

Climate Change Information Resources

New York Metropolitan Region

(CCIR-NYC)



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What is the evidence that the climate is changing?

Key Points

Instrumental data from the twentieth century indicate that near-surface air temperatures and precipitation are increasing globally. In response to twentieth century warming, glaciers have been retreating and snow cover extent has decreased. Arctic sea-ice thickness during the summer and early autumn has declined and tide gauge data show that sea level has been rising. Observational evidence indicates that regional changes in climate have already affected biological systems in many parts of the world.

Temperature, Precipitation, and Extreme Weather

Observed (instrumental) data indicate that global near-surface air temperature has increased by approximately 1.08°F (0.6°C) since the late nineteenth century. Most of this increase has occurred in two periods, from about 1910 - 1945 and since 1976. Minimum temperatures in the latter half of the century have been increasing at nearly twice the rate of maximum temperatures, reducing the diurnal temperature range in many parts of the world.

Increases in daily minimum temperatures are lengthening the freeze-free season in most mid- and high latitude regions. Instrumental records of precipitation on land show an increase of 0.5 to 1% per decade in much of the Northern Hemisphere mid- and high latitudes. In contrast, over much of the sub-tropical land areas rainfall decreased during the twentieth century.

Over the latter half of the twentieth century it is likely that there has been a 2 to 4% increase in the frequency of heavy precipitation events reported by the available observing stations in the mid- and high latitudes of the Northern Hemisphere. However, the observed record shows no significant change in tropical and extra-tropical storm intensity, and no systematic changes in the frequency of tornadoes, thunder days, or hail events. Furthermore, the reporting of extreme events has changed substantially with time, making a trend analysis difficult.

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Glaciers, Lake-Ice and River-Ice

Alpine and continental glaciers have retreated in response to twentieth century warming, although glaciers in a few maritime regions are advancing. Northern Hemisphere lake-ice and river-ice cover over the past century shows widespread decreases in duration, averaging about two fewer weeks of ice cover. Snow cover extent has decreased by about 10% since 1966

Sea-Ice Extent

There has been a 10 to 15% reduction in sea-ice extent in the Arctic spring and summer since the 1950s and data from submarines indicate that there has been about a 40% decline in Arctic sea-ice thickness in summer or early autumn between the period 1958 to 1976 and in the mid-1990s, or an average of about 1.57 inches (4 cm) per year. Other independent observations show a much slower decrease in winter sea-ice thickness of about 0.39 inches (1 cm) per year. However, it is difficult to assess the influence of the substantial interannual and inter-decadal variability on these changes.

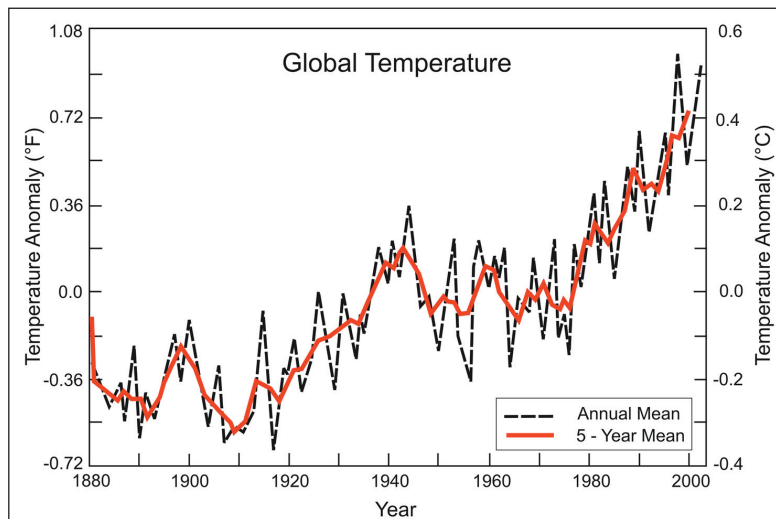
Sea-level Rise

Based on tide gauge data, the rate of global average sea-level rise during the twentieth century is in the range of 0.04 to 0.08 inches (1.0 to 2.0 mm) per year, with a central value of 0.06 inches (1.5 mm) per year. Based on the few very long tide gauge records, the

average rate of sea-level rise has been larger during the twentieth century than the nineteenth century.

Biological Systems

Available observational evidence indicates that regional changes in climate, particularly increases in temperature, have already affected biological systems in many parts of the world. Examples of observed changes include lengthening of mid- to high-latitude growing seasons, poleward and altitudinal shifts of plant and animal ranges, declines of some plant and animal populations, and earlier flowering of trees, emergence of insects, and egg-laying in birds.



Temperature changes over the past one hundred and twenty years. Source: NASA Goddard Institute for Space Studies (NASA GISS) 2001. <http://www.giss.nasa.gov/data/update/gistemp/graphs/>

References

Intergovernmental Panel on Climate Change (IPCC), 2001. "Working Group I Third Assessment Report." *Cambridge University Press*. Cambridge, UK. 881 pp.

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