Atmospheric and Oceanic Sciences (ATM)

Major in Atmospheric and Oceanic Sciences
Marine Sciences Research Center

DEAN AND DIRECTOR: David Conover
DIRECTOR OF UNDERGRADUATE STUDIES: Mary I. Scranton
ASSISTANT TO THE DIRECTOR: Nancy Glover
COORDINATOR OF ATMOSPHERIC STUDIES PROGRAM: Brian A. Colle

EDUCATION OFFICE: 105 Endeavour Hall
PHONE: (631) 632-8681
E-MAIL: msrcugrad@notes.cc.sunysb.edu
WEB ADDRESS: http://www.msrc.sunysb.edu

Faculty

Bassem Allam, Assistant Professor, Ph.D., University of Western Brittany: Diseases of shellfish.

Josephine Y. Aller, Research Professor, Ph.D., University of Southern California: Marine benthic ecology; invertebrate zoology; marine microbiology; biogeochemistry.

Robert C. Aller, Distinguished Professor, Ph.D., Yale University: Marine geocenology; marine animal-sediment relations.

Robert A. Armstrong, Associate Professor, Ph.D., University of Minnesota: Marine ecology and biogeochemistry.

Stephen B. Baines, Research Assistant Professor, Ph.D., Yale: Aquatic biogeochemistry of carbon and trace elements.

Henry J. Bokuniewicz, Professor, Ph.D., Yale University: Near-shore transport processes; coastal sedimentation; marine geophysics.

Malcolm J. Bowman, Professor, Ph.D., University of Saskatchewan: Estuarine and coastal ocean dynamics.

Bruce J. Brownawell, Associate Professor, Ph.D., Massachusetts Institute of Technology-Woods Hole Oceanographic Institution Joint Program: Biogeochemistry of organic pollutants in seawater and groundwater.

Michael J. Cahill, Adjunct Professor, J.D., DePaul University College of Law: Application and development of environmental law in local government.

Robert M. Cerrato, Associate Professor, Ph.D., Yale University: Benthic ecology; population and community dynamics.

Robert D. Cess, Professor Emeritus, Ph.D., University of Pittsburgh: Radiative transfer and climate modeling; greenhouse effect; nuclear winter theory; atmospheric structures of Mars, Saturn, and Jupiter.

Edmund K.M. Chang, Associate Professor, Ph.D., Princeton University: Atmospheric dynamics and synoptic meteorology.

J. Kirk Cochran, Professor, Ph.D., Yale University: Marine geochemistry; use of radionuclides as geochemical tracers; diagenesis of marine sediments.

Brian A. Colle, Assistant Professor, Ph.D., University of Washington: Synoptic meteorology; mesoscale numerical modeling and forecasting; coastal meteorology.

Jackie L. Collier, Assistant Professor, Ph.D., Stanford University: Phytoplankton ecology, microbial diversity and biocomplexity.

David O. Conover, Professor, Ph.D., University of Massachusetts-Amherst: Ecology of fishes; fishery biology.

Alistair Dove, Assistant Professor, Ph.D., University of Queensland: Pathology; taxonomy; life cycles; ecology.

Nicholas S. Fisher, Professor, Ph.D., Stony Brook University: Marine phytoplankton physiologgy and ecology; biogeochemistry of metals; marine pollution.

Roger D. Flood, Professor, Ph.D., Massachusetts Institute of Technology-Woods Hole Joint Program: Marine geology; sediment dynamics; continental margin sedimentation.

Marvin A. Geller, Professor, Ph.D., Massachusetts Institute of Technology: Atmospheric dynamics; stratosphere dynamics; ozone behavior.

Christopher Gobler, Associate Professor, Ph.D., Stony Brook University: Coastal oceanography; marine algae; harmful algae blooms.

Paul F. Kemp, Associate Research Professor, Ph.D., Oregon State University: Growth and activity of marine microbes in water and sediment; benthic-pelagic interactions; molecular ecology of marine bacteria.

