Meteorologist

Snapshot

Career Cluster: Environment & Conservation; Science & Technology
Interests: Weather, climate patterns, science, atmospheric science, analyzing and interpreting data
Earnings (Yearly Average): $88,140
Employment & Outlook: Faster Than Average Growth Expected

OVERVIEW

Sphere of Work

Meteorology is the scientific study of the earth's atmosphere and the natural forces that shape weather and climate patterns. Using atmospheric forecasting and research, meteorologists explain and forecast how the atmosphere affects the earth. Meteorologists in all specialties use instruments to record the short- and long-term effects of climate and variations in weather patterns. They use their skills and experience to produce and deliver forecasts and other weather-related information to the public via radio and television broadcasts, among

other mediums. Meteorologists can also use their forecasting skills to help city planners locate and design construction projects, such as airports and factories.

Work Environment

Meteorologists collaborate with other scientists and researchers in basic disciplines such as chemistry, physics, mathematics, oceanography, and hydrology. They can operate in any environment, from weather centers to field offices to ships at sea. The government is the largest employer of meteorologists in the United States; meteorologists work for government agencies such as the Department of Defense, Department of Energy, and Department of Agriculture, while many serve as civilians in the military. Broadcast meteorologists typically work for television and radio stations. Some meteorologists are self-employed and consult for large corporations.

Profile

Working Conditions: Work both Indoors and Outdoors
Physical Strength: Light Work
Education Needs: Bachelor's Degree, Master's Degree, Doctoral Degree
Licensure/Certification: Recommended
Physical Abilities Not Required: No Heavy Labor
Opportunities For Experience: Internship, Military Service
Holland Interest Score*: IRS

* See Appendix A

Occupation Interest

Many people are drawn to meteorology because they are keen to address the challenge of forecasting natural events throughout the world. As such, meteorologists should be interested in the world around them and want to understand the scientific principles that explain the patterns of atmospheric behavior. They must also be comfortable working with computer and satellite technology and other research instruments, and analyzing and interpreting data; forecasting is continually changing and improving, resulting in more accurate predictions over longer spans of time (such as five- or ten-day outlooks).

A Day in the Life—Duties and Responsibilities

Meteorologists must be able to direct, plan, and oversee the work of others, and be able to use reasoning and logic to come to conclusions about forecasting weather. In a typical day, they consult charts

and graphs and apply mathematical concepts to help them perceive differences in paths between still or moving objects and picture three-dimensional objects from drawings or photos. Meteorologists base their decisions on measurable data as well as on personal judgment.

Meteorologists from around the world work together daily. They take atmospheric measurements several times a day from surface weather stations and on board ships at sea. They then analyze and interpret weather data that is generated and gathered by upper air stations and satellites, and through weather reports and radar, to prepare forecasts for the media and public. They use computer modeling and simulation to assist in creating these forecasts. Meteorologists also analyze charts and photos and data and information related to barometric pressure, temperature, humidity, and wind velocity. They issue storm warnings and advise pilots on atmospheric conditions such as turbulence, winds aloft, and cloud formations. They also provide relevant forecasts for sea transportation. Some meteorologists make tailored predictions for specific clients, such as city managers and agricultural stakeholders.

Duties and Responsibilities

- **Analyzing and interpreting meteorological data gathered by surface and upper air stations, satellites and radar**
- **Studying and interpreting reports, maps, photographs and charts to make both long and short –term weather predictions**
- **Preparing weather forecasts for the media and other users**
- **Interpreting charts, maps and other data in relation to such areas as barometric pressure, temperature, humidity, wind velocity and areas of precipitation**
- **Conducting research for long-range forecasting**
- **Directing forecasting services at a weather station**

WORK ENVIRONMENT

Physical Environment

Meteorologists work in a variety of physical locations. They can work in large field offices near airports or big cities, or they may operate from smaller sites in remote areas. Those in smaller, remote stations often work alone. Other meteorologists are on board ships, doing field work where visual weather observations are required. Some are located at television and radio stations. Meteorologists work primarily indoors. Weather support units at US military bases include global weather centers and command and control centers at sea.

