Introduction to Atmospheric Librarianship 101:
Overview and Frequently Asked Reference Questions
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Atmospheric science is the study of the physics and chemistry of clouds, gases, and aerosols (airborne particles) that surround the planetary bodies of the solar system. Research in atmospheric science includes such varied areas of interest as:

**Climatology** — the study of long-term weather and temperature trends.
**Dynamic meteorology** — the study of the motions of the atmosphere.
**Cloud physics** — the formation and evolution of clouds and precipitation.
**Atmospheric chemistry** — the chemical composition of the atmosphere.
**Atmospheric physics** — the study of processes such as heating and cooling of the atmosphere.
**Aeronomy** — the study of the upper atmosphere.
**Oceanography** — the study of the Earth’s oceans and how they affect the atmosphere.

Most atmospheric scientists study the atmosphere of the Earth, while others study the atmospheres of the planets and moons in our solar system.
Quick Bio

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Schedule a Research Consultation: Monday – Friday

Meet Our Specialists – Emily Wild

- Princeton University Library, 2018-Present
  Chemistry, Geosciences and Environmental Studies Librarian
  https://library.princeton.edu/staff/ewild


Wait, hydrologists know about the Ocean & Atmosphere? Yes!


NH: NOAA Office of Coastal Management: https://coast.noaa.gov/states/new-hampshire.html

VT: Climate Change in Vermont https://climatechange.vermont.gov/our-changing-climate/dashboard/more-annual-precipitation


CO: NOAA Boulder Labs https://www.boulder.noaa.gov/
National Center for Atmospheric Research (NCAR) https://ncar.ucar.edu/who-we-are
University Corporation for Atmospheric Research (UCAR) https://www.ucar.edu/

USGS Santa Cruz, CA https://www.usgs.gov/centers/pcmsc
USGS St. Petersburg, FL https://www.usgs.gov/centers/spcmsc

NWS Home > Climate > NWS Philadelphia/Mount Holly > Climate Resources https://w2.weather.gov/climate/climate_resources.php?wfo=phi

• Climate Information Outside the Local Office Area
  Climate Information Outside the Local Office Area
  • Regional Climate Centers
  • State Climate Offices
  • National Centers for Environmental Information (NCEI)
  • National Climate Information
    National Temperature and Precipitation Summary for Selected Cities
    • National Operational Hydrologic Remote Sensing Center
    • NOAA’s Climate Page
    • National Centers for Environmental Information (NCEI)
    • Climate of the U.S.
    • Climate Prediction Center
    • Earth System Research Laboratory (ESRL)
    • NOAA’s El Niño and La Niña Pages
    • NOAA’s Drought Monitoring Page
    • NOAA’s Storm Event Archives
    • U.S. Hazards Outlook
  • International Climate Information
    World Meteorological Organization
    • World Climate
    • Global Climate Extremes
    • Global Climate Change
    • Global Climate Observing System
    • Climate Data Online (CDO)
U.S. Geological Survey (USGS)

https://dashboard.waterdata.usgs.gov/app/nwd/?aoi=state-nj
https://dashboard.waterdata.usgs.gov/app/nwd/?aoi=state-nj
U.S. Geological Survey (USGS)

https://dashboard.waterdata.usgs.gov/app/nwd/?aoi=state-nj
NOAA NWS

https://www.weather.gov/phi/

https://www.weather.gov/phi/marine

https://www.ndbc.noaa.gov/
U.S. Geological Survey (USGS)


https://stn.wim.usgs.gov/FEV/#HarveyAug2017
What is the difference between Climate & Weather?

**Weather** is defined as the state of the atmosphere at a given time and place, with respect to variables such as temperature, moisture, wind speed and direction, and barometric pressure.

