GS 16 form.
4. A student who passes the preliminary exam will change status from Ph.D. I to Ph.D. II. The department requires a memo from the student's advisor to be notified of this change.

v. Notification of Exam

1. The student is responsible for arranging a time and place for the oral portion of the preliminary exam after consultation with their graduate committee.
2. The student must notify the graduate adviser no later than three weeks prior to the exam. The date, time and place of the preliminary examination will be announced to all Atmospheric Science academic faculty members one week prior to the examination. The preliminary examination shall be administered at least two terms before the final examination. It is the candidate's responsibility to comply with these notifications.

vi. Extenuating Circumstances

1. The student is expected to make every effort to comply with departmental timelines for admission and for passing the preliminary examination. However, in some cases, there may be extenuating circumstances that require modification of these timelines or the exam format itself. In such cases, the student and adviser may petition, in writing, to the Department Graduate Committee, outlining the reasons for the request and the proposed

modified timetable and/or exam format. The department head will approve or deny the request.

2. Violation of departmental requirements and timetables will be considered grounds for dismissal from the program.

b. Proposal Assessment Committee Meeting

The purpose of this formal meeting of the student's graduate committee is to evaluate the ability of the graduate student to successfully conduct the research for a Ph.D. dissertation. At this point in time, students must demonstrate a capability to perform original, creative, and meaningful research to the graduate committee and other academic faculty in attendance before they may be considered a candidate for the doctoral degree. In particular, students must propose (either orally or in writing) a specific research program for the Ph.D. and defend its purpose, scope, scientific value, and overall credibility. This committee meeting shall take place about 6-12 months after the preliminary exam.

The committee shall meet as many times as necessary to reach a conclusion. As a result of the committee's evaluation, the adviser will write a memorandum to the department head indicating that the committee is either satisfied or not satisfied with the student's proposed research program.

c. Final Ph.D. Examination

Upon completion of the dissertation, the Ph.D. candidate's graduate committee and other participating faculty administer an oral examination in which the candidate defends the dissertation. The exam outcome is reported to Graduate School within 2 working days via the GS24 form.

N. Thesis/Dissertation Requirements

Unless specifically authorized by their adviser/supervisor, students are expected to make independent arrangements for drafting of their theses and must adhere to the format specified in the [Graduate School Thesis Manual](#). The department assumes no responsibility for the mechanics of thesis preparation.

1. M.S. Degree (Plan A):

A complete, typed final draft of the thesis must be submitted to the student's committee at least four weeks before the final examination.

2. Ph.D. Degree

A complete, typed final draft of the candidate's dissertation must be submitted to the student's committee at least four weeks before the final examination.

O. Academic Appeals Procedures

Appeals of academic decisions made at the departmental level will include but are not limited to decisions on grades and other academic aspects of a course or academic program involving evaluation of a student. Academic decisions are not themselves disciplinary and are not to be confused with decisions on academic dishonesty or other kinds of misbehavior that may affect courses or programs. Appellate procedures of academic decisions should make clear that they do not apply to other types of procedures.

Appeals must be initiated no later than the end of the next regular academic term (either fall or spring semester) following the academic decision being appealed. Before making an appeal, the student should discuss the situation with the faculty member(s) involved in the decision.

In appeals of academic decisions, the burden of proof lies with the student. The student must demonstrate that the decision was one of the following:

1. A decision based on some basis other than performance.
2. A decision based on unreasonable standards different from those which were applied to other students.
3. A decision by a substantial, unreasonable, and unannounced departure from previously articulated standards.

Only parties directly involved in the dispute or called to provide information may be present during the hearings.

If discussion with the faculty member(s) fails to resolve the situation, the student will have access to the steps that follow:

1. The student may submit a statement in writing to the department head setting out the basis for the appeal with appropriate documentation. The department head will respond in writing to all parties within a reasonable time as stipulated in the department code. If the department head's response is unacceptable to the faculty member(s) or the student, either party may then appeal (in writing) to a departmental appeals committee, setting out the basis for the appeal.
2. The department appeals committee shall consist of two academic faculty members and two graduate students from the Department of Atmospheric Science: (a) the associate department head, (b) one other faculty member appointed by the department head, (c) one M.S. student representative appointed by the department head, and (d) one Ph.D. student representative appointed by the department head. In the event that any of the members of the committee are parties to the appeal, the department head would appoint an appropriate alternate.
3. Any appeal of the committee's findings will be made in writing to the dean of that department's college wherein the student or faculty member(s) will stipulate the basis for the appeal. The academic dean should hear the case within a reasonable time, and the Dean's decision is to be communicated in writing to all parties.
4. Any appeal of the dean's findings will be made in writing to the provost/academic vice president setting out the basis for the appeal. The provost/academic vice president should make a determination within a reasonable time. The decision of the provost/academic vice president will be final.
5. In the event that parties to the appeal are absent from campus, additional time may be given for the appeal.

Remedies, if any, for the appeal will be stipulated in writing by the deciding party at each step. Such remedies may include but are not limited to:

1. Change of grade.
2. Directing the instructor(s) to administer a new examination or term paper.

Brief records of the hearing and decisions at each level will be kept. These records will be forwarded to the next step in the appeal process if the appeal continues. Hearings and findings are confidential.

P. Summary of Procedures for M.S. and Ph.D. Degrees

Steps		Due Date
1	Online application for admission (M.S. and Ph.D. candidates)	6-12 months before first registration
2	Appointment of adviser (M.S. and Ph.D. candidates)	At time of admission
3	Selection of graduate committees (M.S. and Ph.D. candidates)	At the start of your third semester
4	Filing of Program of Study (GS 6 form) (M.S. and Ph.D. candidates)	Before fourth regular semester registration (about October for spring registration; about April for fall registration)
5	Announcement of preliminary examination (Ph.D. candidates)	To department office 2 weeks in advance of target date
6	Preliminary examination (Ph.D. candidates)	Within 12 months of M.S. (within 18 months of starting the Ph.D. program for those not completing an M.S. in our graduate program)
7	Report of preliminary examination (GS16 form) (Ph.D. candidates)	Within 2 working days after preliminary exam
8	Changes in committee (GS9A form) (M.S. and Ph.D. candidates)	When change is made (REMINDER: If any committee member cannot attend an exam, a substitute must be approved by Graduate School prior to the exam)
9	Proposal assessment committee	Typically 6-12 months after the preliminary exam

