Climate Change 2009:
Faster Change and More Serious Risks

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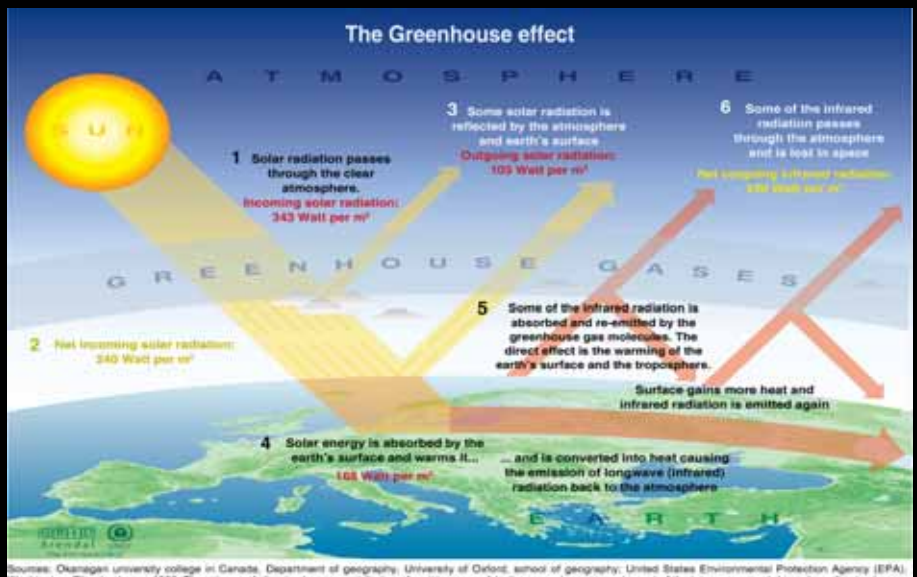
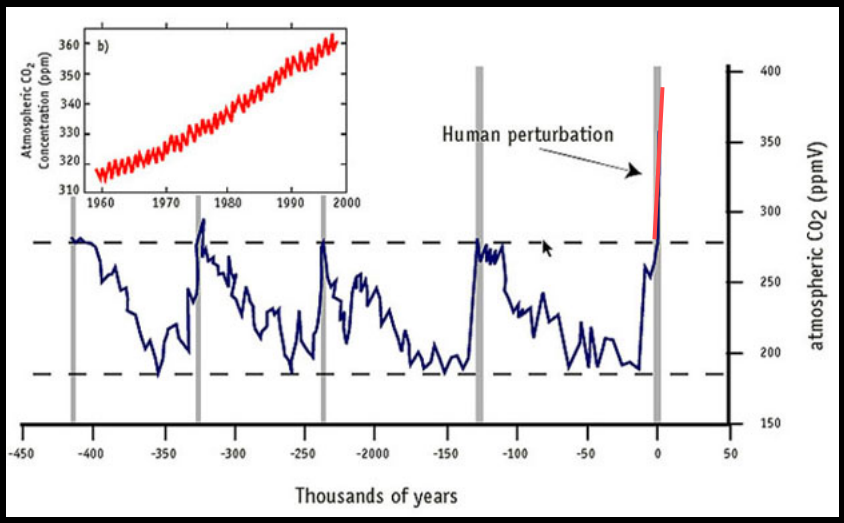


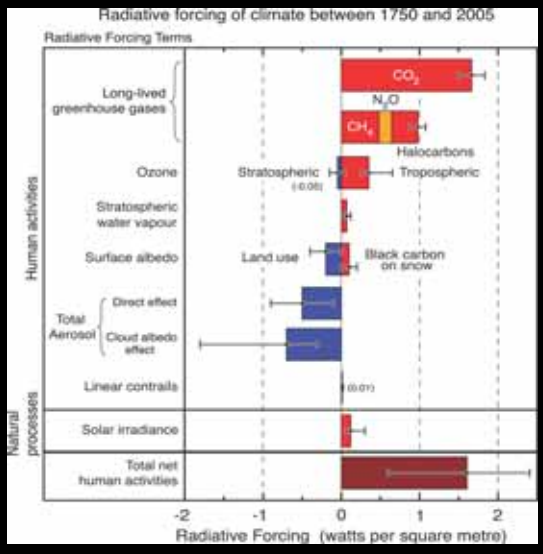
Sources: Okanagan university college in Canada, Department of geography; University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change 1995, The science of climate change, contribution of working group 1 to the second assessment report of the intergovernmental panel on climate change, UNEP and WMO, Cambridge university press, 1996.