**Climate** is defined as the expected frequency of specific states of the atmosphere, ocean, and land including variables such as temperature (land, ocean, and atmosphere), salinity (oceans), soil moisture (land), wind speed and direction (atmosphere), current strength and direction (oceans). Climate encompasses the weather over different periods of time and also relates to mutual interactions between the components of the earth system (e.g., atmospheric composition, volcanic eruptions, changes in the earth’s orbit around the sun, changes in the energy from the sun itself).
Air Quality

https://www.airnow.gov/?city=Princeton&state=NJ&country=USA


https://www.airnow.gov/airnow-app/
**Cumulus** clouds have vertical growth. They are puffy white or light gray clouds that look like floating cotton balls. Cumulus clouds have sharp outlines and a flat base at a height of 1000m. They are generally about one kilometer wide which is about the size of your fist or larger when you hold up your hand at arm's length to look at the cloud. Cumulus clouds can be associated with fair or stormy weather. Watch for rain showers when the cloud’s tops look like cauliflower heads.
All Earth's freshwater, liquid fresh water, and water in lakes and rivers
Spheres showing:

1. All water (sphere over western U.S., 860 miles in diameter)
2. Fresh liquid water in the ground, lakes, swamps, and rivers (sphere over Kentucky, 169.5 miles in diameter), and
3. Fresh-water lakes and rivers (sphere over Georgia, 34.9 miles in diameter).
How Petroleum and Natural Gas Were Formed

Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of sediment and rock. Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.

Today, we drill down through the layers of sedimentary rock to reach the rock formations that contain oil and gas deposits.
Busy Atlantic hurricane season predicted for 2020
Multiple climate factors indicate above-normal activity is most likely
https://www.noaa.gov/media-release/bu...-season-predicted-for-2020

https://pubs.usgs.gov/pinatubo/
The Atmospheric Impact of the 1991 Mount Pinatubo Eruption
https://pubs.usgs.gov/pinatubo/self/
The birthplace of modern climate modeling

In 2007, the Nobel Peace Prize was awarded jointly to Al Gore and the IPCC. Eleven Princeton faculty members — including Held, Oppenheimer and Sarmiento — and many alumni contributed to the IPCC reports cited in the prize.

Michael Celia, Leo Donner, Anand Gnanadesikan, Isaac Held, Gabriel Lau, Denise Mauzerall, Michael Oppenheimer, Venkatachalam Ramaswamy, Jorge Sarmiento, Robert Socolow and Robert Williams have contributed to panel reports over the years. For example, Oppenheimer was lead author of a report presented to the United Nations this past April, and Mauzerall contributed to an IPCC report issued in 2001.

This 1969 photograph shows AOS Senior Scientists Kirk Bryan (left) and Suki Manabe talking with GFDL Director Joseph Smagorinsky, who brought GFDL to Princeton because of the intellectual environment and computer resources available here. Photo courtesy of the Geophysical Fluid Dynamics Laboratory

When/where was the first climate model created?

In the late 1960s, NOAA’s Geophysical Fluid Dynamics Laboratory in Princeton, New Jersey, developed the first-of-its-kind general circulation climate model that combined both oceanic and atmospheric processes. Scientists were now able to understand how the ocean and atmosphere interacted with each other to influence climate. The model also predicted how changes in the natural factors that control climate such as ocean and atmospheric currents and temperature could lead to climate change. The model still stands today as a breakthrough of enormous importance for climate science and weather forecasting. Earlier knowledge of the oceanic and atmospheric circulation, and their interactions, was based purely on theory and observation.

Climate models are computer-based simulations that use mathematical formulas to re-create the chemical and physical processes that drive Earth’s climate. This pioneering model included all the basic components of climatic factors (atmosphere, ocean, land, and sea ice), but covered only one-sixth of the earth’s surface, from the North Pole to the equator and 120 degrees of longitude east to west.

https://celebrating200years.noaa.gov/breakthroughs/climate_model/welcome.html#model

https://www.gfdl.noaa.gov/
https://www.gfdl.noaa.gov/bibliography/
https://aos.princeton.edu/
https://geosciences.princeton.edu/
https://recap.princeton.edu/
Thermal Equilibrium of the Atmosphere with a Given Distribution of Relative Humidity


REFERENCES


Preliminary simulations of the 2011 Japan tsunami

Viewpoint north. Simulation shows first 2 hours of tsunami propagation.

https://www.usgs.gov/centers/pcmsc/science/tsunami-and-earthquake-research?qt-science_center_objects=0#qt-science_center_objects

https://www.usgs.gov/centers/pcmsc/science/preliminary-simulations-recent-tsunamis?qt-science_center_objects=0#qt-science_center_objects

https://www.usgs.gov/media/images/deepwater-horizon-controlled-oil-burn
https://water.usgs.gov/owq/deephorizonoilspill/
What is Climate Change?

