

Atmospheric Science

PHD PROGRAM OF STUDY:

Doctoral students are expected to develop the ability to conduct scientific discourse across a wide range of disciplines, and to conduct original research leading to unique contributions in an area of specialization. The following describes the department's program to accomplish this.

Student advising: An essential part of the program leading to the PhD is a mentoring relationship with a faculty advisor. This apprenticeship is designed to teach the student, through active learning, both the tangible and intangible professional skills needed of a scientist. This mentorship oversees both the coursework activity and the student's research, and is conceived as a means of establishing the student as a full partner in research and scholarship. Formal mentoring activities involve regular academic advisory committee meetings that include a combination of faculty covering the student's field of specialty and faculty covering allied fields where cross-disciplinary exchange of ideas or techniques may prove helpful to the student's progress. Whenever possible, the student's faculty advisor is assigned prior to admission, and the advisory committee is established as soon as a general research direction becomes clear. In all cases, the student will have an advisor assigned prior to the end of the first semester, and a committee assigned by the third semester. The objective in the first year or two is to focus on course work and general scholarship, and to develop the critical thinking and research skills necessary to conduct independent research.

The typical time taken to achieve the Ph.D. is 4-6 years, which is divided into a pre-candidacy and candidacy phase. Students are required to present a departmental seminar communicating their research progress at least annually following their first year.

Pre-candidacy phase: The pre-candidate phase requires the satisfactory completion of the following three objectives.

1. **Research Project:** Beginning in the first semester, the student's advisor will introduce the student to a preliminary research project. This project typically will have a more limited scope than the ultimate PhD dissertation project, but ideally would develop some aspect necessary for the dissertation. The goal is to focus on the critical thinking necessary for research: methodologies, awareness of fundamental scientific problems, understanding of current research areas and creative thought when encountering difficult questions. In addition to the benefit of developing tools and skills, the research project is the first step in developing a research collaboration with the advisor.
2. **Qualifying assessment:** The student's committee will provide an assessment of the student's potential for completing the Ph.D. program in a manner consistent with the traditional standards of the department. Specifically, the committee is to assess (a) the student's ability to deal with the basic concepts of atmospheric science in a mature and effective way, (b) the student's ability to synthesize material normally included in Atmospheric Science curriculum for the solution of non-routine problems, and (c) the student's breadth of knowledge in a wide spectrum of areas around the student's research focus.

The student's Graduate Committee will decide the manner for the assessment. Possibilities include written and oral examinations, performance in courses and scientific productivity. The committee will inform the faculty and the student of the manner chosen for the assessment at least 3 months in advance. The assessment is to be completed as

early as possible, depending on the educational and work background of the student. For students with an atmospheric science background, for example, this may be at the end of the second semester. But in no cases would it be later than the end of the fourth semester of the student's program.

- Most often, the qualifying assessment (QA) takes the form of a written or oral examination aimed at assessing the student's ability to deal with the basic concepts of atmospheric science in a mature and effective way, and evaluated by the ATSC faculty, and is not directly related to the student's research. The ATSC faculty constructs the exam, and reports the results of the QA to the student's committee. The committee will then decide on the outcome of the assessment.
- In lieu of the QA examination, an accomplishment-based qualifying assessment is permitted if the student can provide evidence of scientific maturity and accomplishments acceptable to the committee. Evidence of this normally takes the form of first-authored peer reviewed journal article(s) that demonstrate a scholarly ability to advance the science by synthesizing principles in non-routine ways. Publishing alone is not sufficient in itself to establish this. If the committee accepts this evidence, then the student presents a formal seminar on his/her research, followed by an oral examination by the committee. This examination will assess the student's breadth of knowledge and understanding in a spectrum of areas broader than that of the presented research itself. Assessment may consider a student's previous degrees, theses and/or dissertations, and coursework, but those indicators in themselves is not necessarily sufficient evidence of competency. If this form of assessment is unsuccessful, then the committee will consider if taking the exam-based assessment is the appropriate next step.

The committee will report the Pass/Fail result of the assessment to the faculty in writing, including a statement of the way the assessment was conducted. If the result of the assessment is 'Pass', the student will proceed to develop a dissertation research plan. If the result is 'Fail', the advisory committee will consider this result, along with the student's performance in class and on the introductory research project, to decide whether the student should be given a re-assessment or should discontinue the Ph.D. program. If a re-assessment is to be made, a letter to the faculty and the student will be prepared to justify the re-assessment and to describe the form of the re-assessment, which will take place no later than twelve months after the first assessment, but in no cases would it be later than the start of the fifth semester of the student's program. If the Ph.D. program is discontinued, the advisor and committee may recommend that the student proceed toward an M.S. degree based upon the student's research project (described previously) which should be completed by this time. In that case, the student will submit a Program Plan and a Research Plan for the M.S. degree. Upon approval of that plan, the student's status will change to "M.S. Candidate".

3. **Dissertation Research Plan:** The Research Plan will be a proposal for the student's PhD dissertation research project. It will outline the objective(s), methods, and resources (data sources, equipment, etc.) required for the research. It will list appropriate references and will contain a time schedule for the research.

Candidacy phase: A student becomes as PhD candidate after completion of the three objectives above and the Graduate School has approved the Program Plan submitted by the student with the consent of the committee. The Program Plan may, at the discretion of both the committee and the

Department Head, be submitted prior to committee approval of the Research Plan and the subsequent achievement of a satisfactory performance in the Qualifying Assessment, but this step alone would not satisfy the third step in the pre-candidacy requirements.

After being admitted to candidacy, students are encouraged to proceed rapidly with their research so as to produce a major work in as short a time as possible, commonly two to four years.

As specified by the Graduate Faculty Regulations, Ph.D. candidates are required to pass a Preliminary Exam and a Final Exam. The Ph.D. Preliminary examination is to be held after at least 30 hours of course work has been completed and at least 15 weeks before the Final examination, as specified in the UW *Graduate Bulletin*. The Preliminary examination is conducted by the student's Graduate Committee to assess the student's progress towards the doctorate in terms of completion of the student's Program Plan and Research Plan. The Preliminary examination determines the student's preparedness for concluding the research work and for writing the dissertation. Ideally the preliminary examination is held shortly after the dissertation research plan is submitted and some research progress has been made. Additional courses and specific research directions may be recommended by the examining committee, and in cases of serious problems, the student's Ph.D. program may be terminated. The Final Examination is held to determine if the student fulfilled all the requirements for his or her degree. The Final Exam should be widely advertised and open to the public.