

Data Access and Servicing at NOAA's National Climatic Data Center



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NOAA Data Distribution Partnership

NOAA National Data Centers (NNDC) include

1. National Geophysical Data Center in Boulder
 - Solid Earth, Bathymetry, Space Weather
2. National Oceanic Data Center in Washington
 - Ocean surface and depths
3. National Climatic Data Center (NCDC) in Asheville
 - Land, Atmosphere, Ocean surface, Cryosphere, Paleoclimate
 - Six contracted Regional Climate Centers (RCCs)
 - Tailored products and services of regional relevance
 - Partnering
 - Global Observing Systems Information Center (GOSIC)
 - World Data Centers (WDC) for Meteorology and Paleoclimatology
 - Limited ad hoc partnering with major legacy centers

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NCDC Serves Most Types of Climate Data



- Voluntary U.S. Observers
- Global Weather Reports
- NCEP Weather Charts & Models
- Ship, Buoy Reports
- Rocketsonde
- Weather Balloons
- Storm Data
- Doppler Radar
- Satellites
- Aircraft Observations
- Wind Profiler
- Airport Weather Reports (ASOS)
- U.S. Climate Reference Network
- Climate Models
- Paleoclimate Data
- Climate Assessments

NCDC Website Characteristics

- Drupal Content Management System provides the website content infrastructure
- Google Analytics provides usage statistics and patterns
- Data are stored on disk (Storage Area Network) and tape (robotics system)
- Links to Regional Climate Centers (RCCs) and other partner websites
- Personal user support via phone, email
- www.ncdc.noaa.gov (redesigned in 2012)

The screenshot shows the NOAA National Climatic Data Center website. At the top, the NOAA logo and the text "NATIONAL CLIMATIC DATA CENTER NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION" are visible. Below this is a navigation bar with links for Home, Climate Information, Data Access, Customer Support, and About NCDC, along with a search bar labeled "Search NCDC".

The main content area features a large image of an ice core with a dark center. To the left of the image, there is a text block: "NOAA's National Climatic Data Center (NCDC) is responsible for preserving, monitoring, assessing, and providing public access to the Nation's treasure of climate and historical weather data and information. [Learn more about NCDC >](#)". Below this is a "How may we assist you?" section with a list of options: "I want to search for data at a particular location.", "I want quick access to your products.", "I want to see your monthly climate reports.", "I want to find a specific dataset.", and "I want to know about climate change and variability."

Below the main content area, there are three columns of information:

- Highlights:** "Upcoming Events, Products, and Services" (View a complete listing of the upcoming products and services.), "2012 State of the Climate Report Released" (The 2012 State of the Climate report, an assessment of the world's climate, was released August 6, 2013.), and "2013 Products and Services Guide Available Online".
- Newsroom:** "This Month in Climate History: February 4-7, 2010, Blizzard" (A major winter storm crippled the U.S. Mid-Atlantic region the first week of February 2010.), "NCDC Employees Receive NOAA Gold Medal Award" (Members of the Comprehensive Large Array-data Stewardship System team received the NOAA Gold Medal Award for their outstanding achievement.), and "Product Update: Climate Data Online 3.1" (NCDC is releasing a new version of the Climate Data Online (CDO) application—version 3.1.).
- NCDC Partners:** Logos for Climate.gov, weather.gov, NIDIS drought.gov, and globalchange.gov.

Climate Data Online (CDO) System

- Centralized access to numerous U.S. and global data sets and products
- Web Services allow Machine-to-Machine access for direct use in applications
- “Batch” processes: users submit tailored orders (by station, state, country, etc.), then receive email link to data
- Underlying structure includes Oracle databases



Climate Data Online

Climate Data Online (CDO) provides free access to NCDC's archive of historical weather and climate data in addition to station history information. These data include quality controlled daily, monthly, seasonal, and yearly measurements of temperature, precipitation, wind, and degree days as well as radar data and 30-year Climate Normals. Customers can also order most of these data as **certified hard copies** for legal use.