Climate change describes a change in the average conditions — such as temperature and rainfall — in a region over a long period of time. NASA scientists have observed Earth’s surface is warming, and many of the warmest years on record have happened in the past 20 years.

https://climatekids.nasa.gov/climate-change-meaning/

Alaska’s Muir glacier in August 1941 and August 2004. Significant changes occurred in the 63 years between these two photos. Credit: USGS

Who is an Atmospheric Scientist? Oceanographer? Climate Scientist?

https://www.thehistorymakers.org/biography/george-philander

Why Global Warming Is Controversial
https://science.sciencemag.org/content/294/5549/2105/tab-article-info

Our Affair with El Niño: How We Transformed an Enchanting Peruvian Current into a Global Climate Hazard & Is the Temperature Rising?: The Uncertain Science of Global Warming
https://press.princeton.edu/our-authors/philander-s-george

https://www.worldcat.org/search?q=bn%3A+0125532350&qt=advanced&dlist=638
https://science.sciencemag.org/content/288/5473/1997.abstract
Who is an Atmospheric Scientist? Oceanographer? Climate Scientist?


Position Classification Standards for White Collar Work

1300 – Physical Sciences Group

Example Job Searches:
Physical Scientist:
https://www.usajobs.gov/Search/Results?jt=Physical%20Scientist

NOAA: https://www.usajobs.gov/Search/Results?jt=Physical%20Scientist&a=CM54&p=1

Pathways: https://www.usajobs.gov/Search/Results?k=Pathways

• Series Covered: 1301, General Physical Science
• 1306, Health Physics
• 1310, Physics
• 1313, Geophysics
• **1315, Hydrology**
• 1320, Chemistry
• 1321, Metallurgy
• 1330, Astronomy and Space Science
• 1340, Meteorology
• 1350, Geology
• 1360, Oceanography
• 1370, Cartography
• 1372, Geodesy
• 1373, Land Surveying
• 1380, Forest Products Technology
• 1382, Food Technology
• 1384, Textile Technology
• 1386, Photographic Technology

Susceptible supply limits the role of climate in the COVID-19 pandemic
https://www.medrxiv.org/content/10.1101/2020.04.03.20052787v1

Local climate unlikely to drive the early COVID-19 pandemic

Why are big storms bringing so much more rain? Warming, yes, but also winds

PEI Faculty Seminar: "Climatic Influences on Tropical Cyclones and Their Severity"

Princeton University – Geosciences Dept., Climate Science
https://geosciences.princeton.edu/research/climate-science

Cooperative Institute for Modeling the Earth System
A Princeton University and Geophysical Fluid Dynamics Laboratory Collaboration

Princeton University – Princeton Environmental Studies (PEI):
Climate Futures Initiative
https://scholar.princeton.edu/cfi/home
Climate Change and Infectious Disease
https://environment.princeton.edu/research/climate-change-and-infectious-disease/
Princeton Environmental Forum — Full Conference
Attribution of the Australian bushfire risk to anthropogenic climate change

Rapid attribution of the extreme rainfall in Texas from Tropical Storm Imelda

Human contribution to the record-breaking July 2019 heatwave in Western Europe

Siberian heatwave of 2020 almost impossible without climate change

Figure 1: Prolonged Siberian heat: January – June 2020 average temperatures compared to normal (1981-2010) over the Siberian region used in the study (box), and the location of the town of Verkhoyansk that experienced the record June daily temperature within the Arctic circle.
Professional Societies, Organizations, Companies

The American Geosciences Institute (AGI)
https://www.americangeosciences.org/about

