

# PH.D. IN METEOROLOGY AND PHYSICAL OCEANOGRAPHY

## Overview

The Meteorology and Physical Oceanography (MPO) graduate program provides a collegial, inclusive, and welcoming interdisciplinary environment to study the dynamics of the ocean, the atmosphere, and their coupled interactions. The MPO Ph.D. degree is rooted in a curriculum covering the physical forces and energy processes of the intertwined system, with a view toward how these affect life and climate on Earth. Students will learn the gamut of scientific tools used to unravel nature's mysteries, including observations, laboratory measurements, modeling, and theory.

## Admission Requirements

Students wishing to pursue a graduate degree in MPO must have strong quantitative skills and a solid foundation in one of the physical, mathematical or computational sciences. A bachelor's or master's degree in one of the science disciplines - such as physics, mathematics, or engineering - usually provide the requisite background. In addition to good academic training, applicants should bring an unbridled enthusiasm and intense curiosity for the natural world in order to succeed and enjoy their experience at the Rosenstiel School. All application requirements are available here (<https://graduate.earth.miami.edu/admissions/application-information/>).

## Curriculum Requirements

The applicable requirements will be those in effect during that academic year when the student first registered in the Program, unless stated otherwise in the Handbook or by the Program Director.

All Rosenstiel School courses are listed on the website. All courses taken by students should be approved by their advisors. Students are recommended to consult with their advisors and the MPO Program Director regarding their choices of courses. Deviations from the requirements must be approved by the advisor and the MPO Academic Committee.

Code	Title	Credit Hours
The MPO Ph.D. degree requires 60 total credits. <sup>1</sup>		
<b>Core Courses</b>		<b>15</b>
All MPO Ph.D. students are required to take the following courses:		
MPO 603	Physical Oceanography	
MPO 611	Geophysical Fluid Dynamics I	
MPO 651	Introduction to Atmospheric Dynamics	
MPO 711	Geophysical Fluid Dynamics II	
MPO 712 or MPO 765	Large Scale Ocean Circulation: Models and Observations General Circulation of the Atmosphere	
<b>Electives <sup>2</sup></b>		<b>15</b>
<b>Dissertation Research</b>		<b>30</b>
MPO 830	Doctoral Dissertation	
<b>Required Examinations</b>		
Comprehensive Examination <sup>3</sup>		
Qualifying Examination <sup>4</sup>		
<b>Additional Requirements</b>		
RSM 700	Research Ethics	
COMPASS Seminars <sup>5</sup>		
Educational Training Program (TA) <sup>6</sup>		
RSM 771	Educational Training 1	
RSM 772	Educational Training 2	
RSM 773	Educational Training 3	
<b>Total Credit Hours</b>		<b>60</b>

- <sup>1</sup>
- Minimum of 30 course credits and 12 dissertation credits.
    - Minimum 9 course credits should be taken from 700 level courses.
  - The credit transfer and waiver of required courses should be done during the first year of graduate study at the Rosenstiel School with approval from the graduate advisor and the MPO Academic Committee.

