The Meteorology Undergraduate Program

Department of Environmental Sciences

School of Environmental and Biological Sciences

(formerly Cook College)

Rutgers University
Outline of presentation

Overview of program, department, faculty and students
Admission to Rutgers
Virtual tour of facilities
Degree requirements
Career issues: Salaries, job satisfaction, getting a job
Extracurricular activities: Forecast game, Meteorology Club, RuTV
Living-learning community (Meteorology dorm)
Junior Year Abroad
Why study meteorology here?
Financial aid
American Meteorological Society
Final Q & A
For more information:
Professor Tony Broccoli
Acting Director, Meteorology Undergraduate Program
Email: broccoli@envsci.rutgers.edu
Phone: 732-932-9800, x 6202
Web site: http://meteorology.rutgers.edu
Administrative Structure

Rutgers University, President Richard McCormick
Rutgers University-New Brunswick, Executive VP Richard Edwards
School of Environmental and Biological Sciences, Dean Robert Goodman
Department of Environmental Sciences, Prof. Robert Tate

Three undergraduate majors:

Meteorology
Environmental Sciences
Environmental Engineering
Location of Rutgers University-New Brunswick campuses
The Numbers

Number of Meteorology majors: 78
Number of Meteorology faculty: 9

Alan Robock
Anthony Broccoli
Steven Decker
Benjamin Lintner
Ann Marie Carlton

Keith Arnesen
Mark Miller
James Miller
Ying Reinfelder
A survey by the *Chronicle of Higher Education* has ranked the Atmospheric Science graduate program at Rutgers 5th in the nation in Faculty Scholarly Productivity.
Undergraduate Admissions

Admission decisions are **not** made by School of Environmental and Biological Sciences or departments. They are made solely at the University level for all schools without input from other levels.
Instructional Computing Lab on third floor, occasionally used as a classroom
Classroom on second floor, equipped for television and computer visuals
Weather instrument and computer graphic display outside Computer Lab
Meteorology Club display and announcements on third floor outside Computer Lab
Linux supercomputer clusters on second floor
in the Center for Environmental Prediction
Description of the Components of the Photochemical Air Monitoring Station (PAMS)

The Photochemical Air Monitoring Station (PAMS) includes the instrumentation needed to make a comprehensive assessment of meteorological and air quality conditions at this location. The components of the station are as follows:

- 20-Meter (66-foot) Instrumented Meteorological Tower.
- Acoustic Sounder.
- Wind/Temperature Profiler.
- A trailer that contains:
  - Meteorological Data Recording/Display/Access System.
  - Air Pollution Monitors.
Instrumented tower and atmospheric sounding equipment at PAM site
New Brunswick, NJ
Remote Weather Station
Installed: May 23, 2006

- Wind Speed and Direction
- 10 Meter Tower
- Yagi antenna for wireless communications
- Met 4 12” Heated Precipitation Gauge
- Nema enclosure houses data logger, cdma modem etc.
- Temperature / Humidity Sensor
- 3’ locked main gate
- 6’ High Chain Link Fence 40’ by 60’
- 3’ gate used for tilting down tower
Close-up view inside weather instrument shelter
Overview of Graduation Requirements

Total to graduate: **128 credits**

Ave. no. of courses needed per semester: **16 credits** (5 or 6 courses)

General college requirements: **30 credits** (10 courses)

Free electives: **18 credits** (6 courses on any subject)

Meteorology courses required: **34-37 credits** (12-13 courses)

Remainder of courses: prerequisites (math, chem, physics) or related courses (computer, statistics, hydrology)
COURSE REQUIREMENTS FOR METEOROLOGY

GENERAL REQUIREMENTS

• Quantitative Methods (16): 4 sem. of Calculus
• Computer Competence (3): 1 sem.
• Interdisciplinary/Ethical Analysis (3): junior/senior colloquium
• Humanities and Arts (6): 2 sem.
• Multicultural and International Studies (6): 2 sem.
• Human Behavior, Economic and Political Systems (9): 3 sem.
• Oral and Written Communication (6): 2 sem. composition/speech
COURSE REQUIREMENTS FOR METEOROLOGY

