

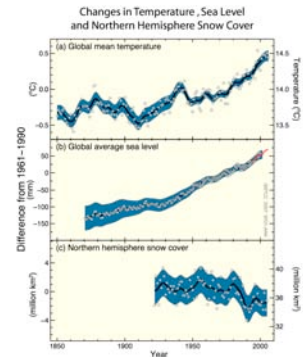
Direct Observations of Recent Climate Change (page 5)

Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level.

Global mean temperature

Global average sea level

Northern hemisphere Snow cover



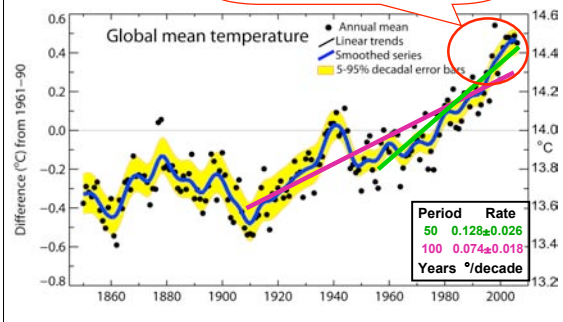
Direct Observations of Recent Climate Change

Global average air temperature

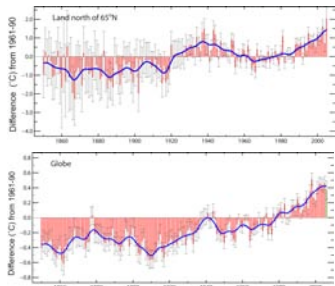
- Updated 100-year linear trend of 0.74 °C for 1906-2005
- Larger than corresponding trend of 0.6 °C for 1901-2000 given in last report
- Average ocean temperature increased to depths of at least 3000 m – ocean has absorbed 80% of heat added
 - > seawater expansion and Sea Level Rise

Global mean temperature

Warmest 12 years: 2005, 2007, 1998, 2003, 2002, 2004, 2006, 2008, 2001, 1997, 1995, 1999



Arctic vs Global annual temperature anomalies (°C) (page 8)

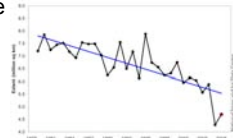


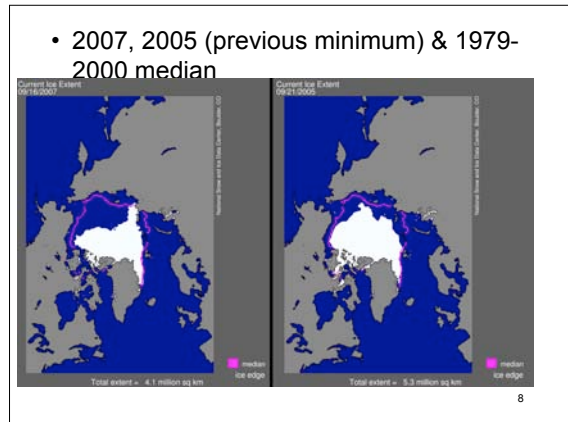
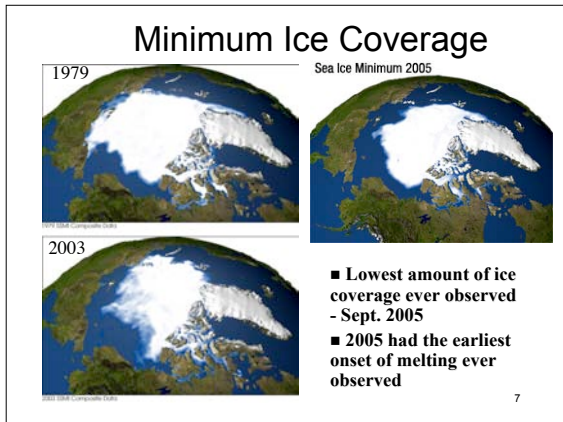
Warming in the Arctic is **double** that for the globe from 19th to 21st century and from late 1960s to present.

Note different scales

Further Changes in Arctic and Frozen Ground

- Annual average Arctic sea ice extent shrunk by 2.7 % per decade
- Temperatures at the top of permafrost layer have generally increased since the 1980s by up to 3°C
- The maximum area covered by seasonally frozen ground has decreased by about 7% in Northern Hemisphere





A Paleoclimatic Perspective (page 10)

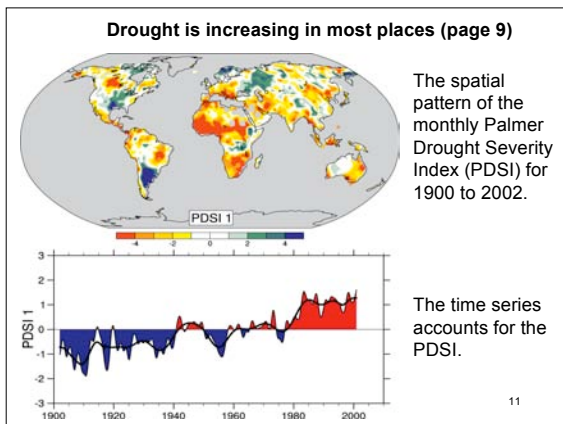
Paleoclimate information supports the interpretation that the warmth of the poles is unusual. The last time the polar regions were significantly warmer than present for an extended period (about 125,000 years ago), reductions in polar ice volume led to 4 to 6 meters of sea level rise.

