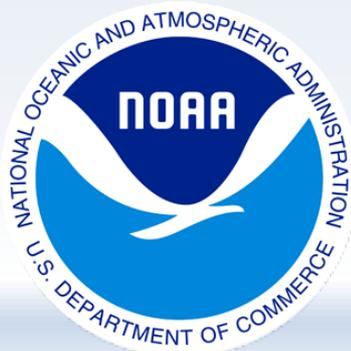


State of the Climate in 2010



Thomas R. Karl, L.H.D., Director, NOAA's National Climatic Data Center, and Chair of the Subcommittee on Global Change Research

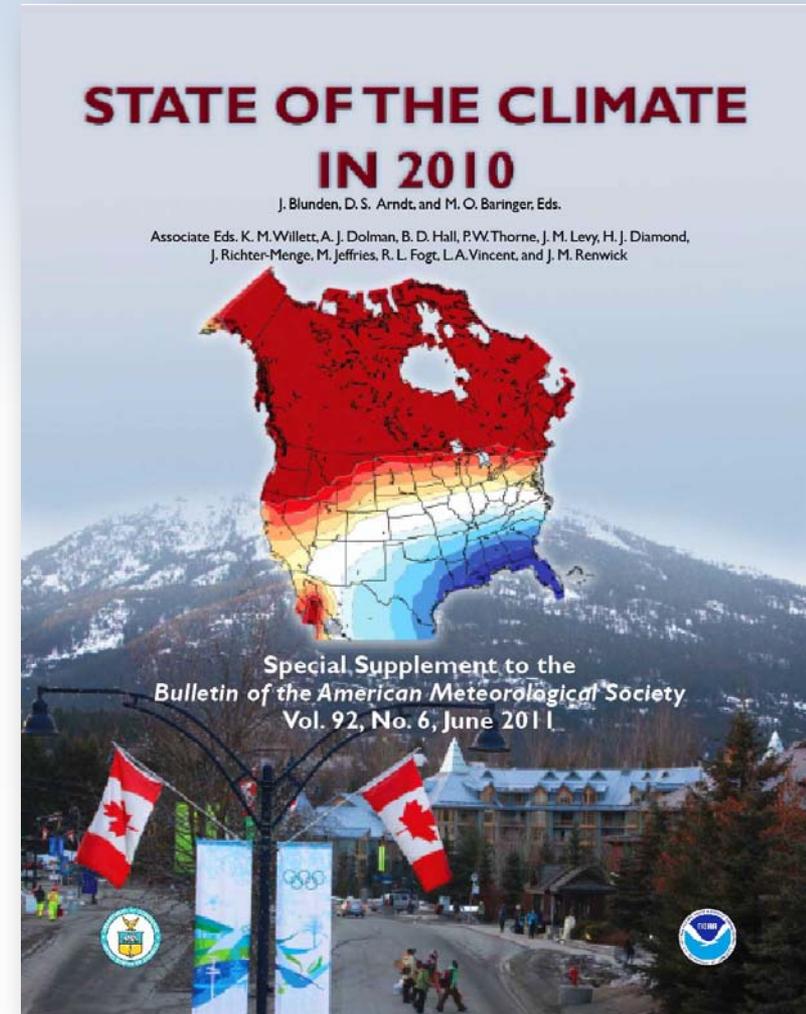
Peter Thorne, PhD, Senior Scientist, Cooperative Institute for Climate and Satellites- North Carolina and Associate Research Professor, North Carolina State University

Deke Arndt, Chief, Climate Monitoring Branch, NOAA's National Climatic Data Center

Walt Meier, PhD, Research Scientist, National Snow and Ice Data Center, University of Colorado at Boulder

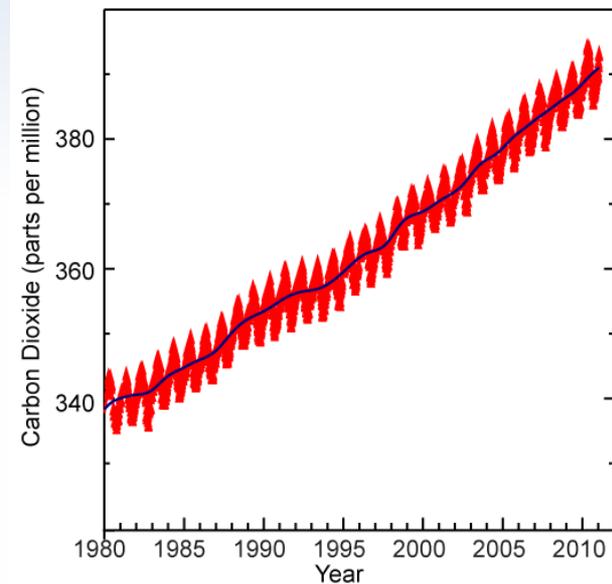
21st Annual *State of the Climate* Report