2 Ph.D. in Meteorology and Physical Oceanography

- 2
- The remaining course credits can be obtained by taking other graduate courses offered by MPO, Rosenstiel School, or UM.
  - MPO Ph.D. students are required to take at least one 3-credit course outside the MPO program, unless they have arrived with an M.S. degree from another institution. Courses with the 'RSM' designation count as an outside course.
- 3
- All M.S. and Ph.D. students are required to take the comprehensive examination. For full-time students, the comprehensive examination should be before the end of their first year of graduate studies at the Rosenstiel School. This examination will be arranged by a Comprehensive Examination Committee which comprises the MPO Graduate Program Director and the instructors (or their assignees) of the first year courses taken by the students.
  - The purpose of this examination is to evaluate students' understanding of materials in the courses completed up to the time of the examination and their capability of integrating these materials, and to determine whether the students are permitted to proceed to the M.S. or Ph.D. program.
  - The comprehensive examination will consist of an oral part and a written part. MPO Ph.D. students are responsible to know material from the required core courses and their other courses from the first year. A grade of **Pass** or **High Pass** is needed to fulfill requirement.
    - The written part, which lasts no longer than 8 hours, consists of closed-book questions in the courses taken in the first year by each individual student. Each student must choose to answer four questions; at least one of the questions from GFD I and II must be answered.
    - The oral part, which lasts no longer than 2 hours for each student, may include questions from all the courses taken by the student.
    - The GPA comprises 20% of the comprehensive exam grade, and the written and oral parts of the comprehensive exams comprise 40% each.
    - A student's performance in this examination, together with their cumulative grade point average, will determine whether the grade of **High Pass**, **Pass**, **Master's Pass** or **Fail** is given by the Comprehensive Exam Committee. The examining board consists of faculty whose questions are answered by the student and any other Rosenstiel School faculty who wish to participate.
      - **High Pass:** for students with no identifiable relevant weaknesses.
      - **Pass:** Students and advisors will receive feedback from the Comprehensive Exam Committee on the strengths and weaknesses of the student, and possible recommendations of how to address those. This information can be used to help plan the next steps in the student's academic career.
        - *NOTE: This is a new category where a student is NOT required to defend a master's thesis as was the case previously, but the student and advisor may of course still decide that a Masters is the appropriate next step.*
      - **Master's Pass:** Students with this result will be required to defend a master's thesis before considering whether to pursue a Ph.D. Students and advisors will receive feedback from the Comprehensive Exam Committee on the strengths and weaknesses of the student, and possible recommendations of how to address those.
      - **Fail:** Students with this result will have an opportunity to re-take the exam once.
- 4
- These guidelines complement those given in the UM Graduate Student Handbook.
  - All students are expected to take the qualifying exam and proposal defense by the end of their third year in the program. If the student needs to take the exam in their fourth year, they will need to write a petition to the MPO Academic Committee with an explanation. A second extension after the end of the fourth year will not be permitted, unless there are exceptional circumstances.
  - While the exact format is left to the discretion of the Ph.D. Committee, a typical oral qualifying exam comprises an hour of questions from the written qualifying exam and other related questions, and a second hour in which the student presents their dissertation proposal. It is recommended that the presentation emphasizes future work and is not a review of previous results, which are in the written Proposal.
  - Expectations of the Qualifying Exam:
    1. Written Exam: Written answers judged by each Committee member to demonstrate that the student has the ability to understand and investigate the concept asked in the question. The questions are usually related to the research described in the dissertation proposal.
    2. Oral Exam: Demonstration of oral communication skills in responding satisfactorily to questions raised by the Committee in relation to the written questions, and any other questions asked by the Committee members.
    3. Dissertation Proposal: Written by the student in clear English befitting the standard of writing in a peer-reviewed journal. The proposal should demonstrate the capability of the student to produce and present research that is of the quality suitable for a journal article. Emphasis needs to be placed on the proposed research: the questions and hypotheses to be tested, the data and methodology used to test the hypotheses, and some anticipated results (which may or may not be realized). A student is encouraged to discuss the proposal with the advisor, but the writing must be their own.
  - Possible Outcomes of the Qualifying Examination:
    - **Pass:** Meets all expectations.
    - **Fail:** Unsatisfactory in at least one of the written/oral/proposal.
  - In some cases, the Ph.D. Committee may require revisions to a proposal or question, or a retake of the oral part of the qualifying examination. Normally there is no need to retake the entire qualifying examination or have a full committee meeting.

