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Meteorologists

Occupational Summary

Meteorologists study the earth's atmosphere and the ways it affects our environment. Many of them forecast the weather.

Have you ever wondered why hurricanes receive names? The reason is actually quite simple: there is often more than one at a time. Hurricanes can also take days to travel over the ocean, gaining or losing strength. By naming them, meteorologists can track them without confusion. They don't waste time coming up with new names, however. Instead, meteorologists use a list of pre-selected names. Only when a storm is particularly big do they retire a name. Thus, there will never be another Hurricane Andrew or Hurricane Fifi, although there may be more hurricanes just as powerful.

The atmosphere consists of all the air that covers the earth. It also contains the water vapor that turns into rain and snow. Meteorologists study what the atmosphere is made of and how it works. They also see how it affects the rest of our environment.

Meteorologists usually specialize in one area. Weather forecasting is the best known of these. Meteorologists who forecast the weather are called operational meteorologists. They identify and interpret weather patterns to

predict the weather. They try to predict what the weather will be like for a week, a month, or several years. In order to predict the weather, meteorologists analyze information. They get data from weather satellites, photographs, and computers. In addition, they read reports that summarize data from several sources. Meteorologists use computers to analyze information. They also use computers to make models of climate change, write reports, and create weather maps. Some meteorologists broadcast their forecasts on radio or TV. They usually manage and direct other forecasting workers at the stations where they work. Other meteorologists create forecasts for specific groups. For example, farmers, airplane pilots, and fishers need specific information about the weather.

Some meteorologists create weather models using complex mathematical equations and computer programs. Others still use weather balloons to collect information. They measure wind, temperature, and humidity in the upper atmosphere. However, they also use more-sophisticated weather equipment that transmits data every few minutes. Doppler radar is an example of this kind of equipment. It can find patterns in violent storm systems. This allows forecasters to better predict thunderstorms, tornadoes, and flash floods. It also allows them to determine which direction the storm is coming from and how strong it will be.

Some meteorologists conduct research. Climatologists study past records of weather. This includes wind, rainfall, sunshine, and temperatures over land or even oceans. They try to figure out what changes will occur over a long period of time. Many study the impact of pollution on climate and air quality. Also, they may use paleoclimate data taken from ancient ice sheets. Others may use Geographic Information Systems (GIS) to look at these impacts.

Meteorologists' predictions are used to plan heating and cooling systems, land use, and agricultural production. Physical meteorologists study the chemical and physical properties of the atmosphere. They also study factors that affect how clouds, rain, snow, and storms are formed.

Related Occupations

This occupation is part of the Science, Technology, Engineering, and Mathematics cluster of occupations.

Related occupations include:

Climate Change Analysts
Geologists and Geophysicists
Natural Sciences Managers
Occupational Health and Safety Specialists
Photographers
Physicists
Safety Engineers
Transportation Inspectors

Military Occupations

Meteorological Specialists Physical Scientists

Task List

At a Glance

- Not all forecast the weather
- Many specialize in one area
- May work overtime during weather emergencies
- Have good research and communication skills
- Have at least a bachelor's degree

The following list of occupational tasks is specific to meteorologists.

- Conduct research about weather patterns and other aspects of the weather.
- Measure wind, temperature, and humidity for present conditions and to check other data.
- Analyze climate data sets gathered by weather balloons, radar, and satellites.
- Direct weather forecasting services for radio, TV, or weather stations.
- Operate computer graphic programs. Make weather reports and maps for analysis and TV broadcasts. Create media to show climate from
 the past or the future.
- Develop weather and climate forecasting tools.
- Study reports that summarize data gathered from many sources. Prove or disprove information taken from various sources.
- · Broadcast weather forecasts on TV or radio.
- · Analyze the impact of industrial pollutants on climate and air quality.
- · Issue severe weather warnings.
- Predict short- and long-range weather and climate conditions for certain areas. Use varied data sets to make predictions.
- · Make forecasts for specific groups of people or agencies.

Common Work Activities

Meteorologists perform the following tasks. These tasks are common to many occupations.