- Surveys the changing state and the behavior of the physical climate system
- Now tracks 41 global-scale climate indicators
- Peer reviewed report has 368 authors from 45 countries

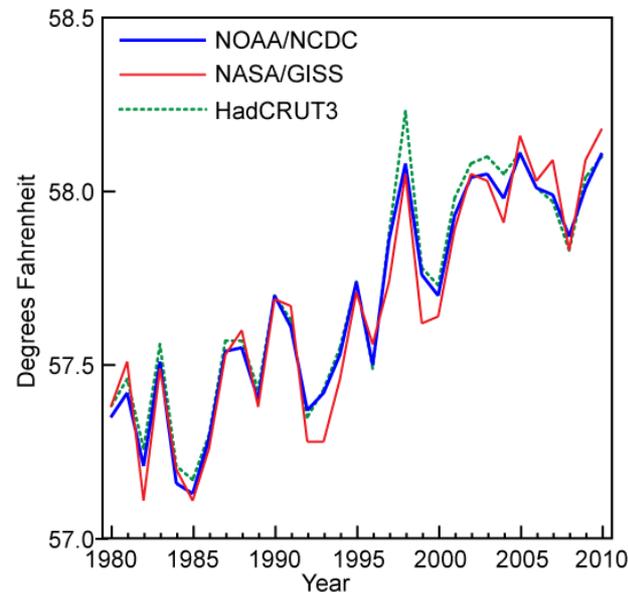


2010: Long-term Trends Continue

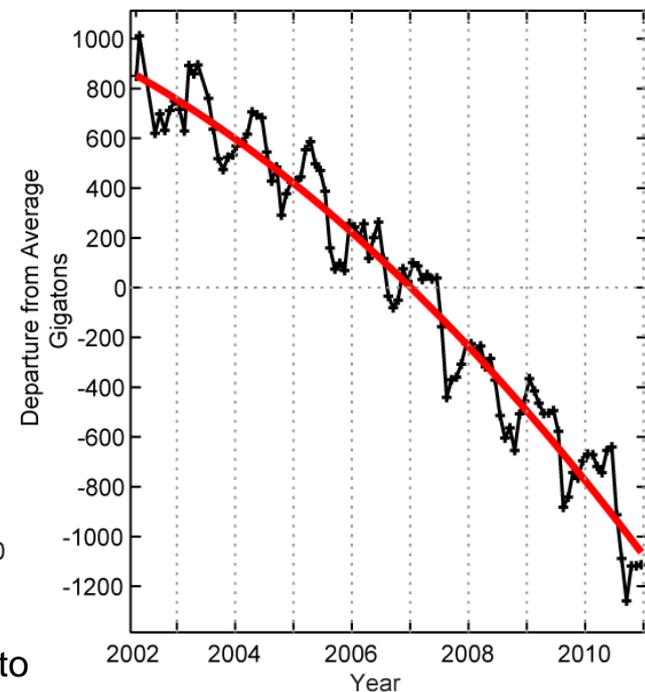
Global average surface temperature among the two warmest of the instrumental record



Air samples collected weekly at NOAA's Mauna Loa observatory continue to show a rise in the concentration of carbon dioxide.



Three data sets show global surface temperatures continue to rise; 2010 was one of the two warmest years on record.



Greenland's ice sheet lost more mass in 2010 than at any time in the past ten years.