Relevant Skills and Abilities

Analytical Skills
- Collecting and analyzing data

Communication Skills
- Speaking and writing effectively

Organization & Management Skills
- Making decisions
- Paying attention to and handling details

Research & Planning Skills
- Creating ideas
- Developing evaluation strategies
- Using logical reasoning

Technical Skills
- Performing scientific, mathematical and technical work

Human Environment

Weather stations and offices are located nationwide. Meteorologists work with a variety of other scientists in addition to lay people, such as broadcast journalists, who may simply report on the weather; meteorologists should therefore be aware of other peoples' roles and level of knowledge so that technology terms can be explained at the appropriate level. Strong communication skills are essential.

Technological Environment

Meteorologists use highly sophisticated tools to collect and analyze data. Radar systems, aircraft, satellites, and weather balloons gather information from the atmosphere. Computers are used to analyze the collected data and create simulations, models, and forecasts.

EDUCATION, TRAINING, AND ADVANCEMENT

High School/Secondary

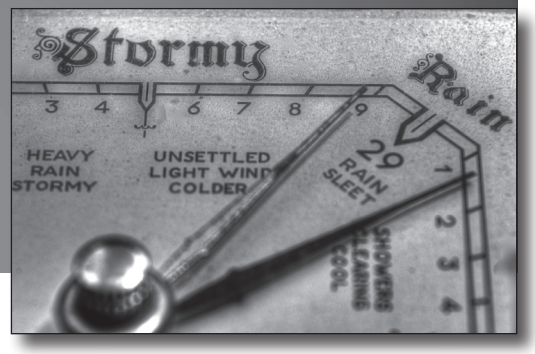
Since the field of meteorology is highly scientific, the most prepared high school students will have taken calculus-level mathematics, chemistry, physics, earth sciences, and computer science. Mathematical proficiency is required in every aspect of physical science. It is also necessary to have a strong command of written and spoken English as well as other languages for following international developments.

Suggested High School Subjects

- Algebra
- Applied Math
- Chemistry
- College Preparatory
- Computer Science
- English
- Geography
- Geometry
- Mathematics
- Literature
- Physical Science
- Physics
- Science
- Statistics
- Trigonometry

Famous First

The first weather forecasting service to use the telephone was launched in New York City in 1938. Although newspaper forecasts and radio broadcasts were available at the time, the telephone provided on-demand reports through the city's Weather Bureau. A steel tape recorder developed by Bell Telephone and capable of responding to 30,000 inquiries per day was the central component of the system.



College/Postsecondary

Many universities offer a bachelor's degree in meteorology or atmospheric science. Meteorology is calculus-based, which means the academic coursework is designed to maximize its use. Recommended courses include physics, chemistry, geography, hydrology, oceanography, differential equations, linear algebra, numerical analysis, and computer science. Some university programs focus more on broad-based meteorological studies, others in more specialty areas. Undergraduate programs provide the foundation needed to move into specialties, such as agricultural meteorology. Those interested in pursuing a career in meteorology should consider applying for relevant internships.

While a bachelor's degree is the norm, the best jobs are available to those with graduate-level education. Advanced degrees are highly useful, and often required, for atmospheric research. Those with a master's degree are qualified to work as operational meteorologists for the government or in private-sector organizations. Alternatively, they may work as assistants to researchers, who have doctoral degrees. Those who wish to teach at the university level must have at least a master's degree.

Related College Majors

- Atmospheric Sciences & Meteorology
- Earth Science
- Oceanography

Adult Job Seekers

When it is not possible to attend a college or university, it is useful to consider joining US military branches, such as the US Air Force or US Navy, for training in observation and forecasting. For those returning to the workforce, internal apprenticeships, mentorships, internships, community work with a relevant government agency, and volunteering with meteorologists can be highly valuable for gaining experience in the field of meteorology. Federal agencies often provide some on-the-job training.

Meteorologists often start as weather forecasting trainees at weather centers or airports. As meteorologists become more experienced, they may turn to supervising research analysis as administrators and mentoring meteorological technicians. Experienced meteorologists can advance to senior management and supervisory positions.

Professional Certification and Licensure

Meteorologists are encouraged to acquire certification according to their job function. The American Meteorological Society (AMS) currently has two certification programs: the Certified Broadcast Meteorologist Program (CBM) and the Certified Consulting Meteorologist Program (CCM). Candidates for the CBM must complete an undergraduate degree in meteorology, an examination, and a work review to be certified. The CCM program requires a specified level of education, at least five years of experience in meteorology or a related field, and successful completion of an examination. Certification renewal depends on continuing education in the field. Consult credible professional associations within the field and follow professional debate as to the relevancy and value of any certification program.