- Use computers.
- Get information needed to do the job.
- · Analyze data or information.
- · Process information.
- Communicate with supervisors, peers, or subordinates.
- Communicate with people from outside the organization.
- · Evaluate information against standards.
- Estimate sizes, quantities, time, cost, or materials needed.
- · Establish and maintain relationships.
- Make decisions and solve problems.
- Update and use job-related knowledge.
- · Explain the meaning of information to others.
- · Identify objects, actions, and events.
- · Monitor events, materials, and surroundings.
- · Document and record information.
- Organize, plan, and prioritize work.
- Work with the public.
- · Provide advice and consultation to others.
- · Schedule work and activities.

Working Conditions

In a typical work setting, meteorologists:

Interpersonal Relationships

- Have a high level of social contact. They talk with weather observers and other scientists and may also interact with the public.
- Communicate on a daily basis by telephone, e-mail, and in person.
- Often work as part of a team.

Physical Work Conditions

- Usually work indoors. However, they sometimes work outdoors when broadcasting weather reports on TV.
- May on occasion be exposed to loud sounds and distracting noise levels.
- May share office space with others.

Work Performance

- Must fully complete and be exact in their work. Meteorologists must try to be as accurate as possible
- Repeat the same activities.
- Make decisions that impact their employer's reputation. They usually act independently.
- Set most of their daily tasks and goals without talking to a superior first.

Hours/Travel

- Usually work 40 hours a week. Schedules are generally established.
- May work days, evenings, or weekends.
- · May work overtime during weather emergencies.

Physical Demands

Meteorologists frequently:

- Sit for long periods of time.
- Repeat the same movements.

It is important for meteorologists to be able to:

- · Speak clearly so listeners can understand.
- See details of objects whether they are nearby or far away.
- Understand the speech of another person.

It is not as important, but still necessary, for meteorologists to be able to:

- · See differences between colors, shades, and brightness.
- · Focus on one source of sound and ignore others.

Skills and Abilities

Meteorologists need to:

Communicate

- · Read and understand work-related materials.
- · Express ideas clearly when speaking or writing.
- · Listen to others, understand, and ask questions.

Reason and Problem Solve

- Judge the costs and benefits of a possible action.
- Analyze ideas and use logic to determine their strengths and weaknesses.
- Understand new information or materials by studying and working with them.
- · Use reasoning to discover answers to problems.
- Identify problems and review information. Develop, review, and apply solutions.
- · Combine several pieces of information and draw conclusions.
- · Notice when something is wrong or is likely to go wrong.
- · Develop rules or follow guidelines for arranging items.

Use Math and Science

· Use math skills and scientific methods to solve problems.

Manage Oneself, People, Time, and Things

- · Manage the time of self and others.
- · Check how well one is learning or doing something.
- Motivate, develop, and direct people as they work.

Work with People

- Be aware of others' reactions and change behavior in relation to them.
- Use several methods to learn or teach others how to do something.
- · Look for ways to help people.
- · Persuade others to approach things differently.
- Solve problems by bringing others together to discuss differences.

Work with Things

- Test and inspect products, services, or processes. Evaluate quality or performance.
- Watch gauges, dials, and output to make sure a machine is working properly.
- · Determine the causes of technical problems and find solutions for them.
- Determine the tools and equipment needed to do a job.
- · Operate and control equipment.
- Analyze needs and requirements when designing products.
- Design equipment and technology to meet user needs.
- · Write computer programs.

Perceive and Visualize

- Identify a pattern (a figure, object, word, or sound) that is hidden in distracting material.
- Quickly and accurately compare letters, numbers, objects, pictures, or patterns.

Knowledge

Meteorologists need knowledge in the following areas:

- Geography: Knowledge of land, sea, and air masses. Also includes knowledge of how to describe their location, features, and relationships.
- Physics: Knowledge of the features and rules of matter and energy. Areas of knowledge include air, water, light, heat, weather, and other natural events
- English Language: Knowledge of the meaning, spelling, and use of the English language.
- · Customer and Personal Service: Knowledge of providing special services to customers based on their needs.
- · Mathematics: Knowledge of the rules and uses of numbers. Areas of knowledge include arithmetic, algebra, geometry, and statistics.
- Computers and Electronics: Knowledge of computer hardware and software.