2010: Climate Variability Played a Major Role

Two recurrent climate patterns had major impacts on 2010 weather:

- El Niño / La Niña
- Arctic Oscillation



Washington D.C.,
Feb. 2010

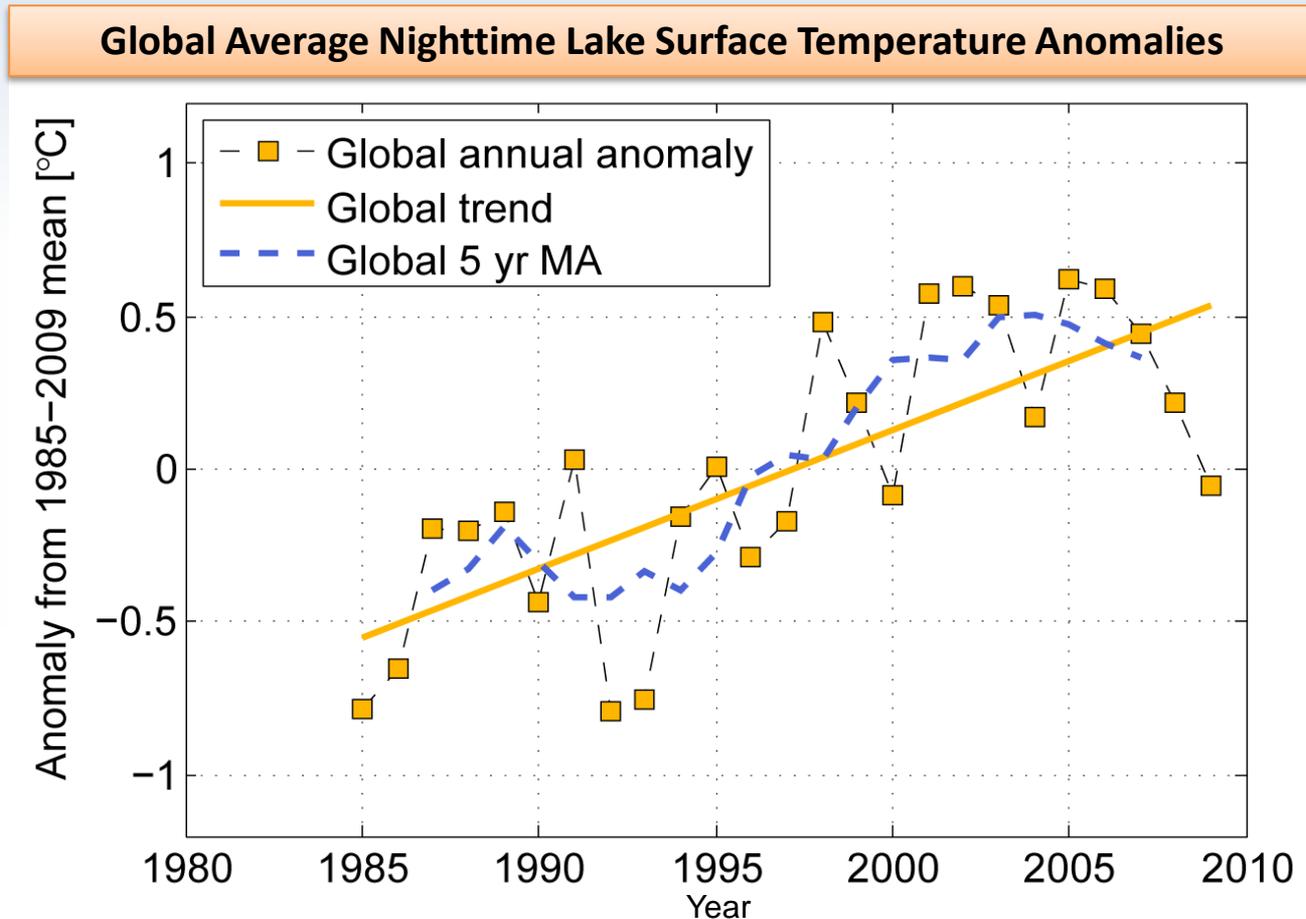
“Climate is what you expect, weather is what you get.” --
Robert A. Heinlein