DATASETS
Browse documentation, samples, and links

CERTIFICATION
Get data orders certified

HELP
Get answers to questions

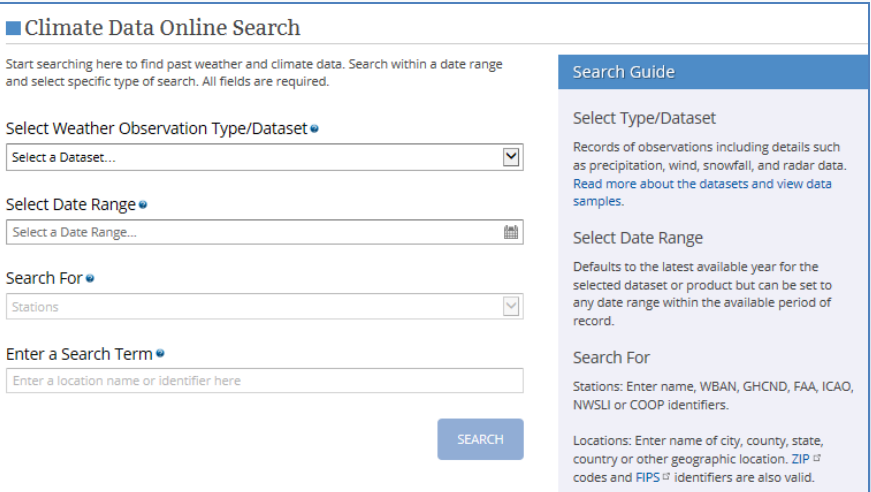
ORDER STATUS
Check the status of a current order

DISCOVER DATA BY

SEARCH TOOL
Search for and access past weather and climate data by station name or identifier, ZIP code, city, county, state, or country.
[Search Tool >](#)


MAPPING TOOL
Find and view past weather and climate data by station name or identifier, ZIP code, city, county, state, or country.
[Mapping Tool >](#)


DATA TOOLS
Access past weather and climate data using a collection of specialized tools.
[Data Tools >](#)





Climate Data Online Search


Start searching here to find past weather and climate data. Search within a date range and select specific type of search. All fields are required.


Select Weather Observation Type/Dataset 


Select a Dataset... 

Select Date Range 

Select a Date Range... 

Search For 

Stations 

Enter a Search Term 

Enter a location name or identifier here

SEARCH

Search Guide

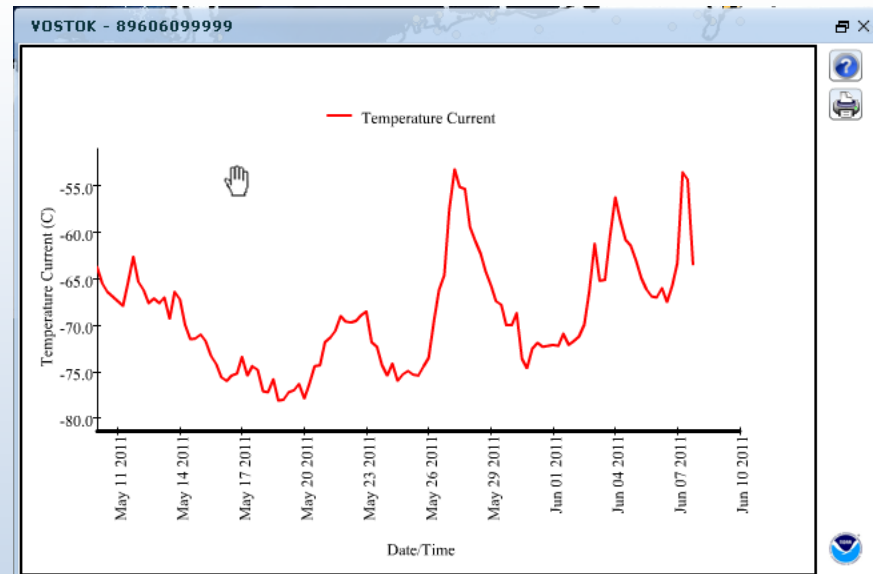
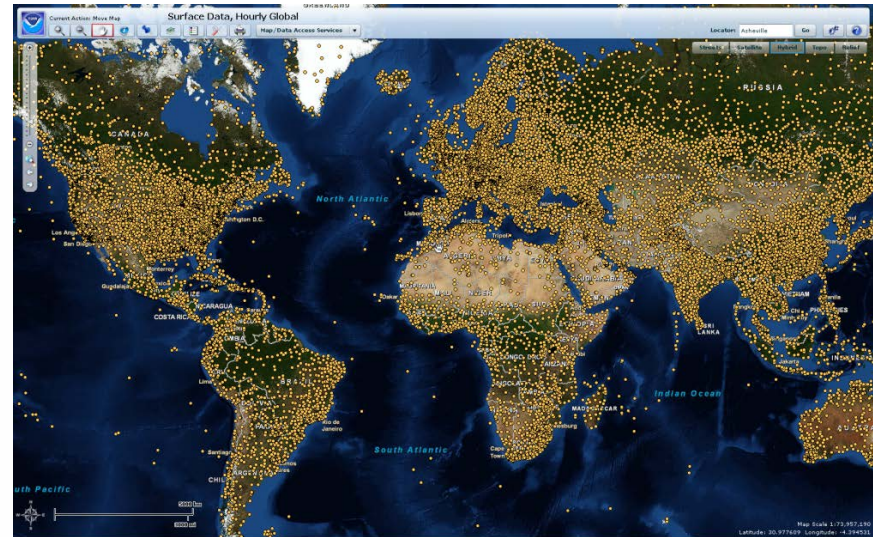
Select Type/Dataset
Records of observations including details such as precipitation, wind, snowfall, and radar data. Read more about the datasets and view data samples.