	(Ph.D. candidates)	
10	Application for Graduation (GS25 form) (M.S. and Ph.D. candidates)	Second week of graduation term for fall and spring semesters; first week of eight-week summer term (any changes in course work submitted on the GS6 must be corrected on this form)
11	Submit thesis/dissertation to committee (M.S. and Ph.D. candidates)	4 weeks prior to final exam
12	Announcement of final exam (M.S. and Ph.D. candidates)	2 weeks prior to final exam; submit title and abstract to Graduate Adviser at least one day before for faculty announcement
13	Report of Results of Final Exam (GS24 form) (M.S. and Ph.D. candidates)	Within 2 working days after oral exam; for written exams, by the end of the 11th week of the graduation term for fall and spring and by the end of the fifth week of the eight-week summer term
14	Present signed thesis/dissertation to Graduate School (M.S. and Ph.D. candidates)	By the end of the 11th week of the graduation term for fall and spring; by the end of the fifth week of the eight-week summer term

IV. FINANCIAL ASSISTANCE AND COSTS

A. Financial Assistance

Financial assistance to graduate students is an integral part of the atmospheric science program, with 60 to 70 research and teaching assistants normally supported by faculty research programs and the department on instructional duties. One quarter to one third of these appointments usually become available annually to new students.

1. Graduate Research Assistantships

Graduate research assistantships (GRAs) normally are awarded to qualified students for the nine-month academic year commencing with the fall semester but a few appointments may be awarded later in the year due to attrition or the initiation of new research projects. Applications for financial support are considered separately, after the student's eligibility for admission is determined. Invariably, more requests are received for financial assistance than can be supported, so the selection of graduate research assistants is quite competitive. The award decisions are generally made during the spring semester, to begin the following fall, when the availability of research funds for the next academic year has become fairly well established and sufficient applications have been received to select students on a relative merit basis.

The M.S. program is designed so that a student can complete the course and thesis requirements in 24-30 months. M.S. candidates generally receive graduate research assistantship support for this entire period, subject to availability of funds. Students must maintain a cumulative GPA at CSU of 3.0 or better to receive a GRA.

Students on a half-time graduate research assistantship are expected to work a minimum of 20 hours per week on their research. However, graduate research assistants should not conclude that their research obligations may be satisfied by working a certain number of hours per week, nor that they are being paid to work a fixed number of hours and no further effort is necessary. They are working toward a degree, and by virtue of the availability of faculty-generated research projects that provide for reimbursed student participation, they are being afforded an opportunity for financial support while acquiring a graduate education. The more rapidly they advance in their work, the sooner they will obtain their degrees and be in a position to seek gainful employment.

Assistantships are effective from either the first or 16th of the month for which they are awarded, depending upon the date the student reports for work in accordance with instructions received from the principal investigator. These positions are not automatically renewed from one year to the next but are dependent upon the availability of funds, satisfaction of the principal investigator with the student's research performance, and the maintenance of academic eligibility by the student. The department requires 30 days' notice from the student in the case of a contractual cancellation, this in turn being the department's responsibility should student funding become unavailable. If students should fail to fulfill their research commitments, the assistantship may be terminated, again with 30 days' notice.

Graduate research assistants are required to register for at least one research credit each semester and must be assigned a grade by the responsible principal investigator who measures the student's research performance. Any grade of "U" (or letter grade lower than "B") in either ATS 699 or ATS 799 for two successive semesters will result in loss of the assistantship regardless of academic standing or other considerations.

Graduate research assistant pay scales vary according to a student's level (M.S. or Ph.D.) and a student's advancement within that level. Advancement of a Ph.D. candidate from level 1 to level 2 is dependent upon the principal investigator's satisfaction with the student's research progress, and the student passing the Ph.D. preliminary examination.

In general, graduate research assistants are paid on a half-time basis during the academic year and on a three-quarter-time basis during the summer months, depending on the availability of funds and mutual agreement between the advisor and the research assistant. Thus an M.S. student typically receives \$36,430 during a 12-month period, while a Ph.D. Level II student receives \$39,501. In addition to paid holidays, up to two weeks of leave per year may be provided. Stipends received by graduate research assistants are subject to income taxes.

Graduate research assistants from states other than Colorado can generally qualify for Colorado residency after one year, as can non-citizens who are permanent residents of the United States (with green card). All eligible students are expected to attain Colorado residency by the beginning of their second year of graduate study.

Graduate Research Assistantship Stipends*

(Academic Year 2022-2023)

		Monthly Rate	
		16 Aug – 15 May	16 May – 15 Aug
		50% Time	75% Time
MS II		2,699	4,048
PhD I		2,765	4,147
PhD II		2,926	4,389

*See [Section IV B Tuition and Fees](#). Twelve-month stipend assumes three-quarter time GRA during summer, half-time GRA during academic year. Rates above apply to students entering the program after August 1, 2022.

During periods between semesters or when the university administrative offices may be closed and classes are not in session, graduate assistants usually concentrate on their research work. To the extent that the adviser and department head concur, graduate research assistants may use such periods for leave without pay from campus. Alternatively, to the extent that they fulfill their research commitments to the principal investigator's satisfaction by prior overtime work, graduate students may be authorized compensatory time off during such periods.

The **Statement of Leave Policy for Graduate Research Assistants** is as follows:

Graduate research assistants are entitled to specific paid holidays as specified in the University General Catalog calendar. Normally, these holidays include:

- Independence Day (1)
- Labor Day (1)
- Thanksgiving (2)
- Christmas (3)
- New Year's Day (1)
- Martin Luther King's Birthday (1)
- Memorial Day (1)
- Juneteenth (1)

There are no paid vacation days, in addition to those above, for graduate research assistants. Any additional time off or absence from the location of employment must have the explicit permission from the student's adviser. In all cases, this leave beyond the official holidays would be classified as "comp time" and would be made up either prior to or following the leave.

As part-time employees of the university, graduate research assistants are not entitled to all of the fringe benefits extended to full-time staff members such as paid annual or sick leave, holidays, etc. However, they are covered by the university's travel and liability insurance policies, and are covered by worker's compensation.

