



UNDERGRADUATE ATMOSPHERIC SCIENCE PROGRAM
STUDENT ADVISING GUIDE
2017-2018





INTRODUCTION

The undergraduate Atmospheric Science program has been part of the academic curriculum at the University of Miami since 1977, when the College of Arts and Sciences and RSMAS joined together to establish an undergraduate Marine and Atmospheric Science Program. It is located within the Rosenstiel School of Marine and Atmospheric Science (RSMAS) since 2008, and the Atmospheric Science program became its own program in 2012. The program follows standards established by the American Meteorological Society, and emphasizes understanding the physical processes governing the motion and composition of the atmosphere. The major encompasses a minor in Mathematics. This approach lays the groundwork for both further graduate study and non-academic professional applications including broadcast meteorology. Undergraduate students are encouraged to work with the faculty, and are able to earn course credit by conducting independent research under the supervision of leading scientists in their field. Research at RSMAS encompasses atmospheric dynamics, climate science, boundary-layer processes, cloud processes, remote sensing and atmospheric chemistry. Focus areas include hurricanes (spanning modeling, data assimilation, field observations), tropical meteorology, atmosphere-ocean coupling, clouds and aerosols, climate and climate change and trace gas chemistry. Many faculty are active in fieldwork.



METEOROLOGY CURRICULUM

The Rosenstiel School of Marine and Atmospheric Science offers a Bachelor of Science in Marine and Atmospheric Science degree (B.S.M.A.S.) with a major in Meteorology. The major includes a minor in Math. The major prepares students for admission to graduate programs and for careers in teaching and research as well as for technical careers in government and private industries concerned with the oceans and atmosphere. The rigorous program requires 120-130 credits for graduation. Only those courses passed with a grade of "C-" or better may be applied to receive the major or minor; the math minor classes are required for the meteorology major. RSMAS courses at the 500-level may be taken for undergraduate credit with junior standing and departmental consent. Streamlined double major programs include options with Marine Science, Mathematics, and Broadcast Journalism.

General Education requirements and Cognates: In order to fulfill the University of Miami's General Education requirements students must complete courses in English composition (ENG 105 and 106 or ENG107) as well as courses with significant writing/communication components. In addition, students must complete a 9-credit cognate in two "areas of knowledge": Arts and Humanities and People and Society (Social Sciences). The optional Broadcast Journalism cognate or minor and Climate Science and Policy minor fulfill the People and Society cognate requirement. Cognates integrating study abroad courses are also available. Information on cognates, along with a search engine, is available at: www.miami.edu/cognates.

FOR ADDITIONAL INFORMATION:

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Meteorology major with math minor (RSMM)

Marine and Atmospheric Science (32 credits):

ATM103, MSC111, MSC112, ATM118, ATM 220 or ATM307, ATM243, ATM303, ATM305, ATM405, ATM406, ATM407, ATM409.

Mathematics (20 credits)*:

MTH161, MTH162, MTH210, MTH224 (may be replaced by MSC 204), MTH211 (or MTH310), and either MTH311 or MTH320

* A minimum grade of C is required in MTH161 and MTH162 to progress to 300 level ATM classes.

Broadcast meteorology majors must take either MTH224/MS204 or MTH311/320, but are not required to take both.

Physics (10 credits): University Physics PHY205, PHY206, PHY207, and PHY208 or University Physics for the Sciences PHY201, PHY202, PHY106, and PHY108

Chemistry (3 credits) ATM 265.

Computer Science (4 credits): CSC120

One free elective in Marine or Atmospheric Science, Mathematics or Science (3 credits) and Six credits of upper level electives (300-level and higher or at 200-level with prerequisites). We suggest MSC301, ATM306, ATM307, and ATM321. 500 level courses are open to undergraduates but are only offered at the RSMAS campus. The elective courses may be chosen to satisfy degree requirements for a second major or a second minor. For Broadcasting Journalism double majors and minors, the electives may be taken from the School of Communications.

Meteorology and Marine Science (RSMM MSC)

Two courses, MSC111 and ATM220, apply to both majors.

Atmospheric Science (29 cr): 103, 118, 243, 303, 305, 405, 406, 407, 409, and 220 or 307

Marine Science (23 cr): MSC 111, 112, 215, 230, 301, 302, either 216 or 232, and 9 credits of MSC electives, of which at least 6 must be at the 200-level or higher.