Additional Requirements

Aspiring meteorologists must have a thorough understanding of calculus-based mathematical concepts, and they must always be willing to learn new methods of collecting, analyzing, interpreting, and delivering useful data. Broadcast meteorologists must also be willing to work long or flexible hours, which may include nights, weekends, and holidays, to meet forecast deadlines.

Fun Fact

The fastest a raindrop can fall is 18 mph. Between evaporation and falling as precipitation, a droplet of water may travel thousands of miles. A molecule of water will stay in earth's atmosphere an average of 10-12 days. One billion tons of rain falls on the earth every minute of each day.

Source: http://www.science-facts.com/quick-facts/amazing-weather-facts

EARNINGS AND ADVANCEMENT

Earnings of meteorologists depend on experience, ability, level of education and on the type of employer. Mean annual earnings of meteorologists were $88,140 in 2013. The lowest ten percent earned less than $50,000, and the highest ten percent earned more than $129,000. Meteorologists employed by the federal government earned average annual salaries of $97,350 in 2013.

Meteorologists may receive paid vacations, holidays, and sick days; life and health insurance; and retirement benefits. These are usually paid by the employer. Some employers also pay expenses for additional education.

Metropolitan Areas with the Highest Employment Level in This Occupation

Metropolitan area	Employment[1]	Employment per thousand jobs	Hourly mean wage
Boulder, CO	1,540	9.44	$45.99
Washington-Arlington-Alexandria, DC-VA-MD-WV	680	0.29	$45.44
Boston-Cambridge-Quincy, MA	310	0.18	$38.05
Chicago-Joliet-Naperville, IL	290	0.08	n/a
Bethesda-Rockville-Frederick, MD	250	0.45	$45.08
Houston-Sugar Land-Baytown, TX	240	0.09	$29.92
Sacramento--Arden-Arcade--Roseville, CA	190	0.22	$51.95
Oklahoma City, OK	190	0.31	$47.26
Miami-Miami Beach-Kendall, FL	180	0.17	$37.73
San Diego-Carlsbad-San Marcos, CA	160	0.13	$38.46

[1] Does not include self-employed. Source: Bureau of Labor Statistics

EMPLOYMENT AND OUTLOOK

There were approximately 11,000 meteorologists and atmospheric scientists employed nationally in 2012. The federal government employs the most meteorologists, around one-third, primarily in National Weather Service stations within the National Oceanic and Atmospheric Administration (NOAA). Employment is expected to grow about as fast as the average for all occupations through the year 2022, which means employment is projected to increase 10 percent to 15 percent. New jobs will be created in private industry as firms, especially those in climate-sensitive industries, recognize the value of having their own weather forecasting and meteorological services. Most of the job openings in this small occupation will arise from the need to replace those who change occupations or retire.

Employment Trend, Projected 2012–22

Total, All Occupations: 11%

Science Occupations (All): 10%

Meteorologists and Atmospheric Scientists: 10%

Note: "All Occupations" includes all occupations in the U.S. Economy. Source: U.S. Bureau of Labor Statistics, Employment Projections Program.

Related Occupations

- Astronomer
- Oceanographer
- Physicist

Related Military Occupations

- Meteorological Specialist
- Meteorologist

Conversation With . . .
DON SCHWENNEKER

TV Meteorologist, 20 years
WTVD-TV, Raleigh, NC

1. What was your individual career path in terms of education/training, entry-level job, or other significant opportunity?

I didn't get my job in the traditional way. I actually started in radio and TV production running cameras and shooting and editing video. I had always performed in choir and theatre and one day I was asked to audition for a part-time weather job. Once I started talking about the weather, I loved it! So I went back to school part-time while working full time and earned my meteorology certification from Mississippi State University. If someone wants to be an on-air meteorologist, they should go to college for Meteorology and while there, take classes in speech and broadcasting.

2. What are the most important skills and/or qualities for someone in your profession?

You have to be able to think on your feet and roll with change. Some days are slow and sunny, some days we have severe weather moving through our viewing area. It's never the same day twice (unless you work in Hawaii). Good math and science skills are also important when it comes to actually making the forecast. Computer skills are essential in making the graphics seen on TV.