- Communications and Media: Knowledge of producing, sharing, and delivering information or entertainment. This may be through written, spoken, or visual media.
- Education and Training: Knowledge of teaching and the methods involved in learning and instruction.

Interests

Meteorologists are people who tend to:

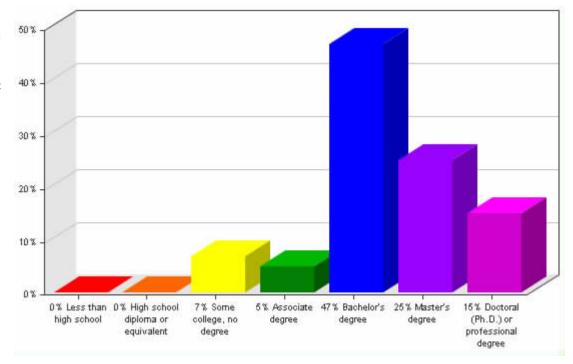
- Consider achievement important. They like to see the results of their work and to use their strongest abilities. They like to get a feeling of accomplishment from their work.
- Consider good working conditions important. They like jobs offering steady employment and good pay. They want employment that fits their
 individual work style. They may prefer doing a variety of tasks, working alone, or being busy all the time.
- Consider relationships important. They like to work in a friendly, non-competitive environment. They like to do things for other people. They prefer jobs where they are not pressured to do things that go against their sense of right and wrong.
- Consider independence important. They like to make decisions and try out ideas on their own. They prefer jobs where they can plan their work with little supervision.
- Consider recognition important. They like to work in jobs which have opportunities for them to advance, be recognized for their work, and
 direct and instruct others. They usually prefer jobs in which they are looked up to by others.
- Have investigative interests. They like work activities that have to do with ideas and thinking. They like to search for facts and figure out solutions to problems mentally.
- Have realistic interests. They like work activities that include practical, hands-on problems and solutions. They like to work with plants, animals, and physical materials such as wood, tools, and machinery. They often prefer to work outside.

Training

To work as a meteorologist, you must:

 have a high school diploma or GED;

 complete at least a bachelor's degree in The chart below shows the level of education reported by a subset of workers in this occupation. The workers surveyed were between age 25 and 44.



meteorology;

- · have a good eye for detail;
- · have excellent oral and written communication skills; and
- · be self-motivated.

Education After High School

You need at least a bachelor's degree if you want to be an operational meteorologist. If you didn't major in meteorology, you will need to have taken several classes in that area. Some people get a master's degree or second bachelor's degree so that they can qualify for these jobs.

If you want to do applied research, you usually need at least a master's degree in meteorology. A bachelor's degree in math, physics, or engineering is good preparation for graduate study. You need a doctoral degree (Ph.D.) to lead research projects or teach at a college or university.

Because meteorology is a small field, few colleges and universities offer degrees in meteorology or atmospheric science. However, many departments of physics, earth science, and geophysics offer atmospheric science and related courses. Make sure that the school you are considering offers the courses required by the National Weather Service.

On-the-Job Training

Many employers offer additional training once you are hired. In general, meteorologists receive up to three months of on-the-job training.

Military Training

Some branches of the military train people to work as meteorological specialists. Training lasts from seven to 18 weeks. Further training occurs on the job.

Educational Programs

The programs listed below are the recommended areas of study to pursue if you wish to enter the occupation you are exploring.

Educational Programs Directly Related to this Occupation

Atmospheric Sciences and Meteorology

Other Educational Programs to Consider

Geological and Earth Sciences Mathematics Oceanography Physical Sciences, General Physics

Helpful High School Courses

In high school, take classes that prepare you for college. A college preparatory curriculum may be different from your state's graduation requirements .

You should also consider taking some advanced courses in high school. This includes Advanced Placement (AP) and International Baccalaureate (IB) courses if they are available in your school. If you do well in these courses, you may receive college credit for them. Advanced courses can also strengthen your college application.

Helpful electives to take in high school that prepare you for this occupation include:

- Computer Applications
- · Earth Science
- Keyboarding

The courses listed above are meant to help you create your high school plan. If you have not already done so, talk to a school counselor or parent about the courses you are considering taking.