Human change to the carbon cycle: A long-term perspective

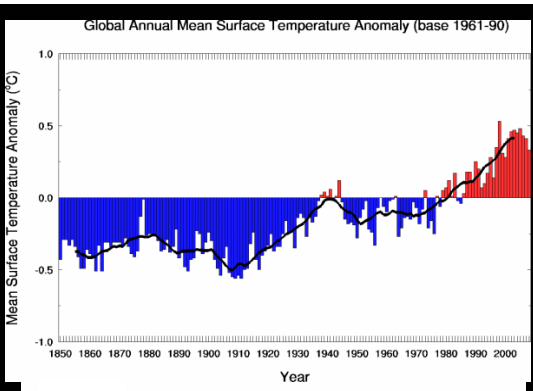


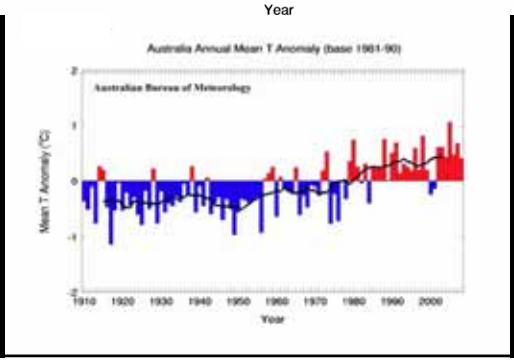
Petit et al. 1999; Keeling and Whorf 2000