Select Date Range
Defaults to the latest available year for the selected dataset or product but can be set to any date range within the available period of record.

Search For
Stations: Enter name, WBAN, GHCND, FAA, ICAO, NWSLI or COOP identifiers.
Locations: Enter name of city, county, state, country or other geographic location. ZIP ¹⁷ codes and FIPS ¹⁷ identifiers are also valid.

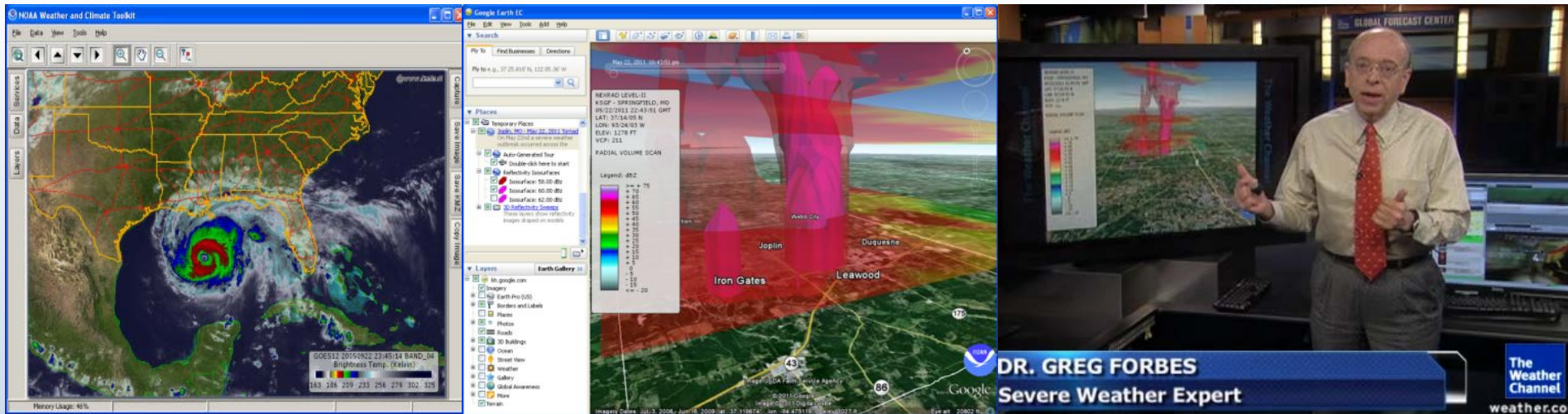
Map/Web Services & Data Visualization

- GIS Map Services allow easier data visualization, selection and use
- Web Services such as WMS, WFS, KML/KMZ (for Google Earth, etc.)
- Data visualization via tools such as *Multigraph* provide graphical display of various parameters



Weather and Climate Toolkit

- Desktop application provides simple visualization and export of data
- Based on community developed tools and standards
- Supports 22 data formats (Radar, Model, and Satellite)
- Data interoperability with diverse user communities
- Export data to GIS, KMZ, NetCDF and text formats
- Export of 3D Radar sweeps and isosurfaces for Google Earth visualization



Numerical Model Data Access

- Climate Forecast System Reanalyses (CFSRv1; 350 TB), along with other model data sets
- NOMADS service allows user-defined subsetting prior to downloading
- Format-independent via OPeNDAP
- Downloads via HTTP, FTP, GridFTP/Globus
- 60-80 TB downloaded per month
- Archive volume grows continuously