Workforce: https://www.americangeosciences.org/workforce/

Geoscience COVID-19 Survey
https://www.americangeosciences.org/workforce/covid19

COVID-19 and Employment of Recent Geoscience Graduates

COVID-19 Impacts to Geoscience Business Operations

Impacts of the COVID-19 Pandemic on Ocean Science Activities

COVID-19 Impacts to Research Activities in Spring 2020
https://www.americangeosciences.org/geoscience-currents/covid-19-impacts-research-activities-spring-2020

Geoscience Information Society
http://www.geoinfo.org/
Listserv: http://www.geoinfo.org/e-mail-list/
Or email me: ewild@princeton.edu
And an AGI Member Society:
https://www.americangeosciences.org/member-societies

GSA Associated Society:
https://www.geosociety.org/GSA/About/Who_We_Are/Associated_Societies/GSA/About/Associated_Societies.aspx

Atmospheric Science Librarians International
http://www.aslionline.org/wp/
Listserv: http://www.aslionline.org/wp/about/asli-listserv/

AMS Society Conference Boston 2020
https://ams.confex.com/ams/2020Annual/meetingapp.cgi/Index/Recording~1/Program/1418

CSA Ocean Sciences Inc. (CSA)
https://www.csaocean.com/portfolio
Global Warming - Global Change - Climate Change

New Orleans drop-off for electronics recycling
Dec 1 - On Saturday, December 3, consumers in the New Orleans area can drop off electronics damaged due to Katrina, at a one-day, free recycling event.


Google Scholar title searches

“Climate Change” 1980-2020 = 138,000  
https://scholar.google.com/scholar?as_q=%22Climate+Change%22+&as_epq=&as_oq=&as_eq=&as_occt=title&as_sauthors=&as_publication=&as_ylo=1980&as_yhi=2020&hl=en&as_sdt=0%2C31

“Global Change” 1980-2020 = 16,400  
https://scholar.google.com/scholar?hl=en&as_sdt=0%2C31&as_ylo=1980&as_yhi=2020&q=allintitle%3A+%22Global+Change%22&btnG=

“Global Warming” 1980-2020 = 19,500  
https://scholar.google.com/scholar?hl=en&as_sdt=0%2C31&as_ylo=1980&as_yhi=2020&q=allintitle%3A+%22Global+Warming%22&btnG=

“Climate Change” 1970-2010 = 61,100  
https://scholar.google.com/scholar?as_q=%22Climate+Change%22+&as_epq=&as_oq=&as_eq=&as_occt=title&as_sauthors=&as_publication=&as_ylo=1970&as_yhi=2010&hl=en&as_sdt=0%2C31

“Global Change” 1970-2010 = 11,600  
https://scholar.google.com/scholar?hl=en&as_sdt=0%2C31&as_ylo=1970&as_yhi=2010&q=allintitle%3A+%22Global+Change%22&btnG=

“Global Warming” 1970-2010 = 15,600  
https://scholar.google.com/scholar?hl=en&as_sdt=0%2C31&as_ylo=1970&as_yhi=2010&q=allintitle%3A+%22Global+Warming%22&btnG=
The Intergovernmental Panel on Climate Change
https://www.ipcc.ch/

Methodology Report on Short-lived Climate Forcers

The Ocean and Cryosphere in a Changing Climate

Climate Change and Land

Global Warming of 1.5°C

Climate Change: The IPCC 1990 and 1992 Assessments

FAR Climate Change: The IPCC Response Strategies

https://www.globalchange.gov/

About Fifth National Climate Assessment (NCA5)
https://www.globalchange.gov/nca5

Fourth National Climate Assessment Vol I + II
https://www.globalchange.gov/nca4

2nd State of the Carbon Cycle Report (SOCCR2)
https://www.globalchange.gov/content/about-soocr-2
https://www.nap.edu/search/?term=%22Climate+Change%22
https://pubs.geoscienceworld.org/search-results?page=1&quicknav=1&q=%22Climate%20Change%22
Atmospheric deposition samples were collected using the National Atmospheric Deposition Program / National Trends Network (NADP/NTN) at 6 sites in the Denver-Boulder urban corridor and 2 adjacent sites in the Colorado Front Range. Weekly wet-only atmospheric deposition samples collected at these sites during winter-summer of 2017 were filtered (0.45 micrometers, polyethersulfone) to obtain particulates washed from the atmosphere (washout). Plastics were identified on over 90 percent of the filters.
M 9.1 - 2011 Great Tohoku Earthquake, Japan
https://earthquake.usgs.gov/earthquakes/eventpage/official2011031054624120_30/executive