Vancouver, British Columbia February 2010

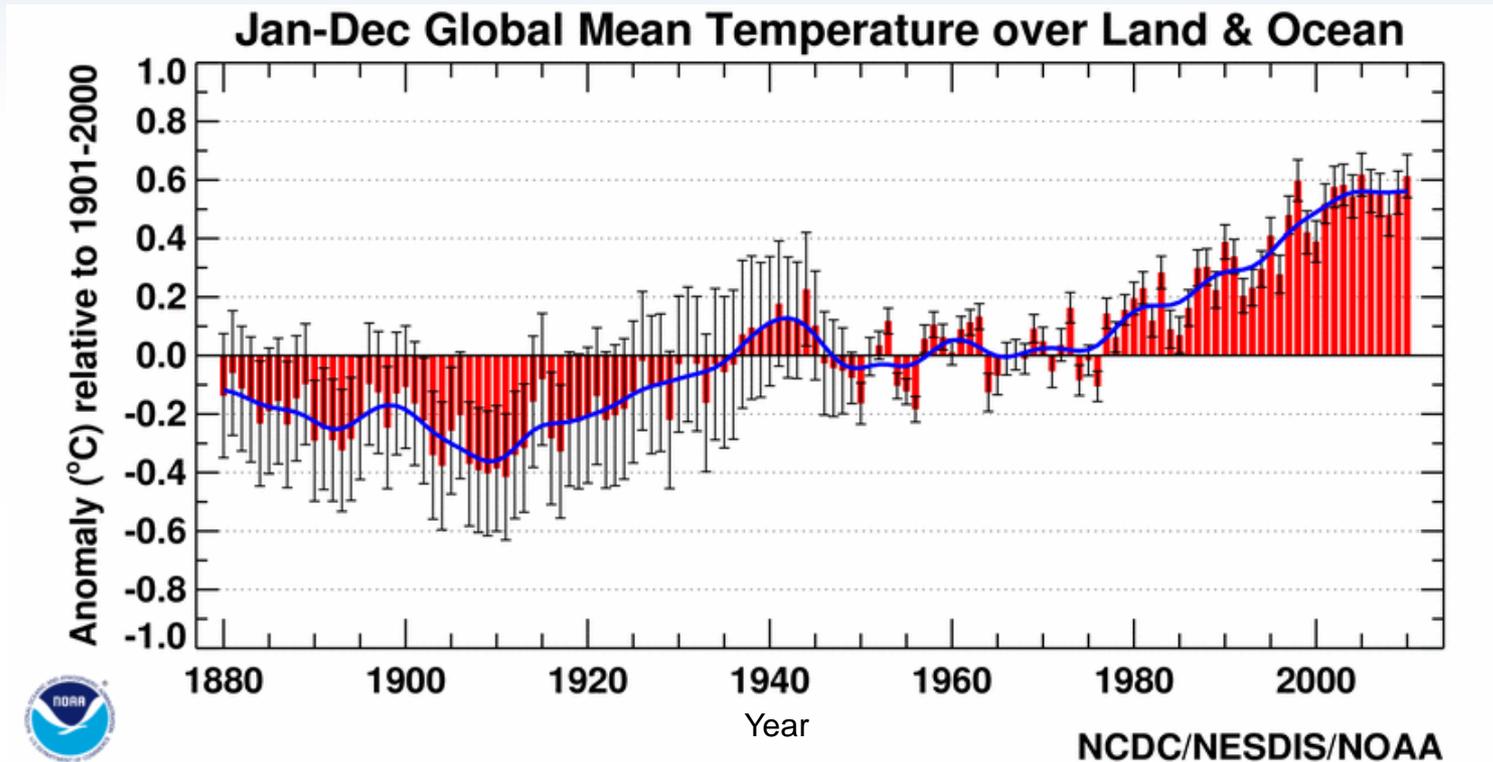
Monitoring the Climate System

- Report added four new indicators to better understand changes in the global climate



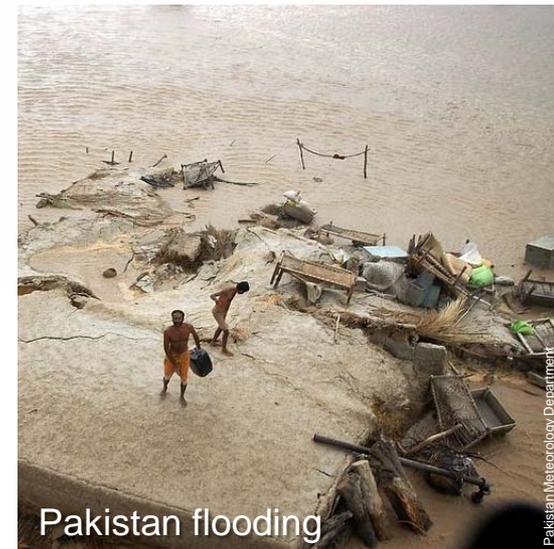
The World Continues to Warm

- Multiple indicators, same bottom line conclusion
 - Consistent and unmistakable signal from the top of the atmosphere to the bottom of the oceans