Human modification of the energy balance at the Earth's surface

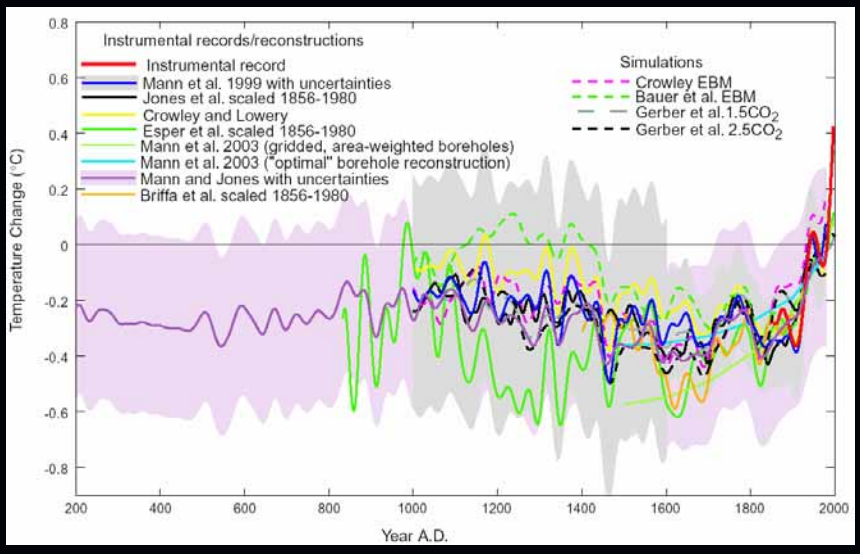


Source: IPCC AR4





Northern hemisphere surface temperature

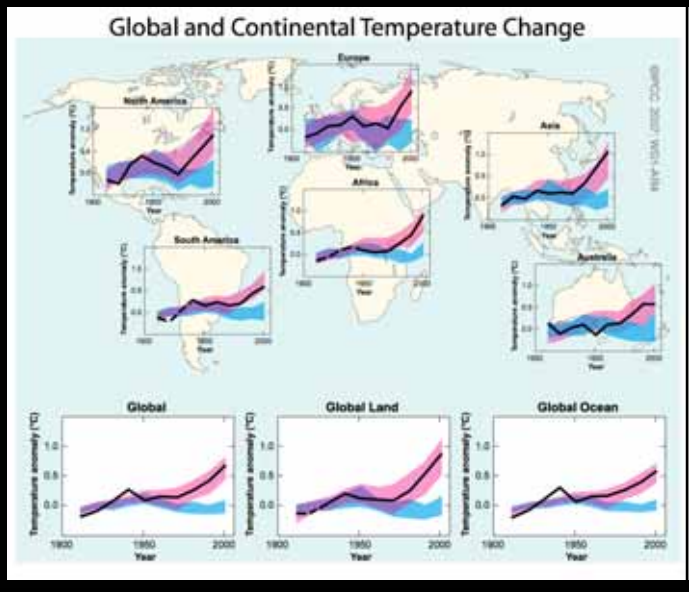


Source: Mann et al. 2003 (EOS)

Understanding and attributing climate change

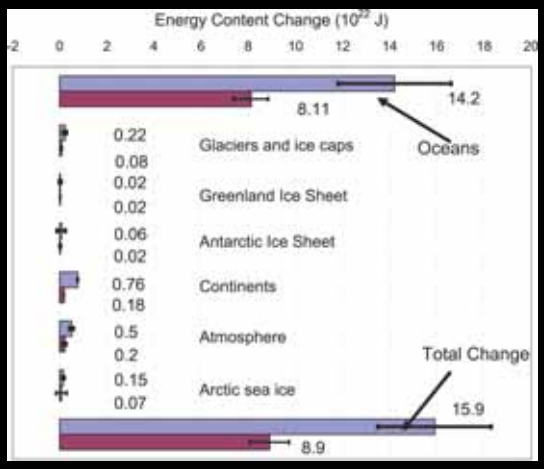
Continental warming

likely shows a significant anthropogenic contribution over the past 50 years



IPCC AR4 2007

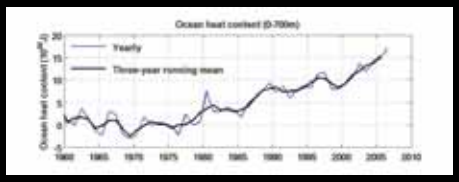
Sinks for the excess energy at the Earth's surface



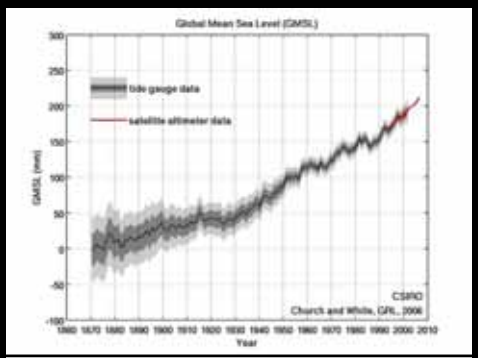
Blue bars: **1961-2003 period**
Purple bars: **1993-2003 period**

Source: IPCC AR4

Change in Ocean Heat Content
(relative to 1961)



Sea-level rise from 1970, relative to 1990



Climate Change Science: IPCC AR4

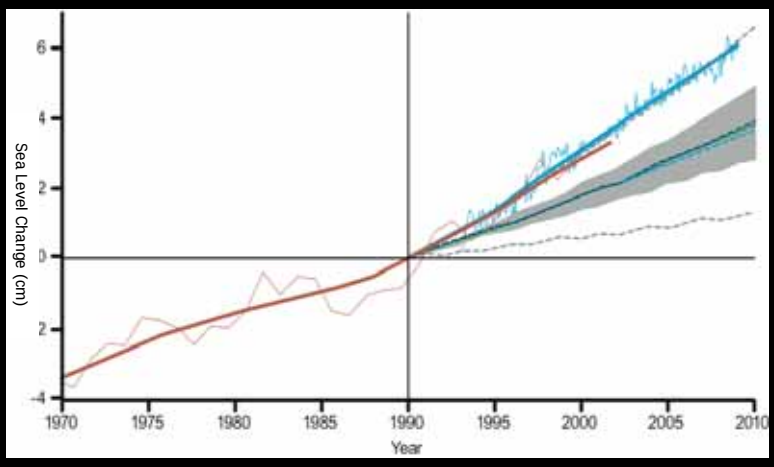
...very high confidence that the globally averaged net effect of human activities since 1750 has been one of warming...