You should also check with a teacher or counselor to see if work-based learning opportunities are available in your school and community. These might include field trips, job shadowing, internships, and actual work experience. The goal of these activities is to help you connect your school experiences with real-life work.

Join some groups, try some hobbies, or volunteer with an organization that interests you. By participating in activities you can have fun, make new friends, and learn about yourself. Maybe one of them will help direct you to a future career. Examples of activities and groups that may be available in your high school or community are here.

Hiring Practices

Most employers require at least a bachelor's degree in meteorology or a related field. Employers of researchers require a master's or doctoral (Ph.D.) degree. Some employers may substitute a combination of experience and education for a degree.

Employers look for applicants who can absorb, process, and apply new information quickly. Employers who hire broadcast meteorologists look for applicants who have excellent communication and computer skills.

Costs to Workers

After entering this field, most workers join professional associations and pay annual dues.

Job Listings

Listed below are links to job categories from the National Labor Exchange's US.jobs website that relate to this occupation. Once you get a list of jobs, you can view information about individual jobs and find out how to apply. If your job search finds too many openings, or if you wish to search for jobs outside of Washington, you will need to refine your search.

Atmospheric and Space Scientists

WorkSource is a joint venture of organizations dedicated to addressing Washington State's employment needs. They represent a unique concept in the labor market - everything in one place. To get a listing of current jobs from the WorkSource system, go to the WorkSource website. You can then select the location in which you would like to view current job openings in the state of Washington.

Advancement Opportunities

Employees of the National Weather Service advance according to civil service rules. These meteorologists earn more pay as they gain

experience and education. Airlines may advance meteorologists to administrative and supervisory positions. Some meteorologists start their own weather-consulting firms. Broadcast meteorologists may move to other cities and work for bigger stations.

Wages

Atmospheric and space scientists (SOC 19-2021)

Location	Pay Period			
	r ay r enou	25%	Median	75%
Washington	Hourly	\$30.70	\$40.23	\$50.13
	Monthly	\$5,320	\$6,972	\$8,688
	Yearly	\$63,852	\$83,682	\$104,259
Seattle-Bellevue-Everett	Hourly	\$30.92	\$40.33	\$52.50
	Monthly	\$5,358	\$6,989	\$9,098
	Yearly	\$64,314	\$83,886	\$109,199
Spokane	Hourly	\$36.89	\$43.62	\$47.87
	Monthly	\$6,393	\$7,559	\$8,296
	Yearly	\$76,745	\$90,717	\$99,570
Vancouver	Hourly	\$39.68	\$45.04	\$53.94
	Monthly	\$6,877	\$7,805	\$9,348
	Yearly	\$82,538	\$93,669	\$112,198
United States	Hourly	\$30.87	\$42.20	\$51.88
	Monthly	\$5,350	\$7,313	\$8,991
	Yearly	\$64,200	\$87,780	\$107,900
Half of all workers earn between	the low and high amo	unts. 25% earn less than th	e low amount and 25% earn more	than the high amount.

Select Different States

Currently, there is no state specific wage information available for meteorologists. However, this occupation is part of the larger group of "atmospheric and space scientists." In Washington, the average entry level wage for atmospheric and space scientists (which includes meteorologists) is \$26.99 per hour (\$4,678 per month).

Wages vary by area of the country and the worker's level of education. The federal government pays higher wages to meteorologists who have more education.

Meteorologists who work full time usually receive benefits. Typical benefits include health and life insurance, a retirement plan, vacation, and sick leave.

Note: Wages for Washington State have been adjusted to reflect projections for 2011. National wage figures are based on 2010 data and have not been adjusted.

Employment and Outlook

Atmospheric and Space Scientists (SOC 19-2021)

Location	Current employment	&	Growth over 10 years		>>>>	Annual openings
			This occupation	All occupations		
Washington	210	&	14.3%	15.3%	>>>>	8
Benton and Franklin Counties	14	&	35.7%	20.4%	>>>>	1
King County	164	&	12.2%	14.5%	>>>>	6
Spokane County	27	&	-3.7%	14.9%	>>>>	1
United States	9,430	&	14.6%	10.1%	>>>>	330

Select Different States

Washington State Outlook

Currently, there is no state specific outlook information available for meteorologists. However, this occupation is part of the larger group of "atmospheric and space scientists" and the outlook for this larger occupational group is as follows:

Between 2009 and 2019, it is estimated that there will be three openings annually due to new positions and five openings annually from workers leaving this occupation.