Pursuant to Colorado State Statute, CRS 24-19-104, all graduate assistants are "employees at will" and their employment is subject to such pre-termination due process as may be required under the circumstances of each case. The provost/academic vice president must review and approve any recommendations concerning the termination of graduate assistants on any grounds, except for termination at the end of the stated employment period. The provisions of this section shall not be interpreted to authorize the termination of any graduate assistant for any reason that is contrary to applicable federal, state or local law.

2. Graduate Teaching Assistantships

A limited number of graduate teaching assistantships supported by funds provided to the department will generally be available to qualified students each semester for the nine-month academic year. These positions provide students with an opportunity to acquire teaching experience as a classroom assistant to the faculty instructor. Some classes may require that students develop and present lectures, laboratories, and discussion materials. Courses to which graduate teaching assistants may expect to be assigned include ATS 150, ATS 350, ATS 351, ATS 555, ATS 560, ATS 601, ATS 602, ATS 605, ATS 606, ATS 620, ATS 621, ATS 622, ATS 640, ATS 641, ATS 650, ATS 652 and ATS 655.

Graduate teaching assistantships normally are rotated among atmospheric science graduate students on a semester basis in order that a greater number may share in this opportunity to gain instructional experience. Inasmuch as most

students are also graduate research assistants with research obligations to meet, departmental teaching assistantships are provided by a flat rate of \$630 per month.

Graduate teaching assistants who are graduate research assistantships are required to register for at least one credit in Supervised College Teaching, ATS 784, during the semester in which they are appointed.

3. Fellowships

Students are encouraged to secure fellowships. Additionally, a number of government agencies and private industries offer long-range training programs in which employees receive full pay while pursuing an advanced degree at a university of their choice.

Each year, the federal government, through various agencies, (e.g., National Science Foundation) sponsors several hundred merit graduate fellowships in the physical sciences which are awarded to U.S. applicants. Applications must be submitted by early November for the following academic year. Awards are made during spring for a maximum of three years. The [NSF Graduate Research Fellowship Program](#) website has additional information.

Foreign students can sometimes obtain fellowships from their respective governments or from a sponsoring agency such as AID (Agency for International Development) or the African American Institute (AFGRAD).

The American Meteorological Society also provides a number of graduate fellowships. Students are encouraged to contact the AMS to learn about these opportunities.

B. Tuition and Fees

NOTE:

The Governing Board for Colorado State reserves the right to change the schedule for tuition and fees at any time. The most current listing of tuition and fees can be found at the [Office of Financial Aid's website](#).

Full-time tuition is presently (academic year 2022-2023) \$5,417.10 per semester for Colorado residents, and for out of state students \$13,282.20 per semester. In addition, students pay fees of \$1,498.01 per semester which are for the student center, student recreation center, student activities, health network access, alternative transportation, athletics, the stadium, and the auditorium gymnasium complex. Students are also responsible for any applicable special course fees.

In accordance with a nationwide trend, graduate student tuition is not waived for graduate research assistants at Colorado State University. However, federal auditors have ruled that these tuition costs may be borne by the research contract or grant used to support the student's research. Thus, tuition costs need not be paid directly by the graduate research assistant. Because of the large difference between resident and nonresident tuition, all U.S. resident graduate research assistants are required to petition for Colorado resident status as soon as possible (normally after one year of attendance at Colorado State University).

Graduate research assistants enrolled in at least 5 credits will receive a health insurance premium from Graduate School.

Fees are charged directly to the graduate research assistant. Fees are the same for Colorado residents and nonresidents.

V. STUDENT REPRESENTATION/PARTICIPATION

Each year three M.S. and three Ph.D. student representatives are elected by the graduate students of the department. The student representatives provide input at faculty meetings that is considered in department policy decisions.

Students are encouraged to voice their opinions on current topics in meetings of the student body. Student representatives then bring these matters to the attention of the faculty.

Weekly colloquia keep students informed of current research activities and provide opportunities to present their own work.

VI. COURSE PROGRAM

A. Course Number System

100 - 499 Primarily for undergraduate students

500 - 699 Primarily for graduate students

700 - 799 Graduate students only

Credits (example): 4 (2 2 1) The first figure indicates total credits for this course, the second figure lecture hours per week, the third figure laboratory hours per week, and the fourth figure discussion/recitation hours per week.

Prerequisites: Consent of instructor is implied whether so stated or not. Prerequisites may be met by presenting evidence of credits earned in equivalent courses or by demonstrating knowledge equivalent to indicated prerequisites.

B. Orientation and Service Courses

Course	Title	Credits	Requisites	Description	Offered
150	Physical Basis of Climate Change	3 (3-0-0)	None	Energy budget of the earth, the greenhouse effect, carbon cycle, paleoclimate, projections of 21 st century climate	Spring
350	Introduction to Weather and Climate	2 (2-0-0)	None	Behavior of the atmosphere and its influence upon man's activities	Fall
351	Introduction to Weather and Climate Laboratory	1 (0-3-0)	ATS 350 or concurrent registration	Actual weather data, visualization of meteorological phenomena, in-depth discussion of current environmental issues	Fall
495	Independent Study	Varies	Varies	General Atmospheric Science	
543	Global Climate Change	2 (2-0-0)	BZ 300 to 499 or CHEM 300 to 499 or ECOL 300 to 499 or LIFE 300 to 499	Climate change science, climate change impacts, and climate change mitigation, including discussions of current topics in climate change.	Spring
555	Air Pollution	3 (3-0-0)	CHEM 113, MATH 261 or MATH 340, PH 122 or PH 142	Nature, ambient concentrations, sources, sinks, and physiological activity of pollutants; meteorology; legislation; social and economic factors	Fall even years
556	Climate Intervention to Cool a Warming Planet	2 (2-0-0)	None	Introduction to the climate system and its modification by human activities, different potential climate intervention methods, and the social, legal and political issues salient to the topic.	Spring
560	Air Pollution Measurement	2 (1-3-0)	CHEM 114	Examination and application of techniques for air pollution measurement; includes sampling and analysis of gases, aerosols, and precipitation	Spring odd years
580	Experimental Courses in Atmospheric Science	Varies	Varies	Courses that have been recently offered: ATS 580A4 Geoengineering the Climate (Spring 2019/20) (Now ATS 556)	Spring
581	Experimental Courses in Atmospheric Science	Varies	Varies	Courses that have recently been offered: ATS 581A1 Science, Policy and Management of Environmental Issues (Fall 2015) ATS 581A2 Chemical Kinetics and Photochemistry of the Atmosphere (Fall 2019)	Fall