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

National Climatic Data Center
U.S. Department of Commerce

NOAA National Operational Model Archive & Distribution System

Data
[Access](#)
[Inventory](#)

Documentation
[User Guide](#)

NOMADS Project
[About NOMADS](#)
[Partners](#)
[Publications & Presentations](#)
[Service Records Retention System](#)
[Plans for the National Climate Model Portal](#)

Contact Us
[Contact Info](#)

The NOAA National Operational Model Archive and Distribution System (NOMADS) is a Web-services based project providing both real-time and retrospective format independent access to climate and weather model data.

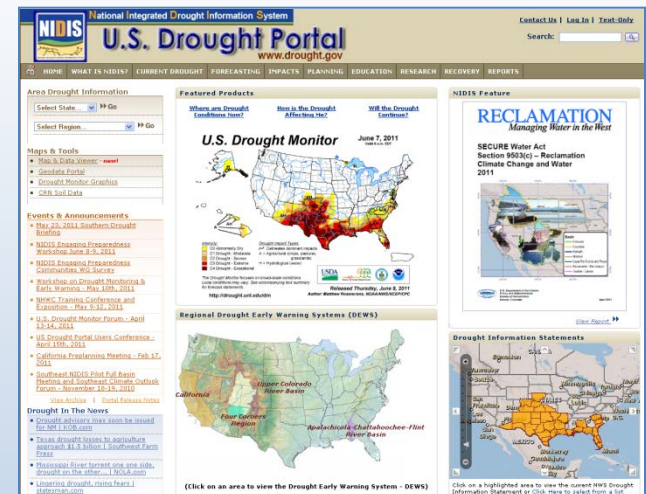
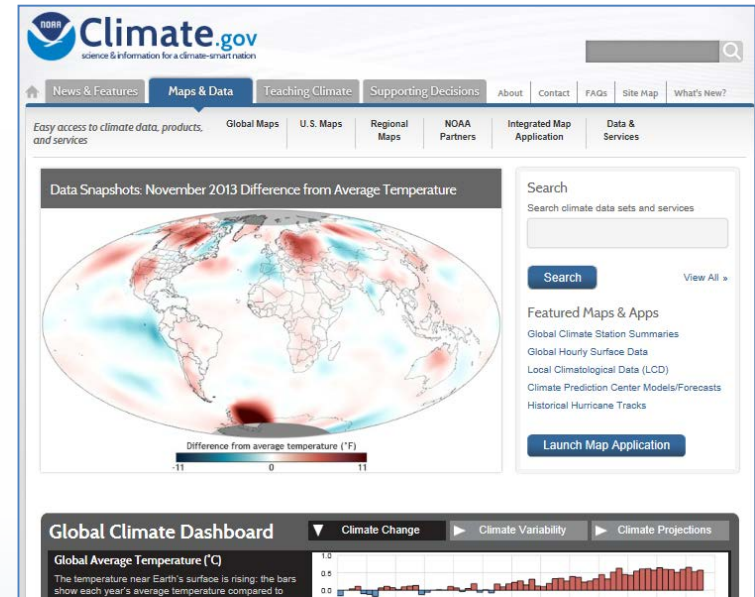
DOC > NOAA > NESDIS > NCDC > NOMADS

Tailored Data Portals

Climate.gov, Drought.gov, Model Portal

- One-stop access for a user community to distributed datasets, products, services
- *Climate.gov* supports wide audience with data, outreach and informational services
- *Drought.gov* supports decision-makers
- *Model Portal* supports scientists with numerical model output and reanalyses
- Leverage partners across government and world

- www.climate.gov
- www.drought.gov
- nomads.ncdc.noaa.gov



International Data Portal Hosting

- GOSIC Portal provides one-stop data access for
 - Global Climate Observing System (GCOS)
 - Global Ocean Observing System (GOOS)
 - Global Terrestrial Observing System (GTOS), and
 - their partner programs

The screenshot shows the GOSIC website homepage. At the top, it features the GOSIC logo and the text 'Global Observing Systems Information Center'. Below the header, there is a navigation menu on the left with links for Home, About the GOSIC, Global Climate Observing System (GCOS), Global Ocean Observing System (GOOS), Global Terrestrial Observing System (GTOS), Essential Climate Variable (ECV) Data & Information, Metadata Creation Tool, Acronyms, News, and Contact. The main content area includes a welcome message, a search bar, and a section titled 'Global Observing Systems Data Access' with links to GCOS, GOOS, and GTOS data access pages, as well as an ECV Data & Information Access Matrix.