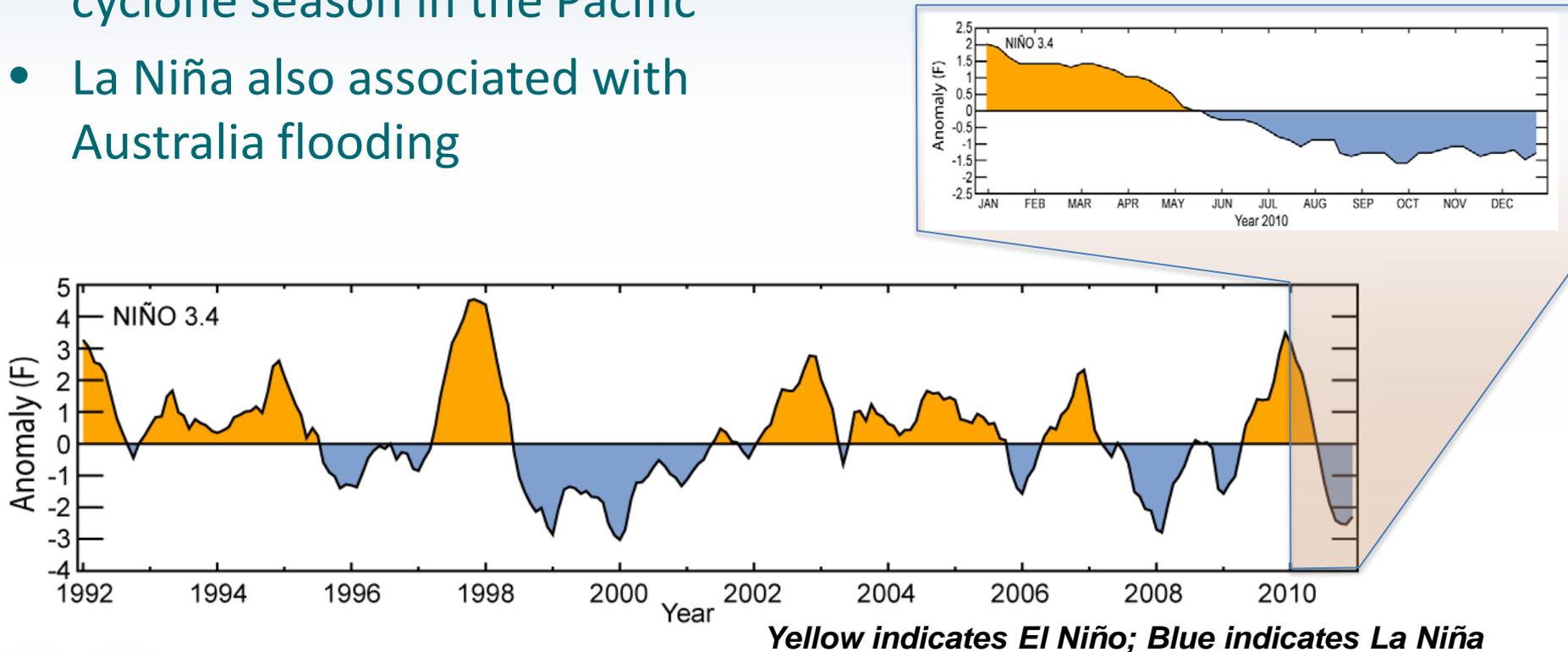
Weather and Climate Events

- Many extreme events at regional and local levels
 - 2009/10 coldest European winter since 1978/79
 - February 2010 – a month of extremes in North America:
 - Several U.S. cities had snowiest months on record
 - Warm, dry, with limited snow for 2010 Winter Olympics in Vancouver, British Columbia
 - Summer:
 - Russia: Deadly summer heat wave
 - Pakistan: Floods displaced over 20 million people
 - Most of the world (except the Atlantic) had a very *inactive* tropical cyclone year
 - Catastrophic flooding in Australia
 - Drought in Brazil



Major Event: El Niño to La Niña Transition

- Lingering effects of El Niño were responsible, in part, for 2010 being one of two warmest years on record
- Relationship between emerging La Niña and very slow tropical cyclone season in the Pacific
- La Niña also associated with Australia flooding