C. Basic M.S. Level Courses

Course	Title	Credits	Requisites	Description	Offered
601	Atmospheric Dynamics I	2 (2-0-0)	MATH 261, MATH 530	Momentum, continuity equations; circulation, vorticity, thermodynamics; boundary layer; synoptic scale motions in midlatitudes	Fall
602	Atmospheric Dynamics II	2 (2-0-0)	ATS 601	Sound waves, gravity waves, Rossby waves; numerical weather prediction; baroclinic instability; general circulation; tropical dynamics	Spring
604	Atmospheric Modeling	3 (3-0-0)	ATS 601	Design of numerical models of the atmosphere and applications to current problems; emphasis is on a practical understanding of relevant numerical methods	Fall odd years
605	Atmospheric Circulations	3 (3-0-0)	ATS 602 or concurrent registration	Observations and theory of the general circulation of the atmosphere, with emphasis on understanding physical mechanisms	Spring odd years
606	Introduction to Climate	2 (2-0-0)	MATH 261 and MATH 530	Exchanges of energy, water, and momentum through the atmosphere, surface, vegetation, and oceans. Climate variability, feedback processes, paleoclimates, and climate change	Spring
607	Computational Methods for Atmospheric Science	3 (2-1-0)	ATS 601 or concurrent registration	Covers computer programming tools unique to and common in the atmospheric sciences	Spring
610	Physical Oceanography	3 (3-0-0)	None	Foundations of ocean circulation theory and the general circulation of the oceans using observational data and rotating tank experiments	Fall
620	Thermodynamics and Cloud Physics	2 (2-0-0)	MATH 340, PH 142	Equilibrium thermodynamics, cloud microphysics, cloud dynamics, precipitation formation, and cloud electrification	Fall
621	Atmospheric Chemistry	2 (2-0-0)	CHEM 114, MATH 340, PH 142	Overview of chemical kinetics and equilibria; sources and sinks of pollutants; photochemistry and smog formation; aqueous-phase chemistry; acid rain	Fall
622	Atmospheric Radiation	2 (2-0-0)	ATS 620, ATS 602 or concurrent registration	Terrestrial, solar radiation propagation in the atmosphere; radiative components in energy budgets, weather systems, climate studies; remote sensing	Spring
623	Atmospheric Boundary Layer	2 (2-0-0)	ATS 601 or concurrent registration	Equations for shallow atmospheric motions; thermal instability of a fluid layer; atmospheric turbulence; flow stability; 1-D mixed layer models	Spring even years
631	Introductions to Atmospheric Aerosols	2 (1-3-0)	None	Physical, chemical, and microphysical characteristics of atmospheric particulate matter; measurement principles and techniques	Spring
632	Interpreting Satellite Observations	2 (1-3-0)	ATS 621; ATS 622	Broad theoretical and practical overview of satellite observations of atmospheric composition. Introduction to the theoretical foundations of satellite composition retrievals of both gases and aerosols, and the associated strengths and weaknesses of commonly used atmospheric products	Spring
640	Synoptic Meteorology	2 (1-2-0)	ATS 601 or concurrent registration	Synoptic-scale weather systems; moist and dry atmospheric variables; static stability; vertical motion; fronts; cyclones and anticyclones	Fall
641	Mesoscale Meteorology	2 (1-2-0)	ATS 640	Mesoscale weather systems; mesoanalysis techniques; upper- and low-level jets; instabilities; dynamics of convective storms; organized	Spring

				convection	
650	Measurement Systems and Theory	2 (2-0-0)	PH 142, STAT 301	Surface and upper air measurement systems; theory and system response, sensor design; automated data collection, analysis and display systems	Fall
651	Data Assimilation	3 (3-0-0)	MATH 530, MATH 340, STAT 301	Methods for combining theoretical understanding encoded in complex weather and climate models with real-world observations. Applications include weather prediction and other problems in the geosciences.	Spring odd years
652	Atmospheric Remote Sensing	2 (2-0-0)	ATS 622	Concepts of electromagnetic and acoustic wave propagation; active and passive remote sensing techniques including radar, lidar, thermal emission systems	Fall even years
655	Objective Analysis in the Atmospheric Sciences	3 (3-0-0)	MATH 531	Objective analysis of geophysical data: general statistics; matrix methods; time series analysis, with emphasis on applications to real world data	Spring
680	Experimental Graduate Courses in Atmospheric Science	Varies	Varies	Courses that have recently been offered: ATS 680A3 Social Responsibility in Atmospheric Science (Fall 2021) ATS 680A6 Applied Numerical Weather and Prediction (Fall 2013) ATS 680A7 The Global Nitrogen Cycle (Fall 2015)	Fall
681	Experimental Graduate Courses in Atmospheric Science	Varies	Varies	Courses that have recently been offered: ATS 681A3 Introduction to Climate Variability ATS 681A4 Mountain Meteorology (Spring 2018) ATS 681A5 Upper-Air Soundings in Atmospheric Research (Spring 2018) ATS 681A6 Introduction to Causal Discovery (Fall 2021)	Spring
693	Responsible Research in Atmospheric Science	1 (1-0-0)		Scientific misconduct; ethical publishing; record keeping; data management; professional skills applicable to atmospheric science	Spring
695	Independent Study	Varies		General Atmospheric Science	
699	A-V Thesis	Varies		ATS 699A Global Climate Change (M. Rugenstein) ATS 699B Land-Atmosphere Interactions (S. Denning) ATS 699C Tropical Meteorology (M. Bell) ATS 699D Weather Systems (R. Schumacher) ATS 699E Remote Sensing (C. Kummerow) ATS 699F Ocean-Atmosphere Interactions (E. Maloney) ATS 699G General Circulation (D. Randall) ATS 699I Atmospheric Chemistry (S. Kreidenweis) ATS 699J Aerosol and Cloud Microphysics (J. Pierce) ATS 699L Data Assimilation (P.J. Van Leeuwen) ATS 699M Mesoscale Meteorology (K. Rasmussen) ATS 699O Mesoscale Modeling (S. van den Heever) ATS 699P Radiation Theory (C. Chiu) ATS 699Q Radar Meteorology (S. Rutledge) ATS 699R Aerosol & Cloud Chemistry (J. Collett) ATS 699S Climate Dynamics (D. Thompson) ATS 699T Climate Analysis (J. Hurrell) ATS 699U Tropospheric Chemistry (E. Fischer) ATS 699V Atmospheric Variability (E. Barnes)	

