CLIMATE CHANGE

NOAA National Weather Service OCTOBER 2007

What is Climate Change?

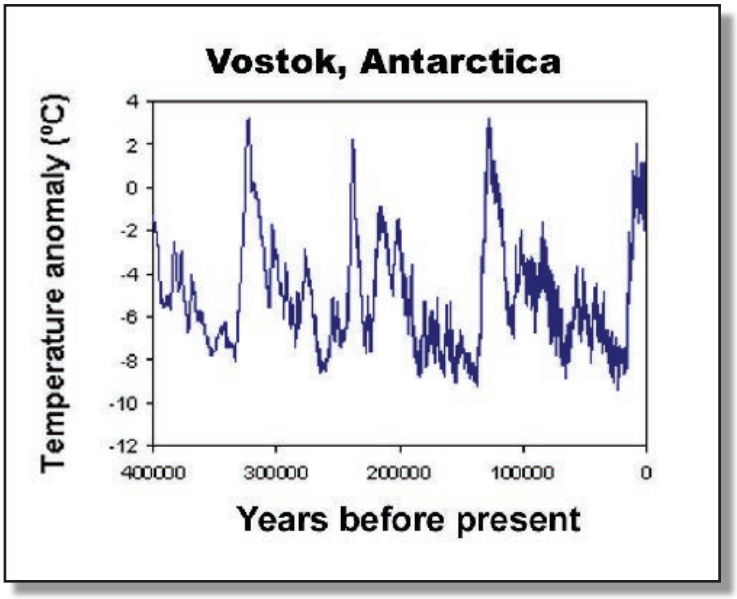
Climate change is a long-term shift in the statistics of the weather (including its averages). For example, it could show up as a change in climate normals (expected average values for temperature and precipitation) for a given place and time of year, from one decade to the next.

We know that the global climate is currently changing. The last decade of the 20th Century and the beginning of the 21st have been the warmest period in the entire global instrumental temperature record, starting in the mid-19th century.

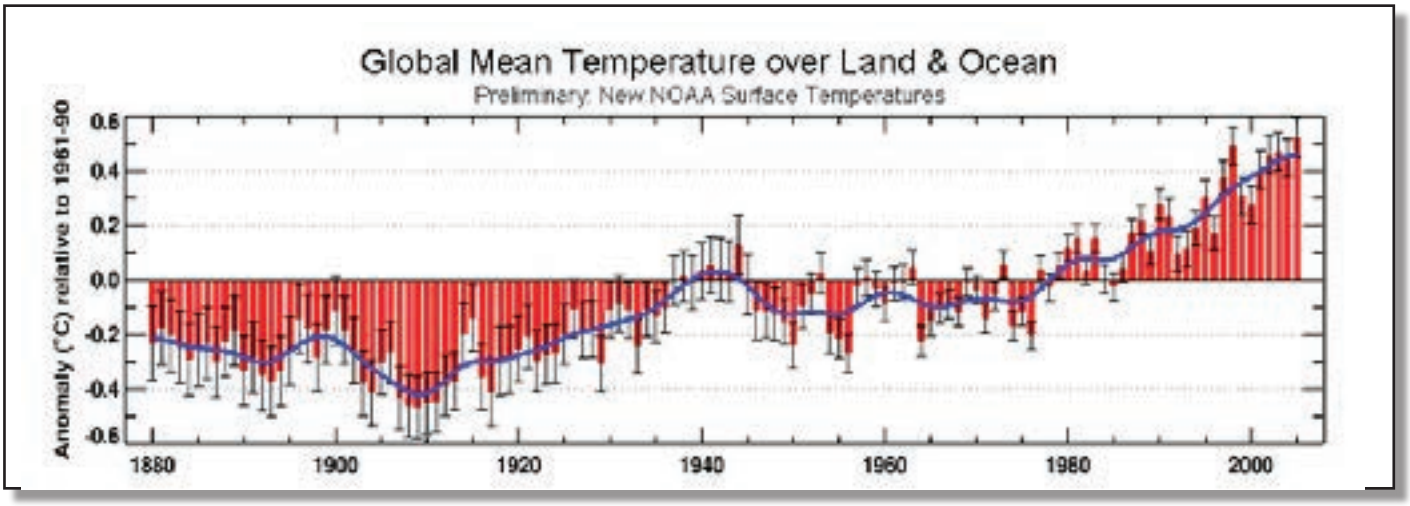
Why is the Climate Changing?