- <sup>5</sup>
- Attendance to the COMPASS seminars (Combined ATM, MPO, OCE Seminar Series) is required every semester.
  - MPO Ph.D. students must give at least one 15- minute presentation each year after completing the comprehensive exam, and a one-hour presentation after advancing to Ph.D. candidacy, and at least 6 months before the dissertation defense.
- <sup>6</sup>
- Ph.D. students are expected to be a Teaching Assistant (TA) for two courses while pursuing their degree.
  - The mandatory TA program will include training of new TAs, evaluation of their performance, and recognition of excellence. The goal is to make the experience as valuable as possible for the TA, the faculty, and the students taking our courses.
  - A training session and two teaching opportunities are offered as courses in educational training (RSM 771, RSM 772, RSM 773). Students will be registered accordingly.
  - Specific requirements for TAs are outlined in the Rosenstiel School Student Handbook.

## Sample Plan of Study

Year One		Credit Hours
<b>Fall</b>		
MPO 603	Physical Oceanography	3
MPO 611	Geophysical Fluid Dynamics I	3
MPO 651	Introduction to Atmospheric Dynamics	3
RSM 700	Research Ethics	0
<b>Credit Hours</b>		<b>9</b>
<b>Spring</b>		
MPO 711	Geophysical Fluid Dynamics II	3
MPO 712 or 765	Large Scale Ocean Circulation: Models and Observations or General Circulation of the Atmosphere	3
Approved Elective		3
<b>Credit Hours</b>		<b>9</b>
<b>Summer</b>		
MPO 830	Doctoral Dissertation	4
<b>Credit Hours</b>		<b>4</b>
<b>Year Two</b>		
<b>Fall</b>		
Approved Elective		3
MPO 830	Doctoral Dissertation	1
<b>Credit Hours</b>		<b>4</b>
<b>Spring</b>		
Approved Elective		3
MPO 830	Doctoral Dissertation	1
<b>Credit Hours</b>		<b>4</b>
<b>Summer</b>		
MPO 830	Doctoral Dissertation	4
<b>Credit Hours</b>		<b>4</b>
<b>Year Three</b>		
<b>Fall</b>		
Approved Elective		3
MPO 830	Doctoral Dissertation	1
RSM 771	Educational Training 1	0
RSM 772	Educational Training 2	0
<b>Credit Hours</b>		<b>4</b>
<b>Spring</b>		
Approved Elective		3
MPO 830	Doctoral Dissertation	1
RSM 773	Educational Training 3	0
<b>Credit Hours</b>		<b>4</b>

<b>Summer</b>			
MPO 830	Doctoral Dissertation		4
	<b>Credit Hours</b>		<b>4</b>
<b>Year Four</b>			
<b>Fall</b>			
MPO 830	Doctoral Dissertation		4
	<b>Credit Hours</b>		<b>4</b>
<b>Spring</b>			
MPO 830	Doctoral Dissertation		4
	<b>Credit Hours</b>		<b>4</b>
<b>Summer</b>			
MPO 830	Doctoral Dissertation		4
	<b>Credit Hours</b>		<b>4</b>
<b>Year Five</b>			
<b>Fall</b>			
MPO 830	Doctoral Dissertation		4
	<b>Credit Hours</b>		<b>4</b>
<b>Spring</b>			
MPO 830	Doctoral Dissertation		4
	<b>Credit Hours</b>		<b>4</b>
<b>Summer</b>			
MPO 830	Doctoral Dissertation		4
	<b>Credit Hours</b>		<b>4</b>
	<b>Total Credit Hours</b>		<b>70</b>

## Mission

The Meteorology and Physical Oceanography (MPO) program prepares students to conduct and communicate research in meteorology and physical oceanography. It seeks to advance students' knowledge and understanding of the physical and dynamical processes in the atmosphere and ocean. Our graduates contribute to advancing knowledge and better informing the public and policy makers on how to prepare for hazards and changes in the Earth's atmosphere and oceans.

## Goals

To advance students' knowledge and understanding of the physical and dynamical processes in the atmosphere and ocean.

## Student Learning Outcomes

- Students will demonstrate knowledge in meteorology and physical oceanography.
- Students will demonstrate their ability to conduct research in meteorology and physical oceanography.
- Students will demonstrate knowledge of discipline, appropriate methodology, application of knowledge, methodology to original research, critical thinking, as well as effective written and oral communication.