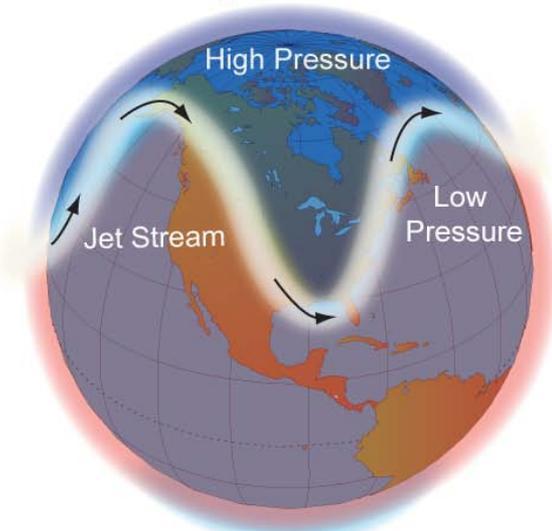


Major Events: Arctic Oscillation

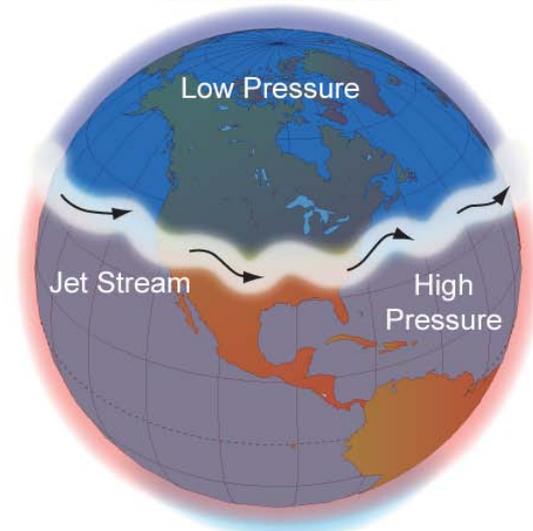
- Record negative values in Feb 2010
- Impacts to the Northern Hemisphere
 - U.S. and Western Europe endured record or near-record cold during winter 2009/10 and winter 2010/11
 - Parts of northern North America, Greenland, and Asia experienced profound warmth at the same time