- World Data Centers for Meteorology and Paleoclimatology
 - Nodes on global network that acquire, catalog, archive, and facilitate international exchange of scientific data without restriction

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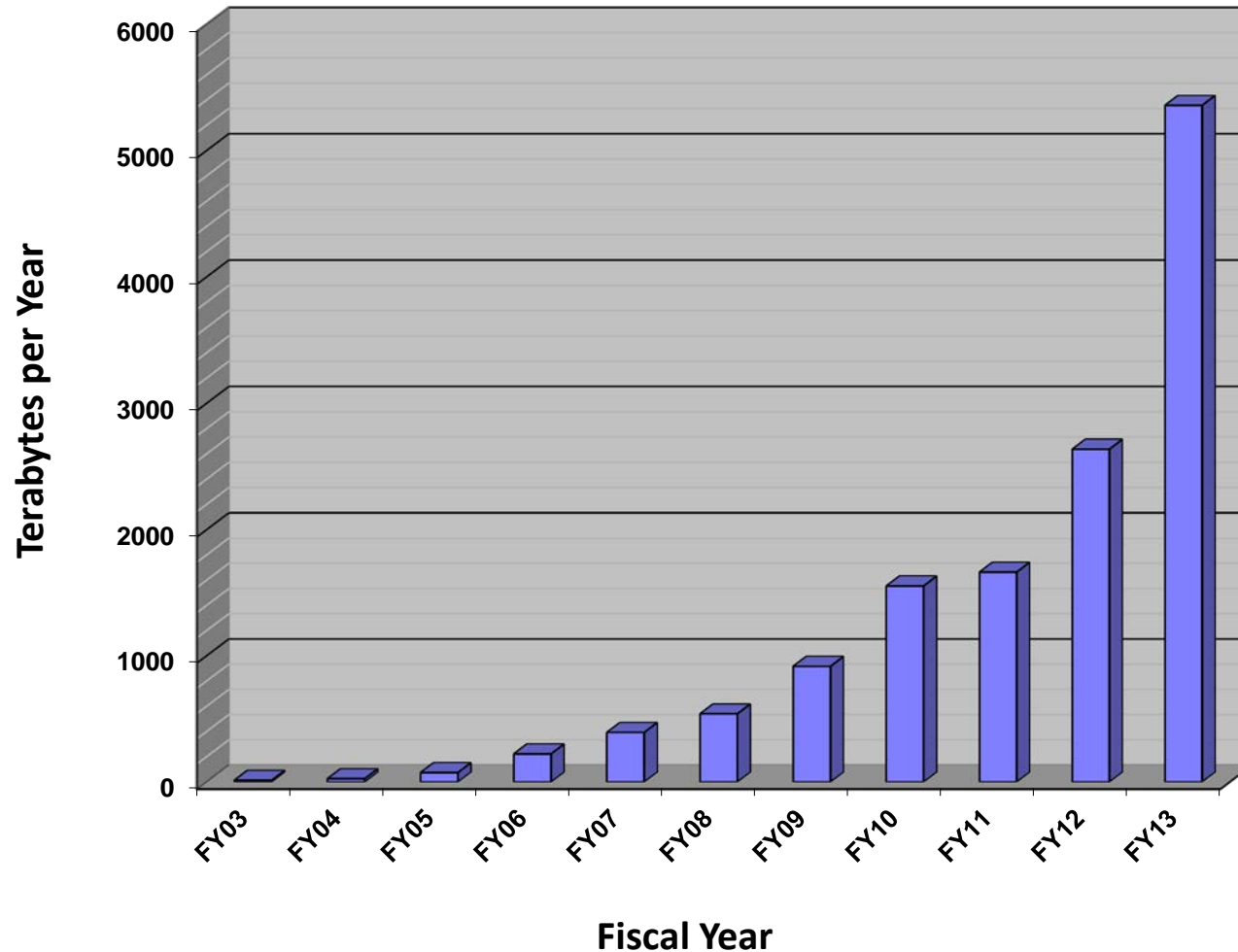
- <http://gotic.org>
- <http://www.ncdc.noaa.gov/customer-support/world-data-centers>

Other Facts and Observations

- Data and product transparency growing
 - Open source, standardized documentation
 - Required by U.S. Law (Data Quality Act) and Exec. Order
- Metadata architecture lags that of data
 - Upgrades needed to allow modern data access and handling
- Stewardship Maturity Matrix unveiled at AMS
- U.S. cloud policy lags cloud capabilities
 - Google experiments (MODIS, Landsat; NOAA CDRs soon)
 - NOAA Request for Information on private partnering
- Digital signature needs growing quickly

A Race to Enable Modern Access To Disparate Historic & Expanding Real-time Data

No Time to Breathe...