Cindy Lee, Distinguished Professor, Ph.D., University of California, San Diego: Marine geochemistry of organic compounds; organic and inorganic nitrogen cycle biochemistry.

Darcy J. Lonsdale, Associate Professor, Ph.D., University of Maryland at College Park: Zooplankton ecology with special interest in physiology; life history studies.

Glenn G. Lopez, Professor, Ph.D., Stony Brook University: Benthic ecology; animal-sediment interactions.

Kamazima M. M. Luiza, Associate Professor, Ph.D., University College of North Wales: Coastal ocean circulation; tides and tidal fronts; mixing.

John E. Mak, Associate Professor, Ph.D., University of California, San Diego: Atmospheric chemistry and biosphere-atmosphere interactions; isotope geochemistry.

Jack Mattice, Director of Sea Grant Institute and Adjunct Professor, Ph.D., Syracuse University: Invertebrate zoology; physiological ecology; population biology; aquatic toxicology.

Annie E. McElroy, Associate Professor, Ph.D., Massachusetts Institute of Technology-Woods Hole Joint Program: Aquatic toxicology.

Sergey A. Piontkovski, Research Associate Professor, Ph.D., Institute of Biology of the Southern Seas, Ukraine: Physical-biological coupling in coastal and oceanic ecosystems.

Nicole Reimer, Assistant Professor, Ph.D., University of Karlsruhe (Germany): Trace gases; aerosols; microphysics; cloud formation.

Frank J. Roethel, Lecturer, Ph.D., Stony Brook University: Environmental chemistry; behavior of coal waste in the environment; solution chemistry.

Sergio A. Sanudo-Wilhelmy, Associate Professor, Ph.D., University of California, Santa Cruz: Chemical oceanography; coastal geochemistry; metal cycling in aquatic systems.

Mary I. Scranton, Professor, Ph.D., Massachusetts Institute of Technology-Woods Hole Oceanographic Institution Joint Program: Marine geochemistry; biological-chemical interactions in seawater.

Robert L. Swanson, Adjunct Professor and Director, Waste Reduction and Management Institute; Ph.D., Oregon State University: Marine monitoring; environmental tradeoffs in waste disposal methodologies and sites especially in the marine environment.

Gordon T. Taylor, Professor, Ph.D., University of Southern California: Marine microbiology; microbial ecology; plankton trophodynamics; marine biofouling.

Prasad Varanasi, Professor, Ph.D., University of California, San Diego: Planetary spectroscopy.

Dong Ping Wang, Professor, Ph.D., University of Miami: Coastal ocean dynamics.

Robert E. Wilson, Associate Professor, Ph.D., The Johns Hopkins University: Estuarine and coastal ocean dynamics.

Peter M.J. Woodhead, Research Professor, B.S., University of Durham: Behavior and physiology of fish; coral reef ecology; ocean energy conversion systems.

Minghua Zhang, Professor and Director of the Institute of Terrestrial and Planetary Atmospheres, Ph.D., Academia Sinica: Atmospheric dynamics; climate modeling.
Affiliated Faculty
Robert L. deZafra, Physics
William H. Greene, Medicine
Lee E. Koppelman, Political Science
Manuel Lerdau, Ecology and Evolution
Jeffrey Levinton, Ecology and Evolution
Sheldon Reaven, Technology and Society

Teaching Assistants
Estimated number: 20

The Marine Sciences Research Center (MSRC) is the center for marine research, education, and public service in the marine and environmental sciences for the State University of New York system. In addition, MSRC is the Stony Brook University’s center for research, education, and public service in the atmospheric sciences. MSRC is one of the nation’s leading coastal oceanographic and atmospheric institutions, and the expertise of MSRC’s faculty places them in the forefront in addressing and answering questions about regional environmental problems, as well as problems relating to the global ocean and atmosphere. The primary focus of the MSRC faculty is on fundamental research designed to increase understanding of the processes that characterize the coastal ocean and the atmosphere. The Marine Sciences Research Center is also committed to applying the results of research to solve problems arising from society’s uses and misuses of the environment. The Center includes institutes in several major areas: the Institute for Terrestrial and Planetary Atmospheres, the Living Marine Resources Institute, the Long Island Groundwater Resource Institute, and the Waste Reduction and Management Institute. These institutes add a wealth of varied resources to education and research.