Biology (5 cr): BIO 150 and 151 or 160 and 161

Chemistry (8 cr):CHM 111, 112, 113 and 114

Computer Science: CSC 120

Geological Sciences (4 or 5 cr): GSC 111 or 110 and 114

Mathematics (17 cr): MTH 161, 162, 210, 211 (or MTH 310), and either 311 or 320

Physics (10 cr): University Physics PHY205, PHY206, PHY207, and PHY208 or University Physics for the Sciences PHY201, PHY202, PHY106, and PHY108

Statistics (3 cr): MSC 204 or MTH 224

Meteorology and Mathematics (RSMM MTH4)

Marine and Atmospheric Science (29 credits):

ATM103, ATM118, ATM 220 or ATM307, ATM243, ATM303, ATM305, ATM405, ATM406, ATM407, ATM409.

Mathematics core (23 credits):

MTH161 and 162, MTH 210, 224 (may be replaced by MSC 204), 230, 310, 311, 433 (or 533) and 461 (or 561), plus an approved Mathematics track, we recommend:

Applied Analysis: MTH 512, and either (513 and 514) or (515 and 516)

Physics (10 cr): University Physics PHY205, PHY206, PHY207, and PHY208 or University Physics for the Sciences PHY201, PHY202, PHY106, and PHY108

Chemistry (3 credits) ATM265.

Computer Science (4credits): CSC120

Three credits of upper level electives (300-level and higher or 200-level with prerequisites)

Major / Minor in Broadcast Journalism: This is available as a double major or a minor operated by the School of Communications and is designed for Meteorology majors interested in Broadcast Meteorology. The flagship course is ATM306 (Broadcast Meteorology), taught by a professional broadcast meteorologist (CBS4 Chief Meteorologist Craig Setzer and NBC Meteorologist Ryan Phillips are affiliated with the program) and uses the UMTV studio. The other courses within the major/minor come from the School of Communications.

This 18 credit minor consists of: JMM 102 Understanding Media and Content in the Digital Age, JMM 208 Fundamentals of News Gathering, JMM 108 Writing in the Digital Age, JMM 245 Introduction to Electronic Media Production, JMM 317 Broadcast Journalism, and an additional 300-level or higher class chosen with the prior approval of program director Andrew Barton.

Meteorology major Rosemarie Knoll-Rodriguez serves as a weather anchor for UniMiami TV.



ATM306 Broadcast Meteorology qualifies as additional class.

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Minor in Climate Science and Policy: The 15 credit minor provides students with grounding in the sciences underlying climate change and the sociopolitical concepts with which to understand society responses. The minor satisfies the People and Society cognate requirement for meteorology majors.

For meteorology majors, the minor consists of two classes from: MSC222 (Earth's Climate: Past and Future), ATM307 (Physics of Climate), MSC 347 (Polar Science and Policy), GSC462 (Earth's Ancient Atmospheres, Climates and Sea Levels); two policy classes from MSC313 (Coastal Law), MSC314 (Ocean Law), MSC340 (Ocean Policy), MSC342 (Decision Making and the Environment), MSC418 (Climate Law), RSM 520 (Climate and Society); and MSC 346 (Climate Science and Policy).

Minor in Meteorology: The 15-credit minor in Meteorology must include ATM 103, with the remainder classes selected from ATM 118, ATM 220, ATM 243, ATM 265, ATM 303 and ATM 306. The minor is open to all non-meteorology majors at UM.

2.1 Sample Curriculum Meteorology Major (math minor)

Freshman Year/Fall

Spring

ATM103 Modern Meteorology	3	ATM118 Weather Topics	2
MTH161 Calculus I	4	MTH162 Calculus II	4
ENG105 English Composition I	3	Elective	3
ATM220 Climate Change	3	ENG107 English Composition II	3
MSC111/112 Intro Marine Science	4	ATM265 Atmospheric Chemistry	3
Total	17	Total	15

Sophomore Year/Fall

Spring

ATM243 Weather Forecasting	3	ATM303 Meteorological Instrumentation	3
MTH210 Intro. Linear Algebra	3	CSC120 Computer Programming I	4
PHY205 Univ Physics I	3	PHY206/208 Univ Physics II	4
Elective	3	ATM Elective	3
Elective	3		
Total	15	Total	14

Junior Year/ Fall

Spring

ATM305 Atmos. Thermodynamics	3	ATM405 Atmos. Dynamics I	3
MTH211 Calculus III	3	MTH311/320	3
PHY207 Univ Physics III	3	Upper Level Elective	3
Elective	3	Upper Level Elective	3
Elective	3	Elective	3
Total	15	Total	15

