ATMOSPHERIC AND OCEANIC SCIENCES, PH.D.

A doctor of philosophy degree is offered with a major in atmospheric and oceanic sciences. Candidates may enter with a master's degree or, for more qualified students, directly after earning a bachelor's degree.

In atmospheric and oceanic sciences, classical physics is applied to describe the behavior of the fluids that compose the atmosphere/ocean/earth system. Influences of solar and terrestrial radiation, clouds and storms, natural and anthropogenic pollution, dynamical forces and turbulence can affect both the weather and longer climatic variations. The department uses computer simulations, passive and active remote sensing, in situ weather instruments, and laboratory experiments to study atmospheric phenomena.

The department has 13 faculty, approximately 60 graduate students, and many staff involved in large and energetic research programs. Particular strengths include climate/earth system science, geophysical fluid dynamics, remote sensing, planetary boundary layer, atmospheric chemistry, weather systems and prediction, and oceanography. Course concentrations within the existing degree program are offered in the areas of weather prediction, earth system science, remote sensing, and oceanography.

Course and research emphasis of the department's oceanographic component is in physical oceanography, ocean–atmosphere climate dynamics, and marine geochemical cycles. A concentration of courses in oceanography can be used to satisfy the AOS Ph.D. minor.

The department has close ties with the Center for Climatic Research, The Nelson Institute for Environmental Studies, Center for Sustainability and the Global Environment, Space Science and Engineering Center, Cooperative Institute for Meteorological Satellite Studies, National Weather Service, and the State Climatologist Office.

Job opportunities have been strong within the United States for people with graduate degrees in atmospheric and oceanic sciences. The government hires a large number of meteorologists with advanced degrees, as do many private forecasting companies and air quality consulting firms. In addition, there are openings for experts at various government and university research labs.

FUNDING

Financial assistance is available to qualified students. The typical sources of funding are research and teaching assistantships. All applicants are considered for any available assistantships. Financial aid is handled separately from admission in the department. Students generally hear about their admission status well before any decision about financial aid is made. Prospective students should see the program website (http://www.aos.wisc.edu/education/graduate/scholarships.html) for additional funding information.

REQUIREMENTS

MINIMUM DEGREE REQUIREMENTS AND SATISFACTORY PROGRESS
To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirementstext) in addition to the requirements of the program.

DOCTORAL DEGREE
Ph.D.

MINIMUM GRADUATE DEGREE CREDIT REQUIREMENT
51 credits

MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT
32 credits

MINIMUM GRADUATE COURSEWORK (50%) REQUIREMENT
Half of the degree coursework (26 of 51 credits) must be completed in graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

PRIOR COURSEWORK REQUIREMENTS: GRADUATE WORK FROM OTHER INSTITUTIONS
With program approval, students are allowed to count no more than 19 credits of graduate coursework from other institutions. Coursework earned five or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENTS: UW-MADISON UNDERGRADUATE
With program approval, students are allowed to count no more than 7 credits of graduate coursework taken as an undergraduate at UW-Madison, as long as those credits were not applied toward an undergraduate degree. Coursework earned five or more years prior to admission to a master’s degree or earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENT: UW-MADISON UNIVERSITY SPECIAL
With program approval, students are allowed to count no more than 15 credits of coursework numbered 300 or above taken as a UW-Madison Special student. Coursework earned five or more years prior to admission to a master’s degree or earned ten years or more prior to admission to a doctoral degree is not allowed to satisfy requirements.

CREDITS PER TERM ALLOWED
15 credits
PROGRAM-SPECIFIC COURSES REQUIRED
At least 15 credits are from lecture courses numbered 600 or above in the department. Seminars, research credits, and audited courses are not included.

An additional 10 (at least) credits are taken to satisfy the minor requirement (see below). These credits may be from the department, but cannot be used to satisfy the first requirement (15 credits from lecture courses numbered 600 or above in the department).

Students are required to take ATM OCN 900 Seminar-Meteorology.

DOCTORAL MINOR/BREADTH REQUIREMENTS
All doctoral students are required to complete two broadening requirements: a minor, and a supplemental requirement.

Minor requirement:
A minor program consists of Option A (external) 10 or more course credits in one discipline or Option B (distributed) 10 or more credits in one or more departments and can include coursework in the major department. Selection of Option A requires approval of the minor department. Selection of Option B requires approval of the major department. The department monitors minor requirements.

Supplemental requirement:
The supplemental requirement is specified by the Ph.D. committee during the first Ph.D. committee meeting. Examples include (but are not limited to): an augmented minor, substantial foreign language skill, significant professional or field experience, or interdisciplinary coursework.