National Employment

Major employers:

- Federal government agencies (National Oceanic and Atmospheric Administration, National Weather Service)
- · Weather consulting firms
- · Research and testing services
- Radio and television stations

National Outlook

Jobs with the National Weather Service (NWS) will be scarce. This is because the NWS is using forecasting equipment that allows for fewer meteorologists. The NWS does not plan to add any new jobs in the near future. Thus, job openings with the NWS will be to replace meteorologists who retire or move to other jobs.

In contrast, new jobs may be created in private industry. The demand for private weather consulting is growing. Workers in weather-sensitive industries, such as farming, construction, and transportation, are interested in receiving information specific to them. However, many of these industries are sensitive to the state of the economy. Thus, the growth of these jobs will depend on the economy.

Meteorologists also work for radio and television stations. Few new jobs are expected to be created in the future. Most cities already have news teams, so it is unlikely there will be many new jobs. As with the NWS, most job openings will arise as people leave this occupation.

Other Resources

American Geophysical Union 2000 Florida Avenue NW Washington, DC 20009 800.966.2481 202.462.6900 http://www.agu.org

American Meteorological Society 45 Beacon Street Boston, MA 02108 617.227.2425

http://www.ametsoc.org/ams

Aviation and Aeronatics Career Guide http://www.khake.com/page41.html

AviationJobs.com

http://www.avjobs.com/careers/index.asp

Career Guide for the Atmospheric Sciences http://www.ametsoc.org/AMS/AtmosCareers/index.html

Careers in Atmospheric Research and Applied Meteorology http://www.ametsoc.org/AMS/pubs/careers.html

Jetstream: An Online School for Weather from The National Weather Service http://www.srh.noaa.gov/jetstream/

Meteorology Education & Training (MetEd)

http://www.meted.ucar.edu/

National Oceanic and Atmospheric Administration 1401 Constitution Avenue NW, Room 5128 Washington, DC 20230 202.482.6090 http://www.noaa.gov/

Science Careers

http://sciencecareers.sciencemag.org/

What Do Earth and Space Scientists Do? (from the American Geophysical Union) http://earthinspace.org/careers/

Books and Periodicals

"Careers in Wind Energy," Occupational Outlook Quarterly, Winter 2010-11

Career Information Center

Careers for Nature Lovers & Other Outdoor Types (by Louise Miller, 2001)

Careers in Focus: Earth Science (2002)

Challenges of Our Changing Atmosphere: Careers in Atmospheric Research and Applied Meteorology (American Meteorological Society)

Chronicle Occupational Briefs (Chronicle Guidance Publications, Inc.)

Earth Magazine

Encyclopedia of Careers and Vocational Guidance

Geological Society of America publications

Glossary of Meteorology

Guide for Occupational Exploration

Journal of Applied Meteorology and Climatology

Journal of Geology

Journal of Geophysical Research (American Geophysical Union)

Journal of Physical Oceanography

Journal of Sedimentary Petrology

Journal of the Atmospheric Sciences

Occupational Outlook Handbook

Radio Science (published by American Geophysical Union)

Science Magazine

The New Complete Guide to Environmental Careers (by Bill Sharp, 2001)

The Professional Geologist (American Institute of Professional Geologists)

Videos

Career videos related to this occupation (more information about career videos):

• Atmospheric and Space Scientists (broadband / dial-up)

References

Occupation Cluster

· Science, Technology, Engineering, and Mathematics

Career Paths

· Investigative (Science)

O*Net Occupations

• Atmospheric and Space Scientists (19-2021.00)

O*Net Job Zones

 Job Zone 4 - Considerable preparation needed. A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations.

DOT Occupations

Meteorologist (025.062-010)

Holland Occupational Clusters

- Investigative/Realistic/Conventional
- Investigative/Realistic/Social

COPSystem

• Science Professional

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