3. What do you wish you had known going into this profession?

I thought I could stay in the same place and work for 30 years. I didn't think I would move as much as I have. If you start in smaller markets and want to make a living that will support a family, you have to keep moving to bigger cities to increase the pay. I don't regret it; I've lived in some amazing places!

4. Are there many job opportunities in your profession? In what specific areas?

In TV, the need for meteorologists is steady. But supply for meteorologists in general continues to exceed demand. According to the National Oceanic and Atmospheric Administration, U.S. colleges and universities confer meteorology degrees on

approximately 600-1000 students every year. One study suggested the need for new meteorologists is only half that. Most people who go into meteorology do so because of a love of all things weather, and not because of the paycheck.

5. How do you see your profession changing in the next five years, what role will technology play in those changes, and what skills will be required?

I think TV meteorology is shrinking. You can get a forecast from many different sources. I think our point of difference is severe weather. When you have a tornado bearing down on you, you don't want to rely on a computer for accurate weather information. That may change in 10-20 years, but for now, I think that is where we can still be relevant. As far as skills go, computer skills will continue to become more and more relevant. Knowing where to go online to get official and often complex meteorological data and how to work with it will be key.

6. What do you enjoy most about your job? What do you enjoy least about your job?

TV weather is anything but routine. I love that my job is different every day. Some days it's sunny and quiet, some days I'm chasing a storm. Some days I'm working on the weather computer all day, some days I get to go out and speak to 150 school kids. As far as my least favorite thing about my job, it has to be the hours. We work when most people are home watching TV. There aren't a lot of 8am-5pm jobs in TV meteorology.

7. Can you suggest a valuable "try this" for students considering a career in your profession?

Try making a Power Point of today's weather. On your first page, show some current temperatures. You can get those off your local National Weather Service page. On the second and third pages show some pictures of the weather, either ones you've taken, or one's you've borrowed off the internet. On the last page, make a forecast. Then practice talking about each of the pages. Once you are comfortable, give the forecast to a family member or friend and ask them what you can do better. Don't be afraid to hear criticism! If you are planning on working in a field where you speak to people, there's always a critic.

SELECTED SCHOOLS

Virtually all colleges and universities have bachelor's degree programs in biology; some have concentrations in wildlife biology or marine biology. The student may also gain an initial grounding in the field at an agricultural, technical, or community college. For advanced positions, a master's or doctoral degree is usually obtained. Below are listed some of the more prominent graduate schools in this field.

Colorado State University
Department of Atmospheric Science
200 West Lake Street
1371 Campus Delivery
Fort Collins, CO 80523
970.491.8682
www.atmos.colostate.edu

Cornell University
Earth and Atmospheric Sciences
Snee Hall
Ithaca, NY 14853
607.255.3474
www.eas.cornell.edu

Massachusetts Institute of Technology
Earth, Atmospheric, and Planetary Sciences
77 Massachusetts Avenue
Cambridge, MA 02139
617.253.2127
eapsweb.mit.edu

Penn State University
Department of Meteorology
503 Walker Building
University Park, PA 16802
814.865.0478
ploneprod.met.psu.edu

Texas A&M University
Department of Atmospheric Science
MS 3150
College Station, TX 77843
979.845.7688
atmo.tamu.edu

University of California, Los Angeles
Atmospheric and Oceanic Sciences
Los Angeles, CA 90095
310.825.1217
www.atmos.ucla.edu

University of Maryland, College Park
Atmospheric and Oceanic Science
College Park, MD 20742
301.405.5391
www.atmos.umd.edu

University of Miami
Rosenstiel School of Marine and Atmospheric Science
4600 Rickenbacker Causeway
Miami, FL 33149
305.421.4000
www.rsmas.miami.edu

University of Oklahoma
School of Meteorology
120 David Boren Boulevard,
Suite 5900
Norman, OK 73072
405.325.6561
som.ou.edu

University of Washington
Department of Atmospheric Science
408 ATG Building
Box 351640
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206.543.4250
www.atmos.washington.edu

MORE INFORMATION

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Alexandria, VA 22302-1502
703.379.2480
www.americangeosciences.org

American Meteorological Society
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Boston, MA 02108-3693
617.227.2425
www.ametsoc.org

National Weather Association
228 W. Millbrook Road
Raleigh, NC 27609-4303
919.845.7121
www.nwas.org

National Oceanographic and Atmospheric Administration
1401 Constitution Avenue, NW,
Room 5128
Washington, DC 20230
www.noaa.gov

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