D. Ph.D.* and Advanced M.S. Level Courses

*700 level courses are usually taught in alternate years. However, this is merely a general planning guideline in that the frequency with which all courses are offered is dependent upon the demand; even in its absence, a special reading course can be arranged to satisfy the needs of individual students who might otherwise be deprived of an opportunity to take a particular course critical to their program.

Course	Title	Credits	Requisites	Description	Offered
703	Numerical Weather Prediction	2 (2-0-0)	ATS 602	Quasi-geostrophic approximation; barotropic, baroclinic, primitive equation, and general circulation models; numerical methods	Fall even years
704	Large-scale Atmospheric Dynamics	2 (2-0-0)	ATS 602	Quasi-static, quasi-geostrophic equations; planetary waves; geostrophic adjustment; barotropic, baroclinic instability; frontogenesis; tropical cyclones	Fall odd years
708	Middle Atmospheric Dynamics	3 (3-0-0)	ATS 602	Dynamics of the stratosphere and mesosphere with emphasis on the lower and middle stratosphere	Spring
710	Geophysical Vortices	3 (3-0-0)	ATS 602	Dynamical and thermodynamical structure of geophysical vortices from observational, experimental, and theoretical viewpoints. Topics covered include two-dimensional vortex dynamics, invertibility principle, Green functions, point vortex and moment idealizations, vortex axisymmetrization, vortex merger, two-dimensional and three-dimensional quasi-geostrophic turbulence, vortex Rossby waves, Eliassen's balanced vortex model, Ooyama's 1969 hurricane model, Spin down at small and large Rossby number, asymmetric balance (AB) theory, vortex alignment, tropical cyclogenesis and intensification via convectively forced vortex Rossby waves, tornadoes, water spout and dust devils	Fall odd years
712	Dynamics of Clouds	3 (3-0-0)	ATS 623	General theory of cloud dynamics; parameterization of microphysics and radiation; models of fog, stratocumuli, cumulonimbi, and orographic clouds	Fall even years
715	Atmospheric Oxidation Processes	2 (2-0-0)	ATS 621	Atmospheric hydrocarbon and nitrogen oxide reactions; aqueous phase scavenging and reactions; chemical pathways in the atmosphere	Fall odd years
716	Air Quality Oxidation Processes	2 (1-2-0)	ATS 560 or either ATS 555 or ATS 621	Students plan, execute, and report on a measurement campaign to characterize local air quality	Spring
721	Theoretical Topics in Radiative Transfer	3 (3-0-0)	ATS 622	Physics of atmospheric radiation; theoretical techniques used to show radiation transfer equation	Fall
722	Atmospheric Radiation and Energetics	3 (2-0-1)	ATS 622	Radiative transfer in the atmosphere; implications on remote sensing and energetics	Spring odd years
724	Cloud Microphysics	2 (2-0-0)	ATS 621	Theories and observations of nucleation; cloud droplet spectra broadening; precipitation growth and breakup; ice multiplication; cloud electrification	Spring odd years
730	Mesoscale Modeling	3 (3-0-0)	ATS 602,	Development of basic equations used in mesoscale	Spring

			ATS 632	models and methodology of solution	even years
735	Mesoscale Dynamics	3 (3-0-0)	ATS 602	Analysis of physical and dynamical processes that initiate, maintain, and modulate atmospheric mesoscale phenomena	Fall odd years
737	Satellite Observation of Atmosphere and Earth	3 (3-0-0)	ATS 622, ATS 652	Satellite measurements; basic orbits and observing systems; applications of remote probing and imaging to investigations of atmospheric processes	Spring even years
740	Atmospheric Electricity	2 (2-0-0)	ATS 620	Foundations of atmospheric electricity, including global electric circuit and the role of thunderstorms in maintaining this circuit, thunderstorm electrification processes based on non-inductive charging theory, lightning detection based on RF and optical sensing, and lightning phenomena including Transient Luminous Events.	Spring odd years
741	Radar Meteorology	3 (3-0-0)	ATS 652	Radar systems; radar equation and applications; multiple Doppler observation and processing; radar studies of mesoscale systems	Spring odd years
742	Tropical Meteorology	2 (2-0-0)	ATS 601, ATS 602, ATS 606	Overview of the tropical atmosphere, monsoons, intraseasonal variability, hurricanes, theory of tropical convection and the large-scale circulation	Spring odd years
743	Interaction of the Ocean and Atmosphere	3 (3-0-0)	ATS 601, ATS 602	Ocean-atmosphere interactions in observations, theory, and models. Time mean atmosphere-ocean circulations through climate variability and change	Spring odd years
745	Atmospheric General Circulation Modeling	3 (3-0-0)	ATS 602, ATS 605	Theories of the atmospheric general circulation. Numerical modeling findings. Index cycles, blocking action, transient vs. standing wave activity	Fall even years
750	Climate Dynamics: Atmospheric Variability	3 (3-0-0)	ATS 605, ATS 655	Analysis and interpretation of large-scale variability and observed climate change	Fall even years
752	Inverse Methods in Atmospheric Science	2 (2-0-0)	Ph.D. standing in ATS or written permission of instructor	Provides an introduction to inverse modeling, with application to remote sensing retrievals, flux inversions, and data assimilation	Fall even years
753	Global Hydrologic Cycle	(3-0-0)	ATS 601, ATS 622 or ATS 652	Hydrologic cycle; moisture transport and air-ground exchange; water budgets of meteorological phenomena; climatology of atmospheric water	Spring odd years
755	Theoretical and Applied Climatology	(3-0-0)	ATS 606	Current topics in climate research	Fall even years
760	Global Carbon Cycle	2 (2-0-0)	ATS 606	Exchanges of CO ₂ between the atmosphere, the land surface, and oceans; biogeochemical processes; micrometeorological and inverse flux estimation	Fall odd years
761	Land-Atmosphere Interactions	2 (2-0-)	ATS 606	Exchange of energy, water, momentum, and carbon between the land surface and the atmosphere	Fall
762	Biosphere-Chemistry-Climate Interactions	2 (2-0-0)	ATS 621	Explore the sensitivity of the climate system to atmospheric chemical composition with emphasis on connections to biospheric processes and feedbacks	Spring odd years
772	Aerosol Physics, Chemistry, Clouds & Climate	3 (3-0-0)	CHEM 114, MATH 161, PH 122 or PH 142	This course provides a detailed overview of the physics and chemistry of atmospheric aerosols including composition, size, and interaction with radiation and clouds. We develop research-grade models of aerosols, clouds, and radiation.	Fall odd years