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

Numerous changes in climate have been observed at the scales of continents or ocean basins - wind patterns, precipitation, ocean salinity, sea ice, ice sheets, and aspects of extreme weather.

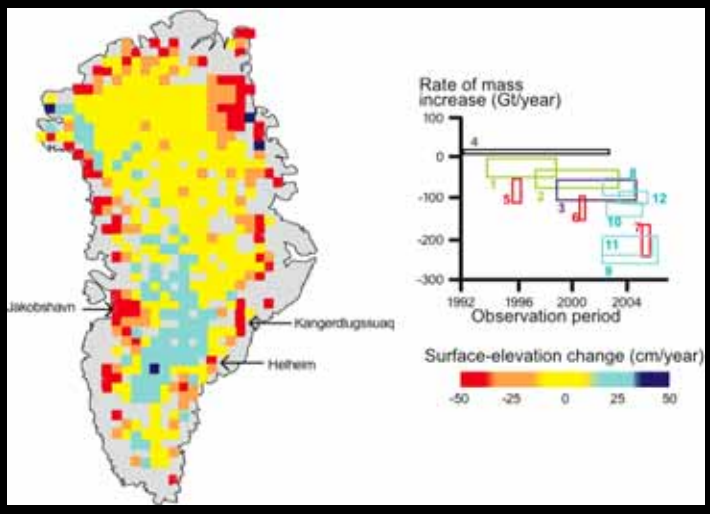
It is *very likely* that anthropogenic greenhouse gas increases caused most of the observed increase in globally averaged temperatures since the mid-20th century.

Observed and projected sea-level rise



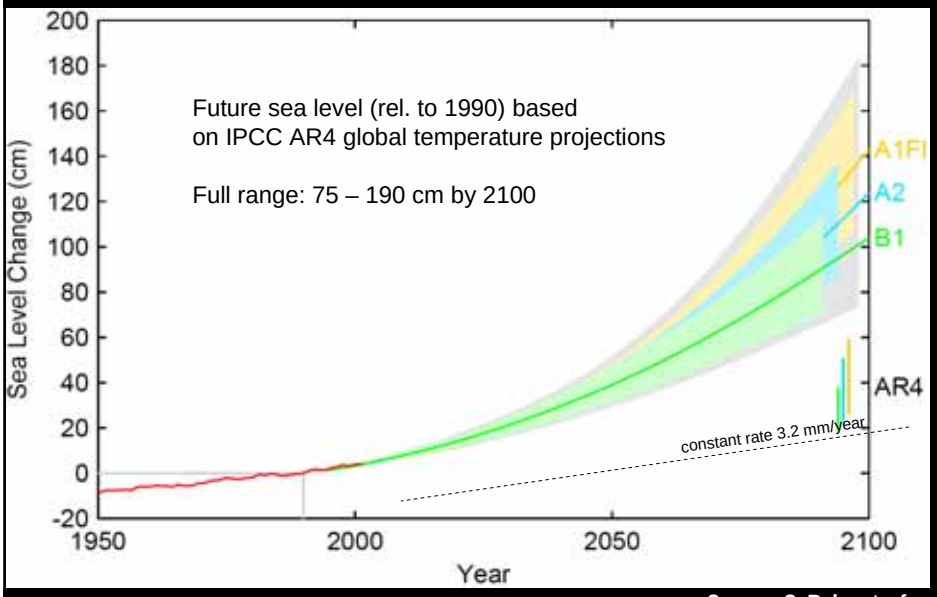
Sources: Rahmstorf et al. 2007; Cazenave and Narem 2004; Cazenave 2006 & 2006-2008 data from A. Cazenave