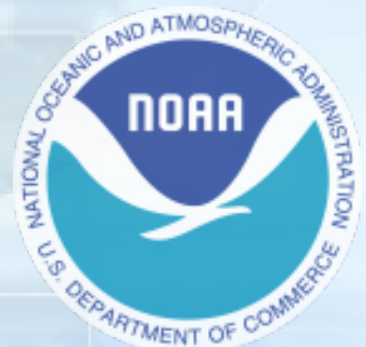
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Climate Monitoring and Derived Products

- National and global monitoring products
- Products for extreme events, hurricanes, tornadoes, etc.
- Temperature and precipitation data monitored in detail to describe variability and change
- <http://www.ncdc.noaa.gov/climate-information>

NOAA NATIONAL CLIMATIC DATA CENTER
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Home Climate Information Data Access Customer Support About NCDC Search NCDC

Home > Climate Information

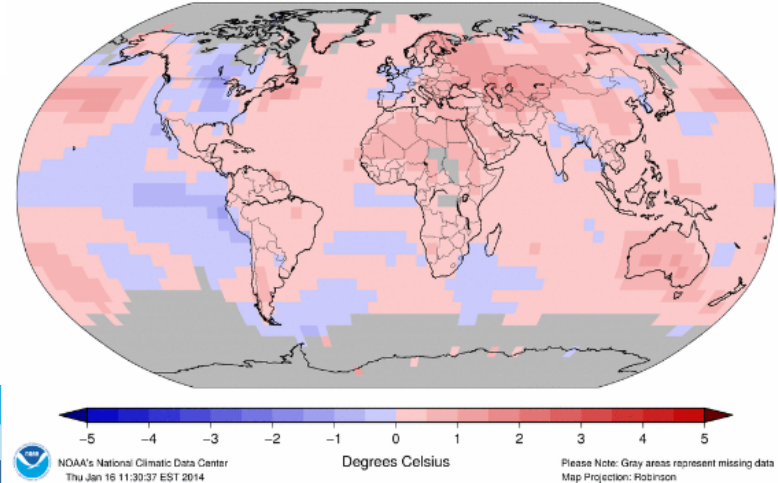
Climate Information

NCDC puts a priority on interpreting and applying scientific understanding to our extensive array of climate datasets. Some of the products and output derived from this effort include extreme event and dynamically generated climate information. Detailed descriptions of the information available are below.

- **Climate of the United States**
The climate of the United States varies by location and by time of year. Climate Normals, monthly climate reports, and drought information are a few of the many datasets and products found under our climate section.
- **Analyses**
NCDC provides analyses of weather and climate events, placing them into proper historical perspective, understanding their unusualness, and increasingly comparing recent events to expectations of future climate conditions.
- **Extreme Events**
Extreme events such as heat waves, droughts, tornadoes, and hurricanes have affected the United States since the dawn of time. NCDC provides a variety of information detailing these events categorized by type of event.
- **Statistical Weather and Climate Information**
NCDC offers several types of climate information generated from examination of the data in the archives. These types of information include record temperatures, record precipitation and snowfall, climate extremes statistics, and other derived climate products.
- **Regional**
NCDC's regional climate services make relevant climate information accessible to people across the Nation.
- **Sectoral**

Land & Ocean Temperature Anomalies Jan–Dec 2013
(with respect to a 1981–2010 base period)