Senior Year/Fall

Spring

ATM406 Atmos. Dynamics II	3	ATM409 Cloud Physics	3
ATM407 Weather Analysis	4	Elective	3
MTH224 Intro. to Prob. Statistics	3	Elective	3
Elective	3	Elective	3
Elective	3	Elective	3
Total	16	Total	15

Total: 122 credits 12 elective courses must include 3 Arts and Humanities Cognate courses and 3 People and Society Cognate courses

2.2 Sample Curriculum Meteorology/Marine Science

Freshman Year/Fall

Spring

ATM103 Modern Meteorology	3	ATM118 Current Weather Topics	2
ATM220 Climate Change	3	Elective	3
MTH161 Calculus I	4	MTH162 Calculus II	4
ENG105 English Composition I	3	ENG107 English Composition II	3
MSC111/112 Intro Marine Science	4	CHM111/113 Principles of Chem 1	4
Total	17	Total	16

Sophomore Year/Fall

Spring

ATM243 Weather Forecasting	3	ATM303 Meteorological Instrumentation	3
MTH210 Intro. Linear Algebra	3	MSC301/302 Intro to Phys Ocean	4
PHY205 Univ Physics I	3	PHY206/208 Univ Physics II	4
CHM 112/114 Principles of Chem II	4	Elective	3
Elective	3	MSC204 or MTH224 Statistics	3
Total	16	Total	17

Junior Year/Fall

Spring

ATM305 Atmos. Thermodynamics	3	CSC120 Computer Programming I	4
PHY207 Univ Physics III	3	ATM405 Atmos. Dynamics I	3
MSC215 Chemical Oceanography	3	BIL 160/161 Evolution and Biodiversity	5
MTH211 Intro. Linear Algebra	3	MTH311 Intro. Ordinary Diff. Equations	3
MSC Elective	3		
Total	15	Total	15

Senior Year/Fall

Spring

ATM406 Atmos. Dynamics II	3	ATM409 Cloud Physics	3
ATM407 Weather Analysis	4	Elective	3
MSC230/232 Intro. Marine Biology	4	GSC111 Geology (Earth System History)	4
MSC Elective	3	Elective	3
Elective	3	MSC Elective	3
Total	17	Total	16

Total: 129 credits 6 elective courses must include 3 Arts and Humanities Cognate courses and 3 People and Society Cognate courses

2.3 Sample Curriculum Meteorology/Math

Freshman Year/Fall

Spring

ATM103 Modern Meteorology	3	ATM118 Current Weather Topics	2
ATM220 Climate Change	3	MTH224 Statistics	3
MTH161 Calculus I	4	MTH162 Calculus II	4
ENG105 English Composition I	3	ENG107 English Composition II	3
Elective	3	ATM265 Atmospheric Chemistry	3
Total	16	Total	15

Sophomore Year/Fall

Spring

ATM243 Weather Forecasting	3	ATM303 Meteorological Instrumentation	3
MTH210 Intro. Linear Algebra	3	Elective	4
PHY205 Univ Physics I	3	PHY206/208 Univ Physics II	4
MTH311 Intro. Ordinary Diff. Equations	3	MTH230 Intro Abstract Math	3
Elective	3		
Total	15	Total	14

Junior Year/Fall

Spring

ATM305 Atmos. Thermodynamics	3	CSC120 Computer Programming I	4
PHY207 Univ Physics III	3	ATM405 Atmos. Dynamics I	3
Elective	3	Elective	3
Elective	3	Elective	3
MTH310 Multivariable Calculus	3	MTH 461 Survey of Modern Algebra	3
Total	15	Total	16

Senior Year/Fall

Spring

ATM406 Atmos. Dynamics II	3	ATM409 Cloud Physics	3
ATM407 Weather Analysis	4	MTH514 Partial Diff. Equations II	3
MTH513 Partial Diff. Equations I	3	MTH512 Complex Analysis	3
MTH433 Advanced Calculus	3	Upper Level Elective	3
Elective	3	Elective	3
Total	16	Total	15

Total: 122 credits 9 elective courses must include 3 Arts and Humanities Cognate courses and 3 People and Society Cognate courses

2.4 Sample Curriculum Meteorology/Broadcasting Journalism

Freshman Year/Fall

Spring

JMM108 Writing in Digital Age	3	ATM118 Current Weather Topics	2
JMM102 Media and Content Digital Age	3	MTH162 Calculus II	4
MTH161 Calculus I	4	JMM208 Fundamentals of Newsgathering	3
ATM103 Modern Meteorology	3	ENG107 English Composition II	3
ENG105 English Composition I	3	ATM 220 Climate Change	3
Total	16	Total	15