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Other changes in Extreme Events (page 8, 9)

- Widespread changes in extreme temperatures observed
- Observational evidence for an increase of intense tropical cyclone activity in the North Atlantic since about 1970, correlated with increases of tropical sea surface temperatures

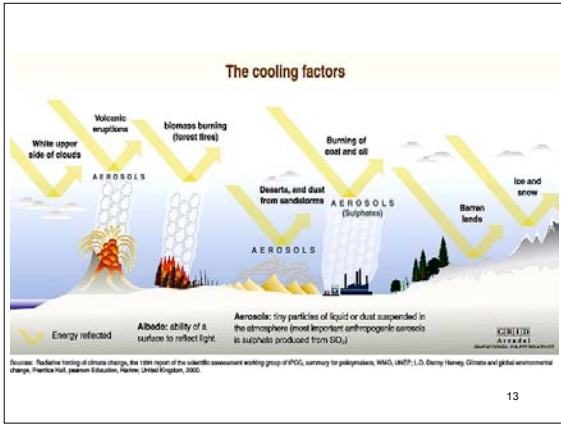
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Radiative Forcing

- **Human Warming:**
 - Greenhouse gas emissions
 - Ozone pollution
 - Lowering Albedo - black carbon on snow
- **Human Cooling**
 - Sulfate emissions
 - Raising Albedo - land use changes
- **Natural**
 - Solar forcing
 - Volcanoes
 - Aerosols

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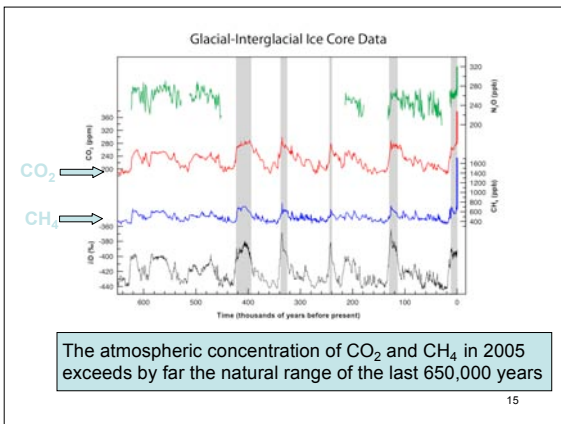
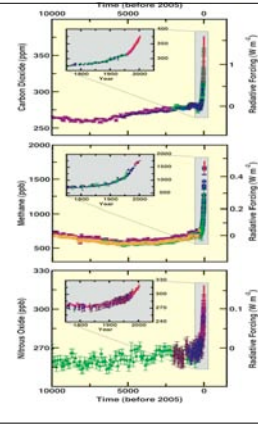
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Human and Natural Drivers of Climate Change (page 3)

CO₂, CH₄ and N₂O Concentrations

- far exceed pre-industrial values
- increased markedly since 1750 due to human activities

Relatively little variation before the industrial era



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Human and Natural Drivers of Climate Change (page 5)

The understanding of anthropogenic warming and cooling influences on climate has improved since the Third Assessment Report (TAR), leading to *very high confidence* that the globally averaged net effect of human activities since 1750 has been one of warming, with a radiative forcing of +1.6 W m⁻².

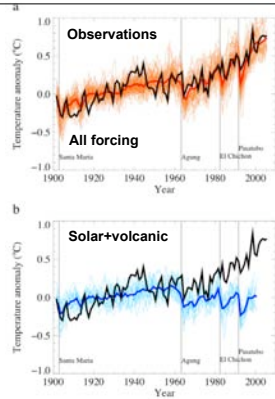
- Changes in solar irradiance since 1750 are estimated to have caused a radiative forcing of +0.12 W m⁻²

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Attribution (page 5)

- The understanding of warming and cooling influences on climate has improved since the TAR leading to a very high confidence* that the net effect of human activities has been one of warming

- * at least 90%



Projections of Future Changes in Climate

Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would *very likely* be larger than those observed during the 20th century.

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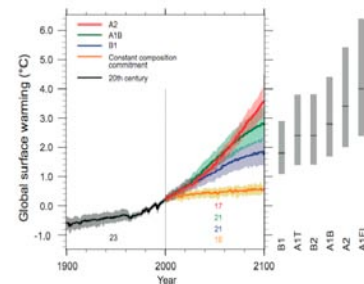
Projections of Future Changes in Climate

- For the next two decades a warming of about 0.2°C per decade is projected
- Even if the concentrations of all greenhouse gases and aerosols had been kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be expected.

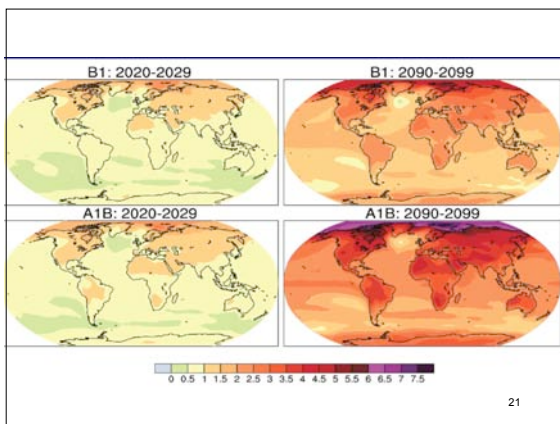
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Projections of Future Changes in Climate

Best estimate for low scenario (B1) is 1.8°C and for high scenario (A2) is 4.0°C



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PROJECTIONS OF FUTURE CHANGES IN CLIMATE (page 15-17)

- Anthropogenic warming and sea level rise would continue for centuries even if greenhouse gas concentrations were to be stabilized.
- Temperatures in excess of 1.9 to 4.6°C warmer than pre-industrial sustained for millennia...eventual melt of the Greenland ice sheet. Would raise sea level by 7 m. Comparable to 125,000 years ago.

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