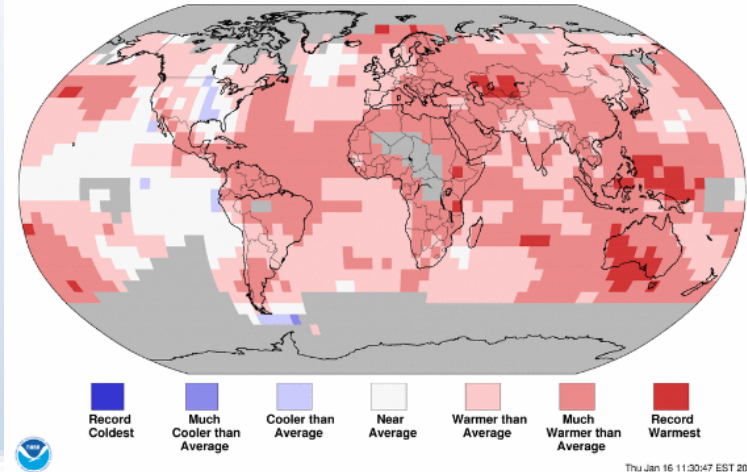
Data Source: GHCN–M version 3.2.2 & ERSST version 3b



Land & Ocean Temperature Percentiles Jan–Dec 2013

NOAA's National Climatic Data Center

Data Source: GHCN–M version 3.2.2 & ERSST version 3b



Maturity Matrix for Long-Term Scientific Data Stewardship (Draft)

Maturity Scale	Preservation	Accessibility	Usability	Production Sustainability	Data Quality Assessment	Data Quality Monitoring	Transparency and Traceability	Information Integrity
Level 1 - Ad Hoc Not Managed	Any storage location Data only	Not publicly available Person-to-person	Extensive product-specific knowledge required No document online	Ad Hoc No obligation or deliverable requirement	Algorithm theoretical basis assessed	Sampling and analysis are spotty and random in time and space	Limited product information available Person-to-person	Unknown data integrity Unknown IT system
Level 2 - Minimal Managed Limited	Non-designated repository Redundancy Limited metadata	Publicly available Not searchable online	Non-standard data format Limited document (e.g., user's guide) online	Short-term Individual PI's commitment (grant obligations)	Level 1 + Research product assessed	Sampling & analysis are regular in time and space Limited product-specific metric defined & implemented	Product information available in literature	No data integrity check Non-designated IT system
Level 3 - Intermediate Managed Defined & Partially Implemented	Designated repository/archive Conforming to community archiving process and metadata Conforming to limited archiving standards	Available online Limited data server performance Collection/dataset searchable	Community standard-based interoperable format and metadata Documentations (e.g., source code, product algorithm document, data flow diagram) online	Medium-term Institutional commitment (contractual deliverables with specs and schedule defined)	Level 2 + Operational product assessed	Regular/ frequent, and systematic Not automatic Community metric defined and partially implemented	Algorithm Theoretical Basis Document (ATBD) and source code online Dataset configuration managed (CM) Data citation tracked (e.g., utilizing DOI system) Unique object identifier (UOI) assigned (dataset, documentation, source code)	Data ingest & archive integrity verifiable (e.g., checksum technology) Designated IT System Conforming to low IT security requirements
Level 4 - Advanced Managed Well-Defined & Fully Implemented	Level 3 + Conforming to community archiving standards	Level 3 + Enhanced data server performance Granule/file searchable	Level 3 + Basic capability (e.g., subsetting, aggregating) and data characterization (overall/global, e.g., climatology, error estimates) available online	Long-term Institutional commitment Product improvement process in place	Level 3 + Quality metadata assessed Limited quality metadata	Level 3 + Anomaly detection procedure well-documented and fully implemented using community metric, automatic, tracked, and reported	Level 3 + OAD (Operational Algorithm Description) online (CM + UOI)	Level 3 + Data access integrity verifiable (e.g., checksum technology) Conforming to moderate IT security requirement
Level 5 - Optimal Level 4 + Measured, Controlled, and Audit	Level 4 + Archiving process performance controlled, measured, and audited Future archiving process and standard changes planned	Level 4 + Dissemination reports available Future technology changes planned	Level 4 + Enhanced online capability (e.g., visualization, multiple data formats) Community metric set of data characterization (regional/cell) online External ranking	Level 4 + National or international commitment Changes for technology planned	Level 4 + Assessment performed on a recurring basis Community quality metadata External ranking	Level 4 + Cross-validation of temporal & spatial characteristics Consistency check Dynamic providers/users feedback in place	Level 4 + System information online Complete data provenance	Level 4 + Data authenticity verifiable (e.g., data signature technology) Conforming to high IT security requirement Performance of data and system integrity check monitored & reported Future technology change planned