BASIC & RELATED SCIENCE

• 01:119:103 Principles of Biology (4)
• 01:160:161-162 General Chemistry (4,4)
• 01:750:203-204 General Physics (3,3)
• 01:750:205-206 General Physics Laboratory (1,1)
COURSE REQUIREMENTS FOR METEOROLOGY

METEOROLOGY

• 11:670:201 Elements of Meteorology (3)
• 11:670:202 Elements of Climatology (3)
• 11:670:209-210 Meteorological Analysis (1.5,1.5)
• 11:670:323 Thermodynamics of the Atmosphere (3)
• 11:670:324 Dynamics of the Atmosphere (3)
• 11:670:431 Physical Meteorology (3)
• 11:670:433 Weather Analysis and Forecasting I: Synoptic Meteorology (4)
• 11:670:434 Weather Analysis and Forecasting II: Mesoscale Meteorology (3)
• 11:670:451 Remote Sensing of Oceans & Atmosphere (3)
• 11:670:461 Climate Dynamics (3)
Also choose one of the following options:

**Operational Meteorology Option**
11:375:303 Numerical Methods in Environmental Science (3)
11:670:414 Hydrologic Processes (3)
11:670:444 Tropical Meteorology (3)

**Environmental Meteorology Option**
11:375:303 Numerical Methods in Environmental Science (3)
11:375:202 Chemical Principles of Environmental Science (3)
11:670:453 Air Quality Modeling (3)

**Climate Option**
01:960:401 Basic Statistics for Research (3)
11:670:414 Hydrologic Processes (3)
11:628:451 Physical Oceanography (4)
Recommended Course Schedule for Meteorology Majors

FIRST SEMESTER FIRST-YEAR
- Expository Writing I (01:350:101) 3
- Calculus I (01:640:151) 4
- General Physics (01:750:203) 3
- General Physics Laboratory (01:750:205) 1
- Elements of Meteorology (11:670:201) 3
- Core or Electives 2

SECOND SEMESTER FIRST-YEAR
- Calculus II (01:640:152) 4
- General Physics (01:750:204) 3
- General Physics Laboratory (01:750:206) 1
- Elements of Climatology (11:670:202) 3
- Core or Electives 6
Recommended Course Schedule for Meteorology Majors

FIRST SEMESTER SOPHOMORE
• Meteorological Analysis (11:670:209) 1.5
• Multivariable Calculus (01:640:251) 4
• General Chemistry I (01:160:161) 4
• Scientific and Tech. Writing (01:355:302) 3
• Principles of Biology (01:119:103) 4

SECOND SEMESTER SOPHOMORE
• Meteorological Analysis (11:670:210) 1.5
• Elem. Differential Equations (01:640:244) 3
• General Chemistry II (01:160:162) 4
• Introduction to Experimentation (01:160:171) 1
• Core or Electives 6
Recommended Course Schedule for Meteorology Majors

**Operational Meteorology Option**

**Year 3:**
11:670:323 Thermodyn. of Atmosphere (3)  
01:198:107 Computing for Math and Sci. (3)  
Area III, IV, V credits or electives (7)

11:670:324 Dynamics of the Atmosphere (3)  
11:670:431 Physical Meteorology (3)  
Area III, IV, V credits or electives (10)

**Year 4:**
11:670:433 Synoptic Meteorology (4)  
11:670:461 Climate Dynamics (3)  
11:670:451 Remote Sensing Atm./Oceans (3)  
Area III, IV, V credits or electives (6)

11:015:400 Jr./Sr. Colloquium (3)  
11:670:434 Mesoscale Meteorology (3)  
11:670:414 Hydrologic Processes (3)  
Area III, IV, V credits or electives (4)  
11:670:444 Tropical Meteorology (3)
# Recommended Course Schedule for Meteorology Majors

## Environmental Meteorology Option

### Year 3:
- 11:670:323 Thermodyn. of Atmosphere (3)
- 01:198:107 Computing for Math and Sci. (3)
- Area III, IV, V credits or electives (7)
- 11:670:324 Dynamics of the Atmosphere (3)
- 11:670:431 Physical Meteorology (3)
- Area III, IV, V credits or electives (10)