Open-File Report 2011–1277

Environmental Science and Technology

https://bqs.usgs.gov/fukushima/
Mass Balance Data

USGS Benchmark Glaciers

Direct field measurements are combined with weather data and imagery analyses to calculate the seasonal and annual mass balance of each glacier. This data release includes seasonal and annual glacier-wide mass balance, and the input point measurements and elevation data used for these calculations. Files are described in detail within the release.

Glacier-Wide Mass Balance and Input Data
- Glacier-Wide Mass Balance
- Compiled Point Mass Balance
- Daily Temperature, Precipitation
- Glacier Hypsometry

Point Raw Glaciological Data
- Ablation Stake Measurements
- Snow Pit Density and Depth Measurements

Weather Data
- Temperature, Precipitation, and Other Meteorological Measurements
- Multiple Weather Stations per Glacier for Wolverine and Guikana
- Sub-Daily Data, Multiple Levels of Quality Control

Geodetic Data
- Glacier Outlines
- Digital Elevation Models (DEMs)
- Orthophotos

Collection Metadata


https://www2.usgs.gov/landresources/lcs/glacierstudies/mbbmark.asp
National Science Foundation - Ice Core Facility

The National Science Foundation Ice Core Facility (NSF-ICF) is located at the Denver Federal Center in Colorado. The Facility is managed and operated by the U.S. Geological Survey for the National Science Foundation.
Two million-year-old ice cores provide first direct observations of an ancient climate

https://www.princeton.edu/news/2016/03/14/princeton-researchers-go-end-earth-worlds-oldest-ice

Antarctic Names:
https://www.usgs.gov/core-science-systems/ngp/board-on-geographic-names/antarctic-names

https://www.usgs.gov/core-science-systems/ngp/board-on-geographic-names
https://library.noaa.gov/

https://photolib.noaa.gov/
Verification Metrics for National Center for Environmental Prediction (NCEP) Models

Bibliography

The GFDL Finite-Volume Cubed-Sphere Dynamical Core: Release 201912
Personal Author: Harris, Lucas; Zhou, Linjing; Chen, Xi; Chen, Jan-Huey;
Corporate Authors: Geophysical Fluid Dynamics Laboratory (U.S.)
Published Date: 2020
Series: NOAA technical memorandum OAR (GFDL); 2020-001
Description: This technical note explains updates to the GFDL Finite-Volume Cubed-Sphere Dynamical Core, abbreviated PV3 or PV3 (superscript 3), and the split GFDL Microphysics. It does not repeat the contents of earlier documentation, especially publications. A...
Earth As Art!

Earth As Art 1: https://eros.usgs.gov/image-gallery/earth-art-1

Earth As Art 2: https://eros.usgs.gov/image-gallery/earth-art-2

Earth As Art 3: https://eros.usgs.gov/image-gallery/earth-art-3

Earth As Art 4: https://eros.usgs.gov/image-gallery/earth-art-4

Earth As Art 5: https://eros.usgs.gov/image-gallery/earth-art-5

Earth As Art 6: https://eros.usgs.gov/image-gallery/earth-art-6
Thank You!

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Princeton University Library
http://library.princeton.edu

Princeton University Geosciences
http://geosciences.princeton.edu

Geophysical Fluid Dynamics Laboratory
https://www.gfdl.noaa.gov/

Princeton Environmental Institute
http://environment.princeton.edu

Princeton University Chemistry
https://chemistry.princeton.edu/

Andlinger Center for Energy and the Environment
https://acee.princeton.edu/