Arctic Oscillation

Negative Phase

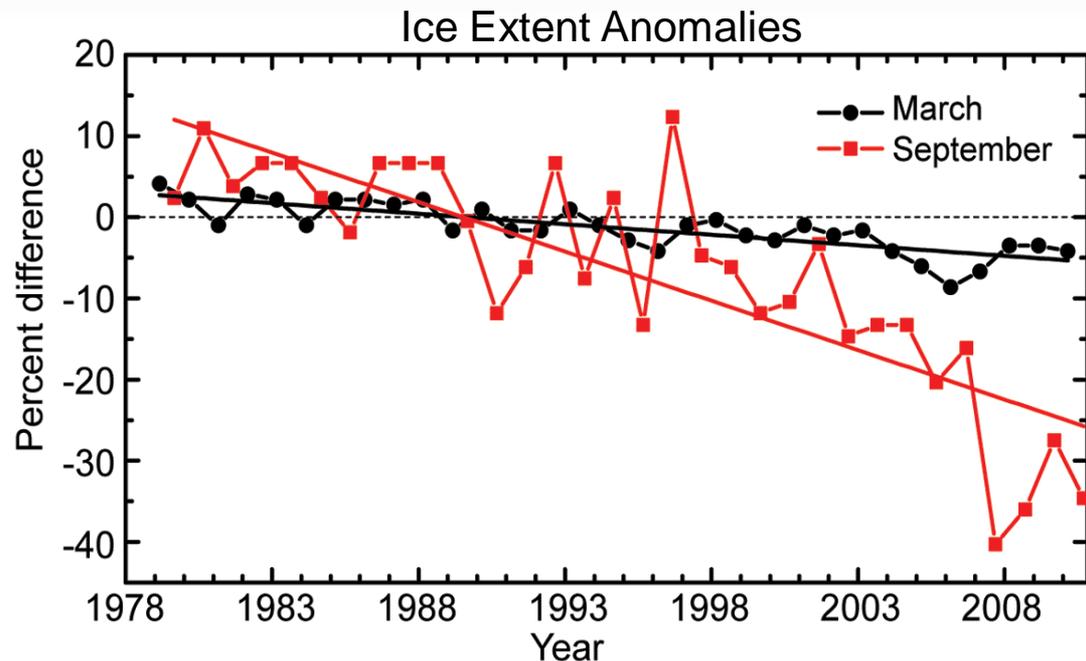


Positive Phase



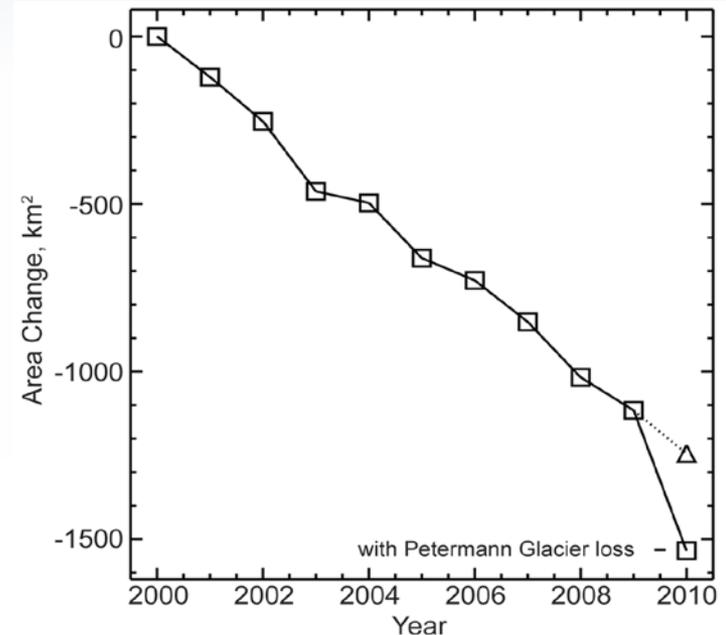
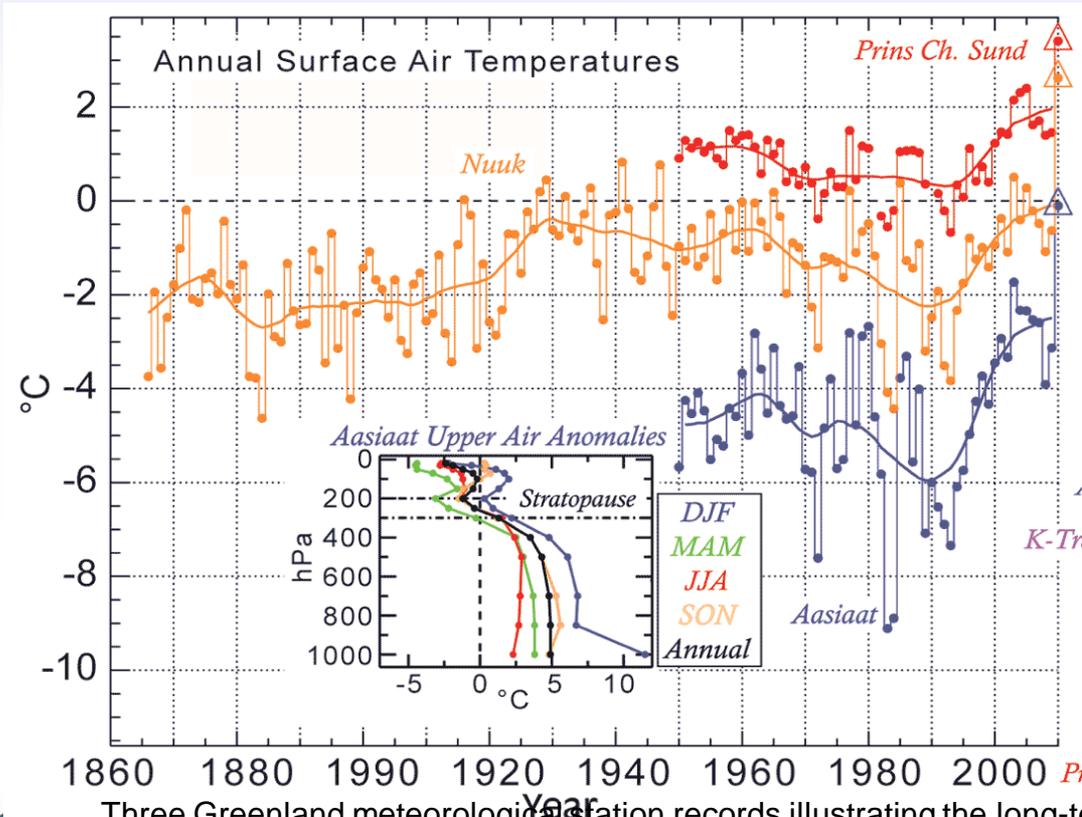
The Arctic