### Year 4:
- 11:670:433 Synoptic Meteorology (4)
- 11:670:461 Climate Dynamics (3)
- 11:670:451 Remote Sensing Atm./Oceans (3)
- 11:670:453 Air Quality Modeling (3)
- Area III, IV, V credits or electives (3)
- 11:015:400 Jr./Sr. Colloquium (3)
- 11:670:434 Mesoscale Meteorology (3)
- Area III, IV, V credits or electives (7)
# Recommended Course Schedule for Meteorology Majors

## Climate Option

### Year 3:
- 11:670:323 Thermodyn. of Atmosphere (3)
- 01:198:107 Computing for Math and Sci. (3)
- 01:960:401 Basic Statistics for Research (3)
- Area III, IV, V credits or electives (7)

### Year 4:
- 11:670:433 Synoptic Meteorology (4)
- 11:670:461 Climate Dynamics (3)
- 11:670:451 Remote Sensing Atm./Oceans (3)
- 11:628:451 Physical Oceanography (4)
- Area III, IV, V credits or electives (3)
The Rutgers Study Abroad Office has arrangements with many universities around the world for spending time learning in another culture.

The University of Reading, outside of London, England, has the largest and best Meteorology Department in the UK. We can arrange for you to spend your Junior year or part of your Sophomore or Senior year studying there. You will have access to a wide array of courses, opportunities to travel both in the UK and throughout Europe, and the chance to live in another culture. We can also arrange for experiences in other countries.
## FIRST EMPLOYMENT STATISTICS

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate school</td>
<td>18</td>
</tr>
<tr>
<td>Environmental consulting</td>
<td>9</td>
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<tr>
<td>Media</td>
<td>7</td>
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<tr>
<td>School teacher</td>
<td>4</td>
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<tr>
<td>Research or other centers</td>
<td>2</td>
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<tr>
<td>National Weather Service</td>
<td>1</td>
</tr>
<tr>
<td>Private forecasting/research</td>
<td>7</td>
</tr>
<tr>
<td>Military</td>
<td>2</td>
</tr>
<tr>
<td>Non-meteorology-science related</td>
<td>5</td>
</tr>
<tr>
<td>Non-science related</td>
<td>7</td>
</tr>
<tr>
<td>Unknown</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>85</strong></td>
</tr>
</tbody>
</table>
Life After Rutgers

Recent Rutgers Meteorology graduates have become graduate students at the following universities:

- Columbia University
- Florida State Univ.
- Georgia Tech. Univ.
- Harvard University
- Oregon State Univ.
- Penn State Univ.
- Rutgers University
- Univ. at Albany - SUNY
- Univ. of Colorado
- Univ. of Delaware
- Univ. of Maryland
- Univ. of Michigan
UNDERGRADUATE JOB AND RESEARCH OPPORTUNITIES

Weather Observer
New Jersey State Climatologist Office
Internships at the National Weather Service (SPIN)

Cook Honors Program
George H. Cook Senior Thesis
Research Problems in Meteorology

Summer Scholarship for Research
Senior Scholarship for Research
When Sky Meets Science, A Career Is Born

Job Title: Atmospheric Scientist

Atmospheric scientists, commonly called meteorologists, study the atmosphere’s physical characteristics, motions and processes, and the way in which these factors affect the rest of our environment. The best known application of this knowledge is forecasting the weather.

AVERAGE SALARY (NEW JERSEY): $94,030

SKILLS/EDUCATION REQUIRED: A bachelor’s degree in meteorology or atmospheric science, or in a closely related field with courses in meteorology, usually is the minimum educational requirement for an entry-level position as an atmospheric scientist.