MSRC offers undergraduate majors in atmospheric and oceanic sciences environmental studies, marine sciences, and marine vertebrate biology; and minors in environmental studies and marine sciences. See the separate entries for environmental studies (ENS), marine sciences (MAR), and marine vertebrate biology (MVB) in the alphabetical listings of Approved Majors, Minors, and Programs. MSRC also offers several cooperative programs with departments in the College of Arts and Sciences (Chemistry, Biology, and Geosciences) and the College of Engineering and Applied Sciences (Chemical and Molecular Engineering). See the entries for those programs in the alphabetical listings of Approved Majors, Minors, and Programs for more information. Research opportunities in marine sciences, atmospheric sciences, environmental studies, and waste management are available to undergraduates. Information on research opportunities may be found by contacting faculty directly or on the MSRC Web site at http://www.msrc.sunysb.edu.

Courses Offered in Atmospheric and Oceanic Sciences
See the Course Descriptions listing in this Bulletin for complete information.

ATM 102-E Weather and Climate
ATM 205-E Introduction to Atmospheric Sciences
ATM 237-H Current Topics in World Climate and Atmosphere
ATM 247 Atmospheric Structure and Analysis
ATM 305-E Global Atmospheric Change
ATM 320 Spatial Data Analysis Using Matlab
ATM 345 Atmospheric Thermodynamics and Dynamics
ATM 346 Advanced Atmospheric Dynamics
ATM 347 Advanced Synoptic Meteorology and Weather Forecasting
ATM 348 Atmospheric Physics
ATM 397 Air Pollution and Its Control
ATM 437 Forecasting Practicum
ATM 447 Senior Tutorial in Atmospheric Sciences
ATM 487 Senior Research in Atmospheric Sciences
ATM 488 Internship

Courses Offered in Marine Sciences
See the Course Descriptions listing in this Bulletin for complete information.

MAR 101-E Long Island Sound: Science and Use
MAR 104-E Oceanography
MAR 301 Environmental Microbiology
MAR 302 Marine Microbiology and Microbial Ecology
MAR 303 Long Island Marine Habitats
MAR 304-E Waves, Tides, and Beaches
MAR 305 Experimental Marine Biology
MAR 308 Principles of Instrumental Analysis
MAR 315-H Conservation Biology and Marine Biodiversity
MAR 318 Engineering Geology and Coastal Processes
MAR 320 Limnology
MAR 333-H Coastal Oceanography
MAR 334-E Remote Sensing of the Environment
MAR 336 Marine Pollution
MAR 340-H Environmental Problems and Solutions
MAR 346 Marine Sedimentology
MAR 349 Introduction to Biological Oceanography
MAR 350 Introduction to Ocean Physics
MAR 351 Introduction to Ocean Chemistry
MAR 366 Plankton Ecology
MAR 370 Marine Mammals
MAR 371 The Biology and Conservation of Marine Birds and Sea Turtles
MAR 380 Ichthyology
MAR 385 Principles of Fishery Biology and Management
MAR 392-H Waste Management Issues
MAR 394-H Environmental Toxicology and Public Health
MAR 395 Topics in Marine Environmental Sciences
MAR 475 Undergraduate Teaching Practicum
MAR 487 Research in Marine Sciences
MAR 488 Internship

http://www.stonybrook.edu/ugbulletin
## Requirements for the Major in Atmospheric and Oceanic Sciences (ATM)

The major in Atmospheric and Oceanic Sciences leads to the Bachelor of Science degree. Two tracks of study are available in the major. One is intended for students wishing to learn about the physical behavior of the atmosphere and its application to weather forecasting and the other track is for students who wish to learn about physical phenomena in the atmosphere and the oceans and their interactions.