Sophomore Year/Fall

Spring

ATM243 Weather Forecasting	3	ATM303 Meteorological Instrumentation	3
PHY201/106 University Physics I	5	PHY202/108 University Physics II	5
COM250 Freedom Expr. & Ethics	3	MTH210 Intro. Linear Algebra	3
JMM245 Intro Elec Media Production	3	COS211 or COS 333 or JMM 233	3
Total	14	Total	14

Junior Year/Fall

Spring

ATM305 Atmos. Thermodynamics	3	ATM265 Atmospheric Chemistry	3
MTH211 Calculus III	3	ATM405 Atmospheric Dynamics I	3
MTH224 Probability and Statistics	3	ATM306 Broadcast Meteorology (JMM elective)	3
JMM 317 Broadcast Journalism	3	JMM345 Intermediate Electronic Media	3
CSC 120 Computer Programming I	4	Elective	3
Total	16	Total	15

Senior Year/Fall

Spring

ATM406 Atmospheric Dynamics II	3	ATM409 Cloud Physics	3
ATM407 Weather Analysis	4	JMM Elective	3
JMM517 Television News Reporting	3	JMM Elective (300+)	3
JMM 303 Communication Law and Policy	3	JMM 527 or 341	3
Elective	3	Elective	3
Total	16	Total	15

Total: 121 Credits 4 elective courses must include 3 Arts and Humanities Cognate courses

ATMOSPHERIC SCIENCE COURSE DESCRIPTIONS

102 Introduction to Weather and Climate (3 cr) Offered Fall and Spring Semesters

Structure, physics, dynamics and thermodynamics of the atmosphere; weather phenomena weather forecasting, climate and climate change. Contemporary topics covered in this class include global warming, the ozone hole, hurricanes and El Nino. For non-meteorology majors and minors.

103 Survey of Modern Meteorology (3 cr) Offered Fall Semester

Dynamics and thermodynamics of the atmosphere as they relate to contemporary issues in meteorology. Overview of numerical weather prediction techniques and new technologies for monitoring weather and climate. Prerequisite: MTH 108 or higher.

MSC111 Introduction to Marine Science (3 cr) Offered Fall and Spring Semester

Geological, physical, chemical and biological processes of the world's oceans; the role of the oceans in global dynamics and ocean management. Field trips included.

MSC112 Introduction to Marine Science (1 cr) Offered Fall Semester

Laboratory and field exercises to accompany Marine Science (MSC111). Co-requisites or Prerequisite: MSC111

118 Current Weather and Climate Topics (2 cr) Offered Spring Semester

Weather and climate-related phenomena such as hurricanes, severe storms, global warming, and acid rain. Prerequisite: ATM103

220 Global Climate Change (3cr) Offered Fall and Spring Semester

The Earth's climate and the role of natural and anthropogenic processes in shaping climate change.

243 Weather Forecasting (3 cr) Offered Fall Semester

Application of physical principles to weather forecasting; use and interpretation of computer-generated forecast guidance products of the U.S. Weather Service. Prerequisite: ATM103 or MSC103; MTH 108 or higher.

265 Atmospheric Chemistry (3cr) Offered Spring Semester

Class lectures cover basic chemistry (atomic and molecular structure; properties of gases; chemical thermodynamics; reaction kinetics; organic chemistry) and atmospheric chemistry (ultra-violet and visible spectroscopy and its relationship to the structure of the atmosphere; stratospheric and tropospheric chemistry; infrared spectroscopy (greenhouse effect); chemistry of atmospheric aerosols). No prerequisites.

303 Meteorological Instrumentation and Observation (3 cr) Offered Spring Semester

Techniques for measuring meteorological variables at the ground and in the free atmosphere. Prerequisite: ATM 103 or MSC103; **PHY 101 or 205 or 201**

305 Atmospheric Thermodynamics (3 cr) Offered Fall Semester

Equation of state; water vapor and moist air thermodynamics; phase changes and latent heat; buoyancy and atmospheric convection; thermodynamic diagrams. **Prerequisite: PHY 205 or 201**

306 Advanced Principles in Broadcast Meteorology (3 cr) *Offered Spring Semester*

Broadcast meteorology including the production of professional weather briefings and weather news for on camera delivery. Emphasis on accurately communicating complex meteorological concepts, use of computer graphics, and on-camera delivery. Prerequisite: ATM103 or MSC103 or permission of instructor.