780	Experimental Graduate Courses in Atmospheric Science	Varies	Varies	The following courses have recently been offered: ATS 780A2 Meteorological Applications of GPS (Fall 2013) ATS 780A4 Atmosphere's Response to Climate Change (Fall 2014) ATS 780A5 Seminal Papers in Atmospheric and Climate Science (Fall 2015) ATS 780A6 African Storms (Spring 2021)	Fall
781	Experimental Graduate Courses in Atmospheric Science	Varies	Varies	The following courses have recently been offered: ATS 781A1 Aircraft Observations (Fall 2018) ATS 781A2 Hydrometeorology (Spring 2019) ATS 781A3 Ocean-Atmosphere as Dynamical-Statmech System (Spring 2022) ATS 781A4 Climate Sensitivity from Charney to AR6 (Fall 2021)	Spring
784	Supervised College Teaching	Varies	Prior consent of instructor, adviser, and department head	College Teaching	
786	Practicum	Varies		Practicum	
795	Independent Study	Varies		General Atmospheric Science	
796	Group Study	Varies		General Atmospheric Science	
799	A-V Dissertation	Varies		ATS 799A Global Climate Change (M. Rugenstein) ATS 799B Land-Atmosphere Interactions (S. Denning) ATS 799C Tropical Meteorology (M. Bell) ATS 799D Weather Systems (R. Schumacher) ATS 799E Remote Sensing (C. Kummerow) ATS 799F Ocean-Atmosphere Interactions (E. Maloney) ATS 799G General Circulation (D. Randall) ATS 799I Atmospheric Chemistry (S. Kreidenweis) ATS 799J Aerosol and Cloud Microphysics (J. Pierce) ATS 799 L Data Assimilation (P.J. Van Leeuwen) ATS 799M Mesoscale Meteorology (K. Rasmussen) ATS 799O Mesoscale Modeling (S. van den Heever) ATS 799P Radiation Theory (C. Chiu) ATS 799Q Radar Meteorology (S. Rutledge) ATS 799S Climate Dynamics (D. Thompson) ATS 799T Climate Analysis (J. Hurrell) ATS 799U Tropospheric Chemistry (E. Fischer) ATS 799V Atmospheric Variability (E. Barnes)	

E. Description of Course Prerequisites Other than Atmospheric Science

Course Number	Description
CHEM 113	<u>General Chemistry II</u> Acid base reactions and equilibria, kinetics, coordination compounds, and oxidation reduction chemistry
CHEM 114	<u>General Chemistry Laboratory II</u> Laboratory applications of principles covered in C 113
MATH 161	<u>Calculus for Physical Scientists II</u> Differentiation and integration of transcendental functions, sequences, series
MATH 255	<u>Calculus for Biological Scientists II</u> Derivatives and integral of functions of several variables, differential and difference equations, matrices, applications in the biosciences
MATH 261	<u>Calculus for Physical Scientists III</u> Vector functions, partial differentiation, cylindrical and spherical coordinates, multiple integrals, line integrals, Green's theorem
MATH 340	<u>Introduction to Ordinary Differential Equations</u> First and second order equations, series, Laplace transforms, linear algebra, eigenvalues, first order systems of equations, numerical techniques
MATH 531	<u>Applied Mathematics I</u> Simultaneous linear ordinary differential equations, matrices, vector analysis, and tensor analysis
PH 122	<u>General Physics II</u> Electricity including electrostatics and simple circuits; magnetism; optics; nuclear physics; radiation; biological, physical examples (non-calculus)
PH 142	<u>Physics for Scientists and Engineers II</u> Electricity and magnetism, circuits, light, optics (calculus based)
STAT 301	<u>Introduction to Statistical Methods</u> Techniques in statistical inference; confidence intervals, hypothesis tests, simple correlation and regression, one way analysis of variance