- Changes occurring faster than in most of the rest of the world
- 2010 maximum sea ice extent was latest in 30 years - March 31
- September sea ice extent was third smallest of the past 30 years
- Trends in snow cover duration, permafrost, and vegetation continued or accelerated



Greenland: changes continue to accelerate

- Record-setting temperatures along entire western Greenland, both near the ground and higher in the atmosphere
- The high temperatures contributed to greater ice sheet melting
 - April–September 2010 melt was about 8 percent more than the previous record



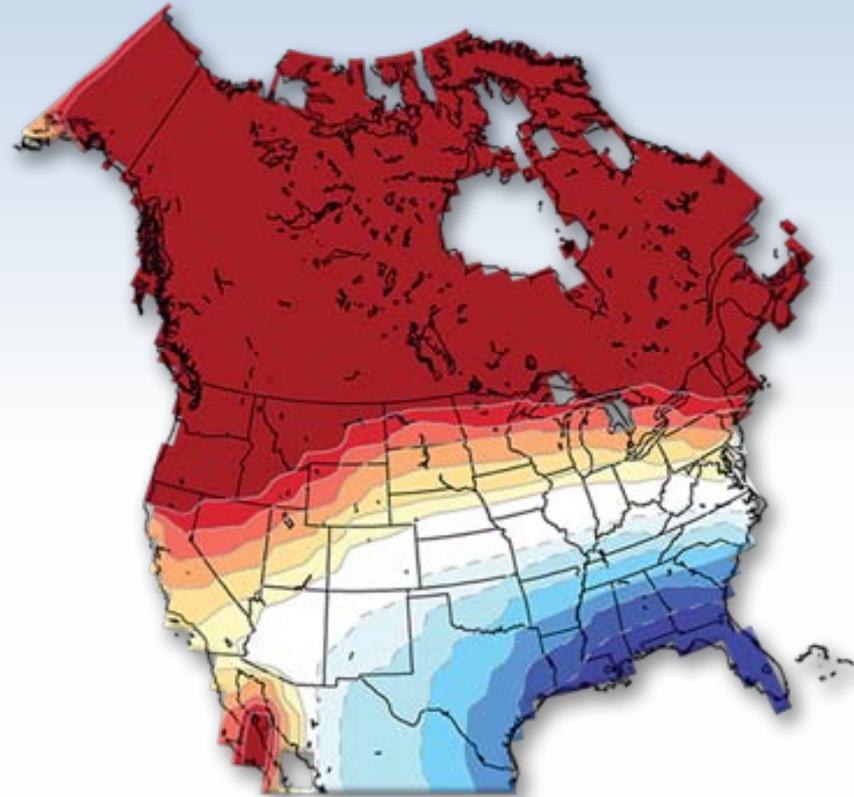
Cumulative area changes for 35 major glaciers of Greenland's ice sheet

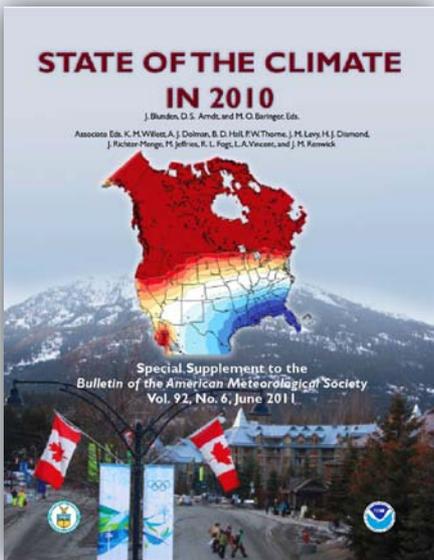
Three Greenland meteorological station records illustrating the long-term

time series of yearly average temperatures

Summary

- 2010 global average surface temperature among the two warmest on record
- Two recurrent climate patterns – El Niño / La Niña and Arctic Oscillation - had major impacts on 2010 weather
- 2010 report tracks 41 climate indicators. Long-term trends continue to show the world is warming





State of the Climate in 2010 full report and Highlights available online
<http://www.ncdc.noaa.gov/bams-state-of-the-climate>