307 Introduction to the Physics of Climate (3 cr) *Offered alternate Spring Semesters*

The physical mechanisms which govern the earth's climate and climate variability. Prerequisite: ATM 305.

321 Scientific Programming in the Atmospheric Sciences (3 cr) *Offered alternate Spring Semesters.* An introduction to scientific programming in a Linux environment using the FORTRAN 90/95 language with specific applications to meteorology. Prerequisite: CSC 120.

371 Readings in Atmospheric Science (1-2 cr) *Offered Fall and Spring Semesters*

Library research with faculty supervision; bibliography to be submitted in preparation for laboratory and/or field research project.

405 Atmospheric Dynamics I (3 cr) *Offered Spring Semester*

Derivation and scaling of the equations of atmospheric motion; hydrostatic and geostrophic balance; circulation and vorticity. Prerequisite: ATM 305 and either MTH310 or MTH211

406 Atmospheric Dynamics II (3 cr) *Offered Fall Semester*

Baroclinic and barotropic instability; boundary layer dynamics; mathematical principles of numerical weather prediction; maintenance of the general circulation. Prerequisite: ATM 405.

407 Weather Analysis (3 cr) *Offered Fall Semester*

Three-dimensional analysis of synoptic-scale weather systems; application of the fundamental laws of atmospheric dynamics to observed weather patterns; practical questions of worldwide data exchange and display. Prerequisite: ATM 305.

409 Cloud Physics, Radiation, and Remote Sensing (3 cr) *Offered Spring Semester*

Atmospheric radiation; absorption and scattering principles of remote sensing of the atmosphere; cloud microphysics; nucleation, coalescence, ice crystal growth, atmospheric electricity and lighting. Prerequisite: ATM 305.

411 Projects in Atmospheric Science (1-3 cr) *Offered Fall and Spring Semesters*

Individual, independent research with faculty supervision. A formal written report is required. Prerequisite: permission of the coordinator during the semester preceding registration.

412 Undergraduate Thesis in Atmospheric Science (1 cr) *Offered Fall and Spring Semesters*

Undergraduate thesis in Atmospheric Science. Students will write a formal thesis summarizing the results of independent research carried out under faculty supervision. Prerequisite or corequisite: ATM411 and permission of instructor.

In addition, any 500 level courses offered by The Rosenstiel School are open to juniors and seniors with permission of the instructors, and may count as ATM electives. Such courses can be applied to a Master in Professional Science degree. For details of all current RSMAS graduate courses, see <http://www.rsmas.miami.edu/academics/graduate-programs/current-students/>

Honors in Atmospheric Science

The Honors in Atmospheric Science Program gives you an opportunity to do original research in an area of your choice, working closely with a faculty member.

Requirements for admission are:

- * Sophomore status
- * Completion of at least 2 semesters of science laboratory or calculus courses, and
- * An overall GPA of at least 3.5

In addition to the requirements for the Bachelor of Science in Marine and Atmospheric Science degree, graduation with “Departmental Honors in Atmospheric Science” requires a student to complete at least four credits of independent research and thesis (ATM 411/412), write a senior thesis reviewed and accepted by a three-member faculty thesis committee, and present a poster of the research at the RSMAS Undergraduate Research Forum. A final G.P.A. of 3.5 overall must be maintained.

Study Abroad

Study abroad affiliations with universities in Australia, Britain and South Africa among others allow students to explore atmospheric sciences issues in a variety of physical and political contexts and to network with fellow students from around the world. Atmospheric science students have studied abroad at the University of East Anglia (UK), Monash University in Australia, and Edinburgh, Scotland. Students may apply scholarships and financial aid to study abroad programs. Speak with your advisor in the spring of freshman year to ensure that curricular requirements are met.

Student Activities

Chi Epsilon Pi is the national Honor Society for atmospheric science. Students with a GPA exceeding 3.4 who have made a significant contribution to scholarly activities are invited to join. Activities include inviting speakers to meetings, organizing visits to forecast offices and research labs, and writing forecast discussions. Chi Epsilon Pi members of particularly high academic standing are given priority for attending national meteorological conferences.

The American Meteorological Society (AMS) Student Chapter is involved in a wide range of activities. Anyone is eligible to join. Its activities include public outreach, participating in the National WxChallenge Forecasting Contest, visiting weather laboratories, identifying internship opportunities, providing weather forecasts to UM and the local media, and operating one of the rain gauges within the national Community Collaborative Rain, Hail and Snow Network. Some club members are offered the chance to attend local and national atmospheric science meetings, either by selection or as a volunteer. A key event is attendance to the AMS Annual Meeting by selected students.