OVERALL GRADUATE GPA REQUIREMENT
3.0 GPA required

OTHER GRADE REQUIREMENTS
All grades must be C or better to count towards the degree.

The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades.

Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.

PROBATION POLICY
Academic probation:
A semester GPA below 3.0 will result in the student being placed on academic probation. If a semester GPA of 3.0 is not attained during the subsequent semester of full time enrollment (or 12 credits of enrollment if enrolled part-time) the student may be dismissed from the program.

Probation is based on student status. The status of a student can be one of three options:
1. Good standing (progressing according to standards; any funding guarantee remains in place).
2. Probation (not progressing according to standards but permitted to enroll; loss of funding guarantee; specific plan with dates and deadlines in place in regard to removal of probationary status).
3. Unsatisfactory progress (not progressing according to standards; not permitted to enroll, dismissal, leave of absence or change of advisor or program).

ADVISOR / COMMITTEE
A Ph.D. committee is required in order to become a Ph.D. student. The student, under the guidance of the major professor, must form a committee of five professors consisting of the major professor, three other professors from our department, and one professor from outside the department (often from the minor department). Additional members may be added, if appropriate. Adjunct faculty can be included among the five committee members. If the committee dissolves for any reason, the candidate cannot continue in the Ph.D. program unless a new committee is formed.

The first meeting of the Ph.D. committee should normally occur after the student completes the qualifying examination, but within the same semester as the qualifying examination. Potential committee members, in deciding whether to form a Ph.D. committee, use results from the qualifying examination as well as additional information about a student’s suitability for pursuing a Ph.D.

All students are required to conduct a yearly progress report meeting with their thesis committee after passing the preliminary examination.

ASSESSMENTS AND EXAMINATIONS
Students wishing to pursue a Ph.D. are required to take a qualifying examination prior to forming a Ph.D. committee (see above regarding the formation of a Ph.D. committee). For more information about the qualifying examination, please consult the department’s Qualifying Exam FAQs (http://www.aos.wisc.edu/education/Qual_ExamFAQ.html).

Ph.D. students are required to complete a preliminary examination by the Ph.D. committee prior to becoming a Ph.D. candidate. Prior to the preliminary examination the student works with the major professor to define an appropriate research topic. This topic is written into a several page research proposal that is given to the Ph.D. committee members a few weeks prior to the preliminary examination.

TIME CONSTRAINTS
The Ph.D. degree should be completed within five years after establishing a Ph.D. committee. For additional time constraints please consult the Graduate School Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy).

LANGUAGE REQUIREMENTS
No language requirements.

ADMISSIONS
Prerequisites for admission are one semester of chemistry, three semesters of calculus, one semester of differential equations, and two semesters of calculus-based physics. Prior work in atmospheric
or oceanic sciences is not required, but it is beneficial. Knowledge of computer programming is recommended. Admitted students generally have GRE quantitative scores of at least 151 (650 prior scale, 56% percentile), verbal reasoning scores of 152 (490 prior scale, 56% percentile) and analytical scores of 4.0 (48% percentile), and have a GPA of better than 3.0 on a 4.0 scale. International students must submit scores from the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS). Applications are also judged on academic record, letters of recommendation, prior research experience, and the statement of purpose. Ph.D. students must have an advisor identified before they can be recommended for admission.

**LEARNING OUTCOMES**

**KNOWLEDGE AND SKILLS**

- Students will have an in-depth knowledge of the fields that are relevant to their research areas by taking appropriate courses not only in atmospheric and oceanic sciences, but also in related disciplines including mathematics, statistics, physics, and engineering.
- Students should be able to ask the right scientific questions: What are the important scientific problems in this field? Can a problem be solved by the available resources in a reasonable time? How to design a scientific approach to tackle the problem?
- Students read original papers of their research field to understand how previous investigators approach the problem and how they can improve on previous results.
- Students articulate research problems, potentials, and limits with respect to theory, knowledge, or practice within the field of study.
- Students formulate ideas, concepts, designs, and/or techniques beyond the current boundaries of knowledge within the field of study.

**PROFESSIONAL CONDUCT**

- Fosters ethical and professional conduct.

**PEOPLE**

**Faculty:** Professors Petty (chair), Ackerman, Hitchman, Liu, Martin, Morgan, Tripoli, Wang; Associate Professors Desai, Holloway, McKinley, Vimont; Assistant Professors Back, L'Ecuyer