Change in mass of Greenland ice sheet



K. Steffen, Natl Snow & Ice Center, U. of Colorado, USA

Future projections of sea-level rise



Source: S. Rahmstorf

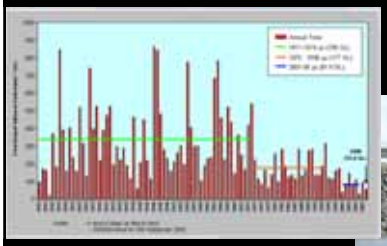
The multiplying effect of sea-level rise on high sea-level events

ACE CRC 2008

High sea-level events: Torres Strait Islands

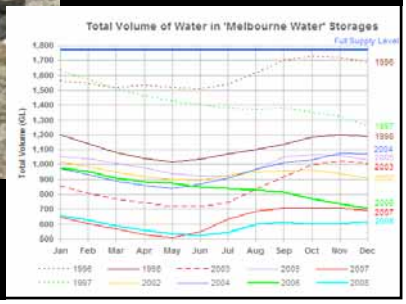
Source: David Hanslow
Torres Strait Regional Authority

Water Availability

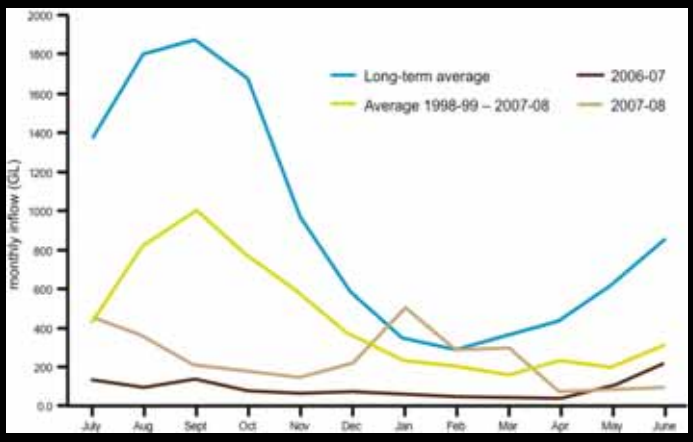


Perth

Melbourne

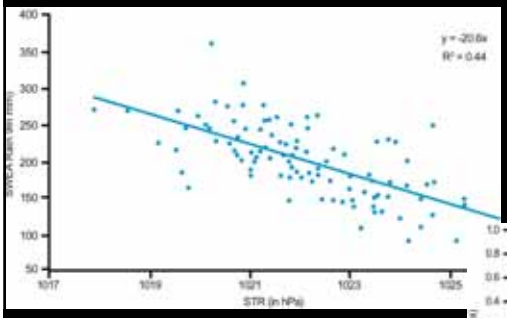


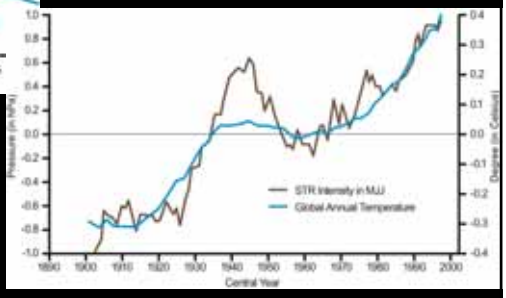
Monthly inflows into the Murray-Darling system



Murray-Darling Basin Commission

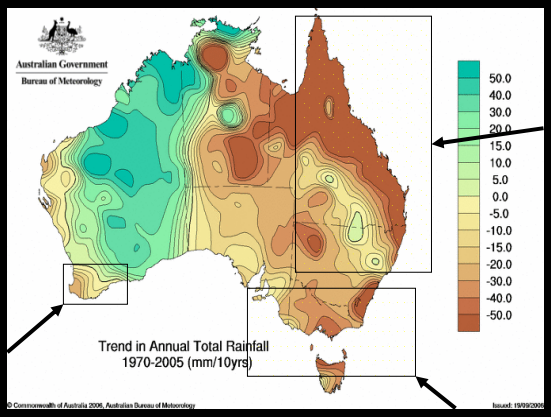
Rainfall in SW eastern Australia, the intensity of the Sub-Tropical Ridge and climate change