VII. ATMOSPHERIC SCIENCE FACULTY AND AREAS OF EXPERTISE

A. Academic Faculty

Faculty Member	Area of Expertise
Elizabeth A. Barnes	Ph.D., University of Washington, 2012. Associate Professor. Large-scale atmospheric dynamics, atmospheric mixing/transport, stratosphere-troposphere exchange, general circulation, atmospheric circulation.
Michael M. Bell	Ph.D., Naval Postgraduate School, 2010. Associate Professor. Tropical cyclones, radar, mesoscale and tropical meteorology.
Melissa A. Burt	Ph.D., Colorado State University, 2016. Assistant Professor and Assistant Dean for Diversity and Inclusion in the Walter Scott, Jr. College of Engineering. Atmospheric science education research, science identity, belonging, mentoring in STEM, science communication education.
Christine Chiu	Ph.D., Purdue University, 2003. Associate Professor. Remote sensing, radiative transfer, cloud-aerosol-precipitation-radiation interactions.
Jeffrey L. Collett, Jr.	Ph.D., California Institute of Technology, 1989. Professor. Atmospheric chemistry, cloud chemistry, physics.
A. Scott Denning	Ph.D., Colorado State University, 1994. Professor. Land-Atmosphere surface interaction processes, climatology.
Emily Fischer	Ph.D., University of Washington, 2010. Associate Professor. Atmospheric chemistry, chemistry climate interactions, reactive nitrogen in the Earth system.
James Hurrell	Ph.D., Purdue University, 1990. Professor and Scott Presidential Chair in Environmental Science and Engineering. Global climate change, natural climate variability, seasonal-to-decadal climate predictability, geoengineering.
Patrick Keys	Ph.D., Stockholm University, 2016. Assistant Professor. Climate change impacts, cross-scale risks, social-ecological tele-connections.
Sonia M. Kreidenweis	Ph.D., California Institute of Technology, 1989. University Distinguished Professor. Atmospheric chemistry; aerosol chemistry and physics, experimental and modeling studies of aerosol/cloud/climate interactions, visibility.
Christian D. Kummerow	Ph.D., University of Minnesota, 1987. Professor. Atmospheric radiative transfer, remote sensing of hydrological parameters.
Eric D. Maloney	Ph.D., University of Washington, 2000. Professor. Tropical meteorology, climate dynamics, ocean-atmosphere interaction.
Steven Miller	Ph.D., Colorado State University, 200. Professor, CIRA Director. Satellite and remote sensing, low-light visible sensing.
Jeffrey Pierce	Ph.D., Carnegie Mellon University, 2009. Associate Professor. Atmospheric chemistry, physics, aerosol/cloud/climate interactions.
David A. Randall	Ph.D., University of California at Los Angeles, 1976. University Distinguished Professor. General circulation modeling, climate change, planetary boundary layer, convective cloud dynamics.
Kristen L. Rasmussen	Ph.D., University of Washington, 2014. Assistant Professor. Satellite and mesoscale meteorology, global convective systems, cloud dynamics, hydrometeorology, cloud-climate interactions, high-impact weather.
A.R. Ravishankara	Ph.D., University of Florida, Gainesville, 1975. University Distinguished Professor. Ozone layer depletion, climate change, air quality.
Maria Rugenstein	Ph.D., Swiss Federal Institute of Technology, 2017. Assistant Professor. Climate dynamics, large scale ocean-atmosphere interaction, ocean heat uptake, climate sensitivity.
Steven A. Rutledge	Ph.D., University of Washington, 1983. Professor. Radar and mesoscale meteorology, precipitation physics, atmospheric electricity.
Russ S. Schumacher	Ph.D., Colorado State University, 2008. Associate Professor. Mesoscale meteorology, mesoscale convective systems, weather analysis and forecasting, the climatology of precipitation, precipitation extremes, flash floods, and societal impacts of weather.
David W.J. Thompson	Ph.D., University of Washington, 2000. Professor. Large scale atmospheric dynamics, climate change and impacts.
Susan van den Heever	Ph.D., Colorado State University, 2001. Professor. Convective storms, mesoscale meteorology, numerical modeling, cloud physics and dynamics, aerosol indirect effects.
Peter Jan Van Leeuwen	Ph.D., Delft University of Technology, 1992. Professor. Nonlinear data assimilation in high-dimensional

	geophysical systems, causality inference in complex geophysical systems, geophysical fluid dynamics and ocean circulation.
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Emeritus Faculty

Emeritus Faculty	Area of Expertise
Myron J. Corrin (deceased)	Ph.D., University of Chicago, 1946. Professor Emeritus. Atmospheric chemistry.
William R. Cotton	Ph.D., Penn State University, 1970. Professor. Numerical modeling, cloud physics and dynamics.
Stephen K. Cox	Ph.D., University of Wisconsin, 1967. Professor Emeritus. Atmospheric and solar radiation, atmospheric measurements, remote sensing.
Lewis O. Grant (deceased)	M.S., California Institute of Technology, 1948. Professor Emeritus. Precipitation physics, weather modification, mountain weather, hydrometeorology
William M. Gray (deceased)	Ph.D., University of Chicago, 1964. Professor Emeritus. Tropical meteorology, tropical cyclones.
Bernhard Haurwitz (deceased)	Ph.D., University of Leipzig, 1927. Professor Emeritus. Atmospheric dynamics.
Richard H. Johnson	Ph.D., University of Washington, 1975. Professor. Mesoscale meteorology, atmospheric convection and boundary layer meteorology.
Thomas B. McKee	Ph.D., Colorado State University, 1972. Professor Emeritus. Former Colorado State Climatologist. Climatology, atmospheric physics.
Roger A. Pielke, Sr.	Ph.D., Penn State University, 1973. Professor Emeritus. Former Colorado State Climatologist. Mesoscale modeling, weather forecasting, air quality modeling.
Elmar R. Reiter (deceased)	Ph.D., University of Innsbruck, 1953. Professor Emeritus. General circulation.
Herbert R. Riehl (deceased)	Ph.D., University of Chicago, 1947. Professor Emeritus. Tropical meteorology.
Wayne H. Schubert	Ph.D., University of California at Los Angeles, 1973. Professor. Dynamic and theoretical meteorology, parameterization of cumulus convection, planetary circulations.
Peter C. Sinclair (deceased)	Ph.D., University of Arizona, 1966. Associate Professor Emeritus. Severe storms, cumulus dynamics, thunderstorm modification, meteorological instrumentation.
Graeme L. Stephens	Ph.D., University of Melbourne, Australia, 1977. Professor Emeritus. Radiation theory, radiative parameterization, cloud/climate studies, and remote sensing
Thomas H. Vonder Haar	Ph.D., University of Wisconsin, 1968. University Distinguished Professor. Satellite meteorology, radiation physics, global climate.