Of the 65 credits required for the major, at least 61 credits must be passed with a letter grade of C or higher.

Completion of the major requires approximately 65 credits.

The core courses for both tracks are as follows:

### A. Required Courses in Mathematics, Chemistry, Physics, and Computer Science

1. **MAT 131 and 132 Calculus I and II** (See Note below)
2. **MAT 203 Calculus III with Applications**
   - or **MAT 205 Calculus III**
   - or **AMS 261 Applied Calculus III**
3. **MAT 303 Calculus IV with Applications**
   - or **AMS 361 Applied Calculus**
4. **CHE 131 and 132 General Chemistry I and II**
   - or **CHE 141 and 142 Honors Chemistry I and II**

### B. Required Departmental Courses:

1. **ATM 205 Introduction to Atmospheric Sciences**
2. **ATM 345 Atmospheric Thermodynamics and Dynamics**
3. **ATM 346 Advanced Atmospheric Dynamics**
4. **ATM 397 Air Pollution and Its Control**
5. **MAR 334 Remote Sensing**
6. **MAR 350 Ocean Physics**

### C. Upper-Division Writing Requirement:

All students majoring in Atmospheric Sciences/Meteorology must submit two papers from required departmental courses (term papers, laboratory reports, or independent research papers) to the director of undergraduate studies for evaluation by the end of the junior year. If this evaluation is satisfactory, the student has fulfilled the upper-division writing requirement. If it is not, the student must fulfill the requirement before graduation.

### Additional Requirements for the Meteorology Track:

- **ATM 247 Atmospheric Structure and Analysis**
- **ATM 347 Advanced Synoptic Meteorology and Weather Forecasting**
- **ATM 348 Atmospheric Physics**

In this track, students learn both the mathematics and physics governing atmospheric behavior and apply this knowledge to forecasting the weather using real-time data received at our weather laboratory. Opportunities are available for students to gain additional practical experience by working under cooperative agreements at two nearby NOAA weather forecasting installations as well as local TV stations. Students graduating in this track will have satisfied all of the coursework recommended by the American Meteorological Society for undergraduate training in meteorology and also the course work required by NOAA.

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**Sample Course Sequence for the Major in Atmospheric and Oceanic Sciences (Meteorology Track)**

**Freshman Fall**

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<tr>
<td>CHE 131 or 141</td>
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<tr>
<td>PHY 131/133 or PHY 141</td>
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**Spring Credits**

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<td>MAT 132</td>
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</tr>
<tr>
<td>CHE 132 or 142</td>
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<td>PHY 132/134 or PHY 142</td>
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**Sophomore Fall**

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**Junior Fall**

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<td>MAT 303</td>
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**Spring Credits**

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**Senior Fall**

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<td>Upper-Division elective</td>
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<td>Elective</td>
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**Spring Credits**

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<th>Credits</th>
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<tr>
<td><strong>Total</strong></td>
<td><strong>14</strong></td>
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</table>
for certification as an entry-level government meteorologist. Students are also prepared for graduate study in atmospheric sciences or positions in other technically related fields.

Additional Requirements for the Atmosphere/Ocean Track:

MAR 308 Principles of Instrumental Analysis
MAR 333 Coastal Oceanography
MAR 340 Environmental Problems and Solutions

Students graduating in this track will have taken the coursework necessary for graduate study leading to degrees that prepare them for research and teaching positions in the atmospheric sciences, in physical oceanography, or in atmosphere-ocean interactions.

Note: The following alternate beginning calculus sequences may be substituted for major requirements or prerequisites: MAT 125, 126, 127 or 141, 142 or AMS 151, 161 for MAT 131, 132. Equivalency for MAT courses achieved by earning the appropriate score on a placement test is accepted as fulfillment of the requirement without the necessity of substituting other credits. For more detailed information about the various calculus sequences, see “Beginning Mathematics Courses” under the Mathematics Department in this Bulletin.