20th Century Reanalysis Project
A Portal to Past Weather

Background

Historical weather reconstructions, or *reanalyses*, provide a crucial link between long paleoclimate reconstructions and climate model forecasts. Reanalysis combines past weather observations with forecast maps from weather prediction models to estimate a comprehensive and consistent record of the weather. However, many instrumental reanalyses begin in 1948 with upper-air observations, or 1979 with the 'satellite era'. This leaves out many important 20th-century climate events, such as the 1930's Dust Bowl.

Led by NOAA's Physical Sciences Laboratory and CIRES at the University of Colorado, and supported by the Department of Energy and the Atmospheric Circulation Reconstructions over the Earth (ACRE) initiative, the **Twentieth Century Reanalysis Project** was launched in 2011 with the goal of expanding coverage and producing the longest instrument-based reanalysis dataset to date. A major upgrade to version three (20CRv3) was completed in 2019 and expanded in 2020. This high-resolution, four-dimensional reconstruction of global climate now estimates what the weather was like, eight times per day, for every day back to 1806.

20CRv3 can reconstruct conditions that led to historic extreme events, such as The Great Blizzard of 1888. This storm paralyzed the East Coast from the Chesapeake Bay to Maine to the Atlantic provinces of Canada, wreaked havoc on transportation, and caused the deaths of over 400 people.

How this was Accomplished

Using NOAA's Global Forecast System, researchers reconstructed the global atmosphere from surface pressure readings, and sea temperature and sea ice observations from historical records, such as 19th and early 20th century ship's logs—some transcribed by citizen volunteers. From this data, the model can estimate many variables including temperature, pressure, winds, moisture, solar radiation and clouds.

Running the model and crunching all this data required astronomical computing resources. To accomplish the third upgrade, the Department of Energy donated 600 million cpu hours on its supercomputing system to generate 21 million gigabytes of data at the National Energy Research Scientific Computing Center.

Benefits

Scientists have been using 20th Century Reanalysis datasets as a foundation for a wide range of studies, from understanding large-scale climate trends to diagnosing the impacts of individual historical extreme weather events. The dataset allows researchers to explore how climate change is influencing temperature, precipitation, and atmospheric circulation, and compare today's storms, heat waves, droughts and floods to historic events.

More Information

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https://psl.noaa.gov/data/20thC_Rean/