B. Affiliate Faculty

Affiliate Faculty	Area of Expertise
Curtis Alexander	Ph.D., University of Oklahoma, 2010 CIRA/Earth System Research Laboratory NSF/Center for Severe Weather Research Research Associate/Co-Principal Investigator
Jeffrey Anderson	Ph.D., Princeton University, 1990 NCAR Senior Scientist Section Head
Chelsea Corr	Ph.D., University of New Hampshire, 2014 Springfield College Assistant Professor
Kenneth Davis	Ph.D., University of Colorado, 1992 Pennsylvania State University Professor
Clara Deser	Ph.D., University of Washington, 1989 NCAR Senior Scientist; Head, Climate Analysis Section
Steven Fletcher	Ph.D., University of Reading, 2004 CIRA/CSU Research Scientist III
Edwin Gerber	Ph.D., Princeton University, 2006 New York University Professor
Jen Henderson	Ph.D., Virginia Tech, 2016 Texas Tech University Assistant Professor
Wen-Chau Lee	Ph.D., University of California-Los Angeles, 1988 NCAR/EOL/Remote Sensing Facility Manager
Glen Liston	Ph.D., Montana State University, 1991 CIRA, Colorado State University Senior Research Scientist
Vivienne Payne	Ph.D., University of Oxford, 2006 Jet Propulsion Laboratory, CALTECH Research Scientist
Bret Schichtel	Ph.D., Washington University, 1996 CIRA Research Physical Scientist

APPENDIX

A. Committee Make-Up and Temporary Appointments

The committee must consist of at least three faculty members for a master's degree program and at least four for a doctoral degree program.

Committee members are as follows:

1. M.S.:
 - a. The adviser who serves as chairperson of the committee
 - b. At least one additional Atmospheric Science (ATS) academic faculty member
 - c. ATS-appointed affiliate faculty members may serve on the committee, but not replace, an ATS academic faculty member
 - d. One member from an outside department
2. Ph.D.:
 - a. The adviser who serves as chairperson of the committee
 - b. At least two additional ATS academic faculty members
 - c. ATS appointed affiliate faculty members may serve on the committee, but not replace, an ATS academic faculty member
 - d. One member from an outside department

ATS staff who are not faculty members also may serve on the committee and vote if they are given a special appointment. Individuals who are not academic faculty and do not have an affiliate or special faculty appointment but who have special expertise may serve on committees in addition to the prescribed members, but may not vote regarding examination results.

The adviser is identified and the committee is appointed through filing a GS6 form with the Graduate School. With prior written approval from Graduate School, temporary replacement of a member may be arranged. A committee substitution can be approved for the examination only. If a thesis/dissertation is to be submitted, the original committee members' signatures are required (including signatures of committee member who participates in exam virtually). Any permanent changes are recorded through the filing of a GS9A form with the Graduate School.

B. Voting Members

Individuals who are not academic faculty but who have special expertise may serve on committees in addition to the prescribed members, but may not vote at the examination unless special approval is granted.

Voting at all examinations shall be limited to the members of the student's committee, and a majority vote is necessary to pass the examination. A tie vote is interpreted as failure to pass the examination. All members of the committee must sign the examination form.

C. Conduct of Examinations

All committee members must be either present at an examination, must be represented by a replacement who has been approved in advance by Graduate School, or can participate in real time virtually. The result form is still due to Graduate School within two working days.

Examinations cannot be suspended after having begun. Once begun, unsatisfactory performance must be documented as a failure, that is, an examination cannot be postponed to give a candidate another chance at a later time.

D. Common Plan B Master's Final Examinations

If a department chooses to administer a single common examination to its Plan B master's candidates, a departmental examining committee may serve this function. Plans and arrangements for a common final examination for Plan B candidates must be on file with Graduate School in advance of the examination date. Questions relating to this option should be directed to Graduate School.

E. Due Date

The student is responsible for initiated the GS 24 form in Graduate School, which must be electronically signed by all committee members and adviser within two working days after exam results are known.

F. Relationships of Final Examinations and Papers/Theses/Dissertations

The final examination is a unique entity and, while it is traditional to base the examination on the content of the thesis or dissertation, passage of the examination and approval of any required professional paper, thesis, or dissertation are separate items and should be dealt with as such. Thus, a student may be passed on a final examination without giving final approval to the submitted thesis, dissertation, or paper. In fact, a student can pass the final examination and not receive a degree if the professional paper, thesis, or dissertation does not meet minimum standards and is not approved. In this regard, it is important to check the appropriate box on the Application for Graduation (GS25 form) stating that the appropriate document is a requirement of graduation.

The report of the final examination is still required within two working days after the results are determined and this is NOT dependent on approval of papers, theses, and dissertations.

G. Examinations

Providing the committee approves a candidate who fails the final or preliminary examination may be re-examined once and, for the re-examination, may be required to complete further work. The re-examination must be held no later than six months after the first examination. The re-examination may not be held earlier than two months after the first examination unless the student agrees to a shorter time period. Failure to pass the second examination results in dismissal from the Graduate School. (See the [Graduate Bulletin](#) for more information.)

H. Examinations Open to Public

Both dissertation defenses and thesis presentations are open to all members of the university community and the public at large.

I. Preliminary Exam Timeline

	STUDENT	ADVISER	COMMITTEE MEMBERS	DEPARTMENT OFFICE
Up to 3 months prior to prelim date	Notify committee members and arrange acceptable date for prelim, reserve a room			
As soon as the prelim date is confirmed (at least 3 weeks prior to exam)	Notify graduate adviser of date, time and location	Contact committee members to arrange prep of 3 questions, confirm date of written exam	Prepare potential written questions and submit to adviser before written exam date	
More than 2 weeks prior to written exam date	Fill out GS6 Program of Study on RAMweb ; discuss timing of written exam with graduate adviser	Contact student about date of written exam (written prelim exam can be arranged for anytime between 8:30 a.m. to 5:00 p.m., M, T, W)		
At least 3 weeks prior to written exam	Submit written prospectus to advisor, committee members			
1 day prior to written exam		Submit questions (email) to graduate adviser		
Date of written exam (approx. 10 days prior to prelim)	Receive written questions via email from graduate adviser			Have questions ready to send via email at agreed-upon time

48 hours after written exam	Submit written solutions to graduate adviser 48 hours after receiving			Send copies of exam solutions to adviser and committee members; cc student
At least one week before prelim exam	Initiate GS16 Preliminary Exam Results form in <u>RAMweb</u> .			Prepare internal preliminary exam memo
Date of prelim exam	Relax!		Decide on results and recommendation	Approve GS16 Prelim Exam Results form so committee members will receive system emails
Immediately after the end of the exam		Electronically sign GS16 Prelim Exam Results form within 48 business hours	Electronically sign GS16 Prelim Exam Results form within 48 business hours	Ensure GS16 Prelim Exam Results form is signed by all committee members
Within a week of exam		Submit completed internal preliminary exam results memo to graduate adviser		