Timbal et al. 2009

Climate change and regional drying trends



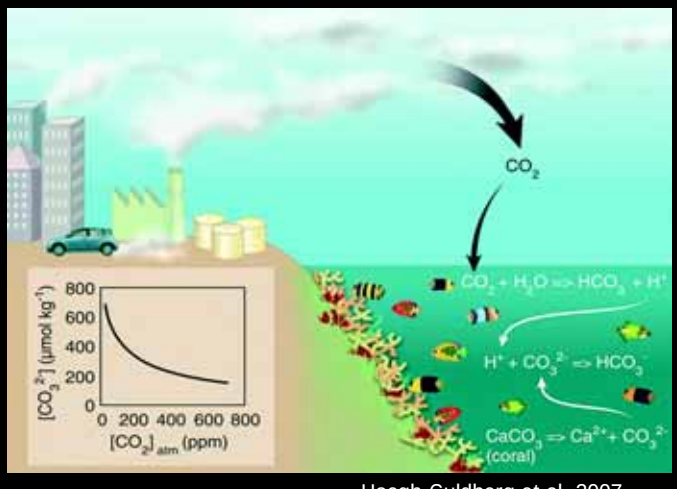
We don't know; no convincing evidence yet for climate change signal

Strong evidence of a climate change signal

Possible climate change signal, but evidence is not yet conclusive

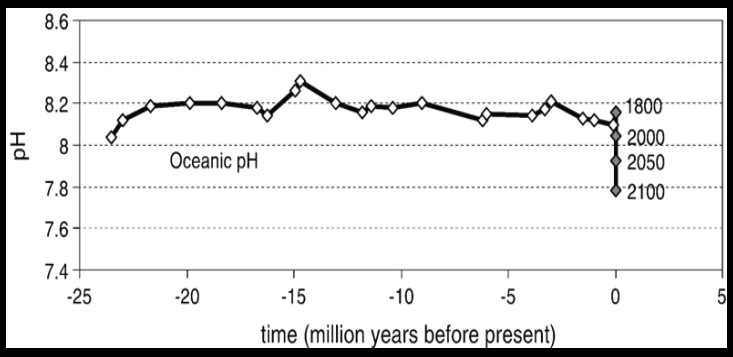
Source: Steffen 2009

Atmospheric CO_2 and ocean acidification



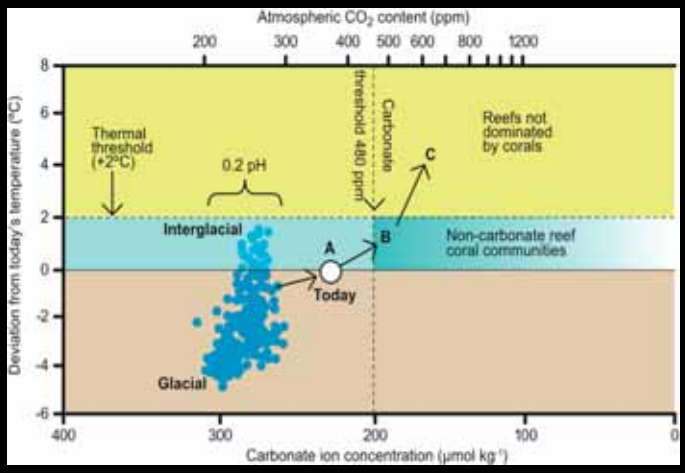
Hoegh-Guldberg et al. 2007

Change in ocean acidity through time