The preferred educational requirement for entry-level meteorologists in the federal government is a bachelor’s degree—not necessarily in meteorology—with at least 24 semester hours of meteorology courses, including six hours in the analysis and prediction of weather systems, six hours of atmospheric dynamics and thermodynamics, three hours of physical meteorology, and two hours of remote sensing of the atmosphere or instrumentation. Other required courses include three semester hours of ordinary differential equations, six hours of college physics and at least nine hours of courses appropriate for a physical science major—such as statistics, chemistry, physical oceanography, physical climatology, physical hydrology, radiative transfer, aeronomy, advanced thermodynamics, advanced electricity and magnetism, light and optics, and computer science. Although positions in operational meteorology are available for those with only a bachelor’s degree, obtaining a second bachelor’s degree or a master’s degree enhances employment opportunities, pay and advancement potential. A master’s degree usually is necessary for conducting applied research and development, and a doctorate is required for most basic research positions.

POTENTIAL EMPLOYERS: The federal government was the largest single employer of civilian meteorologists, accounting for about 2,900. The National Oceanic and Atmospheric Administration (NOAA) employed most federal meteorologists in National Weather Service stations throughout the nation; the remainder of NOAA’s meteorologists worked mainly in research and development or management. The U.S. Department of Defense employed several hundred civilian meteorologists. Others worked for professional, scientific and technical services firms, including private weather consulting services; radio and television broadcasting; air carriers; and state government.

JOB OUTLOOK: Employment of atmospheric scientists is projected to increase about as fast as average for all occupations through 2014. In private industry, job opportunities for atmospheric scientists are expected to be better than in the federal government through 2014. As research leads to continuing improvements in weather forecasting, demand should grow for private weather consulting firms to provide more detailed information than has formerly been available, especially to climate-sensitive industries.

JOB DESCRIPTION: In addition to predicting the weather, atmospheric scientists attempt to identify and interpret climate trends, understand past weather, and analyze today’s weather. Weather information and meteorological research are also applied in air-pollution control, agriculture, forestry, air and sea transportation, defense, and the study of possible trends in the Earth’s climate, such as global warming, droughts and ozone depletion.

Atmospheric scientists who forecast the weather, known professionally as operational meteorologists, are the largest group of specialists. They study information on air pressure, temperature, humidity, wind velocity, and they apply physical and mathematical relationships to make short-range and long-range weather forecasts. Their data come from weather satellites, radars, sensors and stations in many parts of the world. Meteorologists use sophisticated computer models of the world’s atmosphere to make long-term, short-term and local forecasts.

FOR MORE INFORMATION:
- www.nws.noaa.gov/ams
- www.usajobs.opm.gov

Finding jobs for students after graduation

Internships (SPIN program), fellowships

Office of Career Services

Invite speakers working in meteorology & related fields

Keep email addresses up-to-date for sending students job announcements

Networking
HOW DO I GET A JOB IF I DON'T HAVE EXPERIENCE?
HOW DO I GET EXPERIENCE IF I DON'T HAVE A JOB?
The answer is **INTERNSHIPS**.

What are internships? They are a way to:

- work part-time or full-time in a job related to your major
- earn up to 6 credits
- get paid competitive wages
- gain experience to add to your resume
- become more prepared for the job market or graduate school
- make contacts in your profession for the future
- clarify career goals
Recently, students from the meteorology program have obtained internships from many employers, including the following:

- National Weather Service Office, Mt. Holly, NJ
- WCBS TV, CBS-2, New York City
- WNYW TV, FOX-5, New York City
- WWOR TV, UPN-9, Secaucus, NJ
- WCAU TV, NBC-10, Philadelphia, PA
- News 12 New Jersey, Edison, NJ
- WMGM TV, NBC-40, Atlantic City, NJ
- Franklin Institute Science Museum, Philadelphia, PA
- NOAA/Geophysical Fluid Dynamics Laboratory, Princeton, NJ
- PARS Environmental, Robbinsville, NJ
- Weather Works, Hackettstown, NJ
EXTRACURRICULAR ACTIVITIES

Forecast Contest
Meteorology Club
WeatherWatcher (RU-tv)
Department Seminars
Rutgers Meteorology Club
(AMS Student Chapter of the Year 2003)

- Social activities: meet other meteorology students, picnics, holiday parties
- Field trips: Nat. Weather Service, news stations, science centers/museums, AMS conference, observatories
- Hear and meet invited guest speakers and past alumni (guests have included Paul Kocin, Greg Forbes, and Steve Lyons)
- Coordinate Rutgers TV weather broadcast (WeatherWatcher Program)
- Mentoring: advising new freshman
- Help with campus life
- Charity fund raising
What some of these people are doing now:

Jim Nichols '04
Vice President
Stern + Associates
(communication firm)

Jared Klein '05
Meteorologist
NWSFO Sterling, VA

Joe Brodie '05
Graduate Student
Univ. of Delaware

Brian Frugis '04
Meteorologist
NWSFO Albany

Kathleen Schmeelck '04
Environmental Project Manager
PHASE Associates LLC

Megan Linkin '04
Atmospheric Perils Meteorologist
Allianz (Insurance risk assessment)

Mark Papier '04
Meteorologist
The Weather Channel Radio & Weather.com

Corey Rhodes '04
Meteorologist
3Tier (Alternative Energy Co in Seattle)

Sara Boyle '05
Graduate Student
University of New Hampshire

Mark Sannutti '04
Technical Meteorologist
NOAA HQ (works on AWIPS training)

Josh McGrath '04
Research Staff
National University of Ireland, Galway

Andrew Durante '04
Meteorologist
Constellation Energy (Energy Trading)

John Krasting, '03, Ph.D. '08
Meteorologist
NOAA Geophysical Fluid Dynamics Laboratory

Matt Lanza '04
Meteorologist
California Edison (Energy Forecasting)
WeatherWatcher

Student-run venture between Rutgers Television and the Rutgers Meteorology Program.

Produce TV forecasts twice daily that are broadcast on University cable TV, and always live on the [RU-tv home page](http://ru-tv.com) and on [Facebook](https://www.facebook.com/ru-tv). Students in all years serve as on-air weather anchors or off-air producers.

Working with WeatherWatcher and RU-tv gives students television experience.

Featured on the Weather Channel. [Click here for the show](http://weatherchannel.com).

Recognized nationally by the American Meteorological Society (AMS), the Association of Higher Education Cable Television Administrators (AHECTA), employers, and major Universities.
New for 2009

**WeatherWatcher Living-Learning Community**

- Live in Perry Hall on the Cook Campus, with other Meteorology students
- Access to the Cook-Douglass RU-tv studio right in the dorm, 24 hours a day
- Field trips and guest speakers
- Course in Media and TV production (3-credits over one year)
- Priority for being on air or doing production for WeatherWatcher broadcasts
WHY YOU WOULD WANT TO BEGIN YOUR METEOROLOGICAL CAREER AT RUTGERS

• You take introductory meteorology courses during your first two years.

• You have opportunities to get involved immediately through participation in the weekly weather forecasting game, the student-run Meteorology Club, and TV broadcasting.

• State-of-the-art computer systems for weather analysis and display are available for you to get hands-on experience to produce weather graphics.
WHY YOU WOULD WANT TO BEGIN YOUR METEOROLOGICAL CAREER AT RUTGERS II

• Undergraduate teaching and advising is a priority.
• The Meteorology Program puts a strong emphasis on assisting students to obtain suitable post-graduate employment.
• The School of Environmental and Biological Sciences has an Internship Office to assist those who want work experience while enrolled.
• Enrollment at the School of Environmental and Biological Sciences lets you have the personal atmosphere of a small college, while enjoying the full resources of a major university.
• Rutgers University consistently rates high on surveys of “best college values.”
Unsolicited testimony (10/10/03)

From Mike Sager (Meteorology graduating class of 1999):

I work with a lot of Penn State graduates, and I notice that a lot of them do not seem to be at quite the same level as the people that I graduated with. While the Cook College program is smaller than the Penn State program, I think that it prepared me better for the real world. I just met a couple of Cook College graduates who had job interviews at AccuWeather, and they really seemed to know their stuff.
Head in the Clouds

Stacey Kawecki CC’06

How did Rutgers prepare you to be a meteorologist on the Mount Washington Observatory staff? The Rutgers undergraduate meteorology program is very strong, and practical, in environmental studies and physical science. And there are many opportunities to get involved through the Rutgers University Meteorology Club, the National Weather Service, and alumni.