Natural variability

Climate change is a normal part of the Earth's natural variability, which is related to interactions among the atmosphere, ocean, and land, as well as changes in the amount of solar radiation reaching the earth. The geologic record includes significant evidence for large-scale climate changes in Earth's past. An example of this variability is shown in the plot below of temperature data for the last 420,000 years, derived from an Antarctic ice core.



Temperature changes in Antarctica determined from the deuterium proxy measured in the Vostok ice core record. *(Reference: Petit, J.R., et al. 1999. Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica. Nature 399: 429-436.) Available at* **http://www.ncdc.noaa.gov/paleo/abrupt/story2.html**

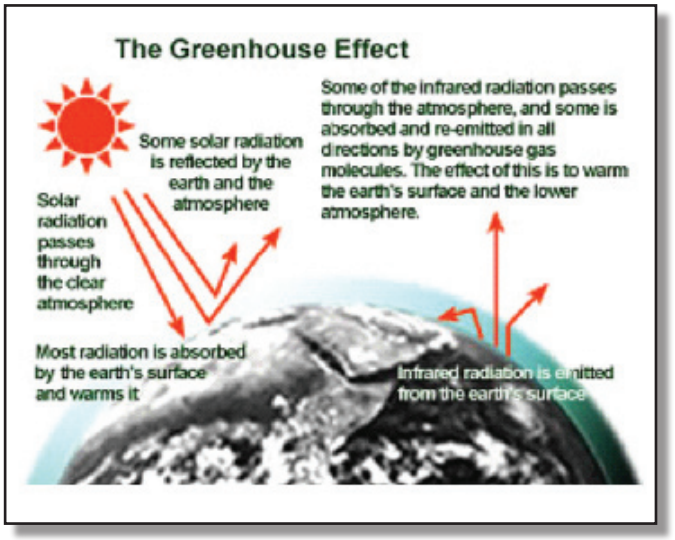


Line plot of global mean land-ocean temperature index, 1880 to present. *Individual years are plotted and the blue line is the five-year mean. (Data and plot available from NCDC at* **http://www.ncdc.noaa.gov/oa/climate/research/anomalies/anomalies.html).**

Human-induced change

Greenhouse Gases

Certain naturally occurring gases, such as carbon dioxide (CO_2) and water vapor (H_2O), trap heat in the atmosphere causing a greenhouse effect. Burning of fossil fuels, like oil, coal, and natural gas is adding CO_2 to the atmosphere. The current level is the highest in the past 650,000 years. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change concludes, "that most of the observed increase in the globally averaged temperature since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations."



What is being done to Study the Effects of Climate Change

There are numerous potential effects of climate change. Extensive research is being done around the world – a good deal within NOAA – to determine the extent to which climate change is occurring, how much of it is being caused by anthropogenic (man-made) forces, and its potential impacts. In some of these areas, there is not a consensus among scientists and in fact, there are often conflicting points-of-view and studies. However, with further research, no doubt many questions regarding impacts will be resolved in the future. Potential impacts most studied by researchers include the effects on sea level, drought, local weather, and hurricanes.

Most of our current knowledge of global change comes from General Circulation Models (GCMs). At present, GCMs have the ability to provide us with a mean annual temperature for the planet that is reliable. Regional and local temperature and precipitation information from GCMs is, at present, unreliable. Much of the global change research effort is focused on improving these models.

Where Can I Find More Information?

U.S. Climate Change Science Program:
http://www.climatescience.gov/

NOAA National Climatic Data Center site on Global Warming:
http://www.ncdc.noaa.gov/oa/climate/globalwarming.html

NASA GISS recent research website:
http://www.giss.nasa.gov/research/

Global Change Master Directory:
http://gcmd.gsfc.nasa.gov/Resources/pointers/glob_warm.html

Intergovernmental Panel on Climate Change (IPCC) Website:
http://www.ipcc.ch/