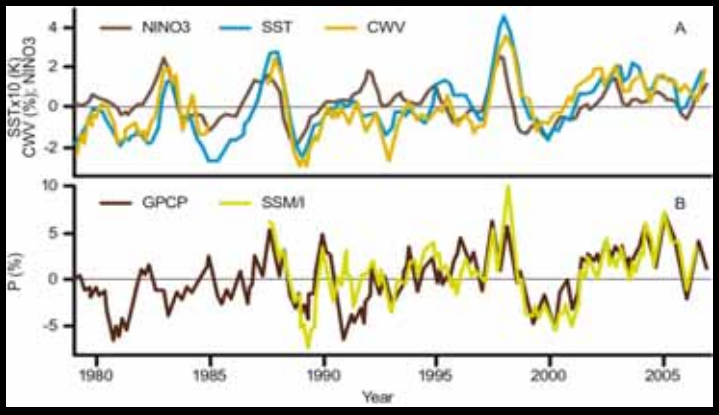
Turley et al. 2006

CO_2, temperature and the future of coral reefs

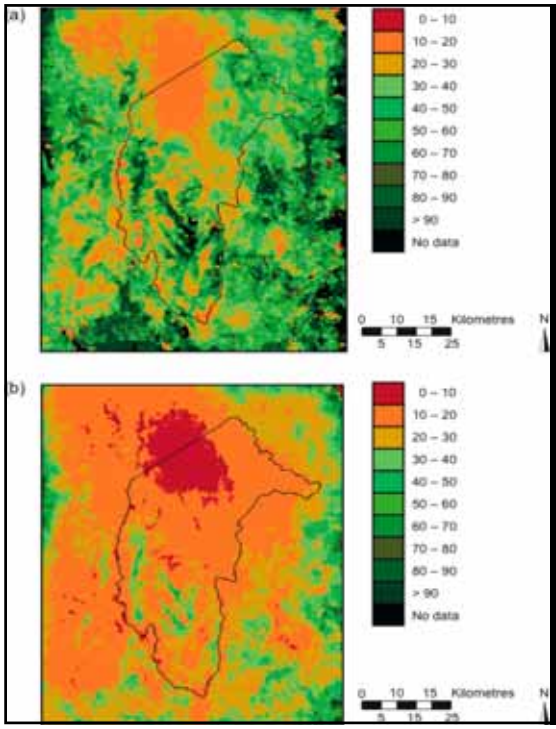


Hoegh-Guldberg et al. 2007

Sea surface temperature (SST) and rainfall extremes



Allan and Soden 2008



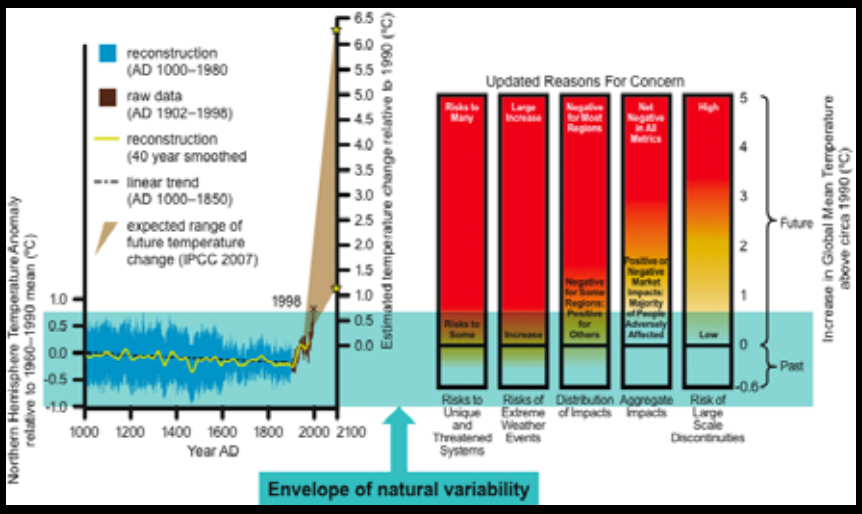
Projected change in ACT bushfire regime
(inter-fire interval, years)

(a) Current climate

(b) Mid-range IPCC climate scenario for 2100

Cary 2002

The Climate Change Challenge



Steffen 2009