We hear that the movie Twister inspired you to be a meteorologist? Tornadoes and thunderstorms have always fascinated me. Twister gave me a glimpse of what it would be like to study severe storms. I began reading about them and studying the weather.

The summit of Mount Washington, in New Hampshire’s White Mountains, is one of the world’s coldest places. How cold does it get? The coldest recorded temperature is -47 degrees. There was a record wind of 231 miles per hour in April 1934. So, windchill is the real issue. Often, you have to make sure to cover every inch of skin: frostbite only takes 10 minutes—or less—to set in.

When does the snow melt for good? Depends on the year and the weather. About 100 inches of snow fell in May 1997.

What’s the strangest thing you have seen? Last August, there was a thunderstorm out of Canada. We could see the lightning lighting up the tops of thunderclouds from 140 miles away!

How do you kill time up there, at 6,288 feet above sea level? Play cards, read books, knit, watch movies, hike, ski (not me, though).

Does the summit make you fonder of your favorite place, the New Jersey shore? Sometimes, especially when visibility is good enough to see the Atlantic.
Dave,

I had a great tour of Mt. Washington by Stacey Kawecki, who is a Rutgers graduate. You should be proud to know that the majority of the current observers at Mt. Washington are Rutgers graduates.

Nancy

Nancy J. Selover, Ph.D.  Tempe, AZ  85287-1508
State Climatologist  tel:  480-965-0580
School of Geographical Sciences  fax:  480-965-1473
Arizona State University  http://geography.asu.edu/azclimate
Live videoconference to Mt. Washington Observatory in sophomore Meteorological Analysis class, Oct. 5, 2009

Stacey Kawecki, Rutgers ‘06
Live videoconference to Mt. Washington Observatory in sophomore Meteorological Analysis class, Sept. 27, 2010

Stacey Kawecki, Rutgers ’06
From Michael Carmon (Meteorology graduating class of 2008):

Thanks to an e-mail from Dr. Robock, I looked into a fall internship at the Mt. Washington Observatory. After a successful interview, I was offered the internship. This past Wednesday was my first day, and I'll be working one week on/one week off until December. I've already been helping out the observers up here with weather observations, and I'm even going to be making my own forecasts for the area soon.

I wanted to thank you guys for all of your help in my career at Rutgers, as it has prepared me well for what I'll be doing up here. I also thought you might like to hear a meteorology graduate's success story!
Live videoconference to Mt. Washington Observatory in sophomore Meteorological Analysis class, Oct. 5, 2009

Mike Carmon, Rutgers ’08
Live videoconference to Mt. Washington Observatory in sophomore Meteorological Analysis class, Sept. 27, 2010

Mike Carmon, Rutgers '08
Rutgers is a member of the National Center for Atmospheric Research, in Boulder, Colorado, available to students and faculty.
A student from Rutgers has attended each of these workshops.

5th NCAR Undergraduate Leadership Workshop
June 19-23

Gifted college juniors are nominated by faculty and convene in Boulder for 5 days, co-sponsored by universities and NCAR

Goals for students:
- Gain knowledge of state-of-the-art multi-disciplinary research, facilities, models.
- Study models of leadership and consider importance of leadership in the sciences
- Establish a network of student peers from leading programs in the geosciences

http://www.ucar.edu/educ_outreach/ulw/
An example of programs at NCAR available to Rutgers students

Significant Opportunities in Atmospheric Research & Science: SOARS

Created in 1996 by UCAR to bring ethnically diverse students into careers in the atmospheric and related sciences including engineering, mathematics and social sciences.

Received 2001 Presidential Mentoring Award for excellence in Science, Mathematics and Engineering.
Scholarship Opportunities for Meteorology Students

American Meteorological Society
(617-277-2425)
http://www.ametsoc.org

Students can join now for only $20/year.
HAVE A GOOD CAREER
AND HAVE FUN WITH THE WEATHER.

Wherever you decide to attend college, we are glad you visited us!

For further information & applications:

http://www.rutgers.edu
http://www.sebs.rutgers.edu
http://envsci.rutgers.edu
http://www.facebook.com/Rutgers.Meteorology