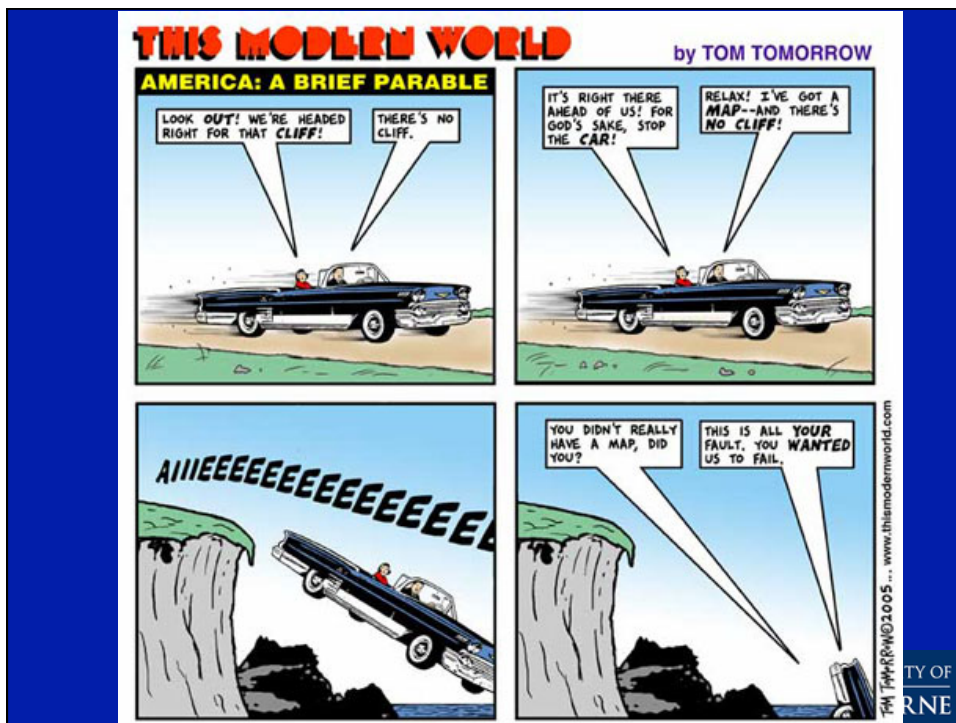
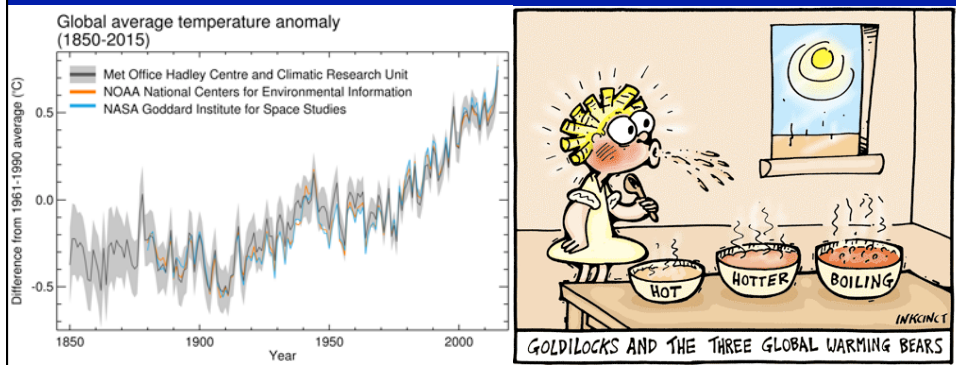


Climate change: where are we now and where are we heading?

Professor David Karoly
 School of Earth Sciences, University of Melbourne

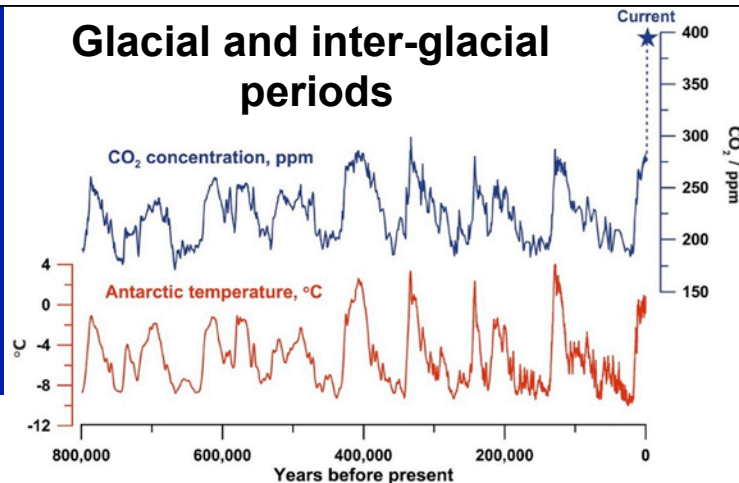


Some views from leaders

- Ban Ki Moon “Climate change is the greatest threat facing humanity. It threatens to undo 50 years of our development work and it will impact the poor in the greatest sense.”
- Barack Obama “We will respond to the threat of climate change, knowing that the failure to do so would betray our children and future generations.”
- Tony Abbott “Coal is good for humanity”
- Pauline Hanson “We are being hoodwinked, climate change is not due to humans”



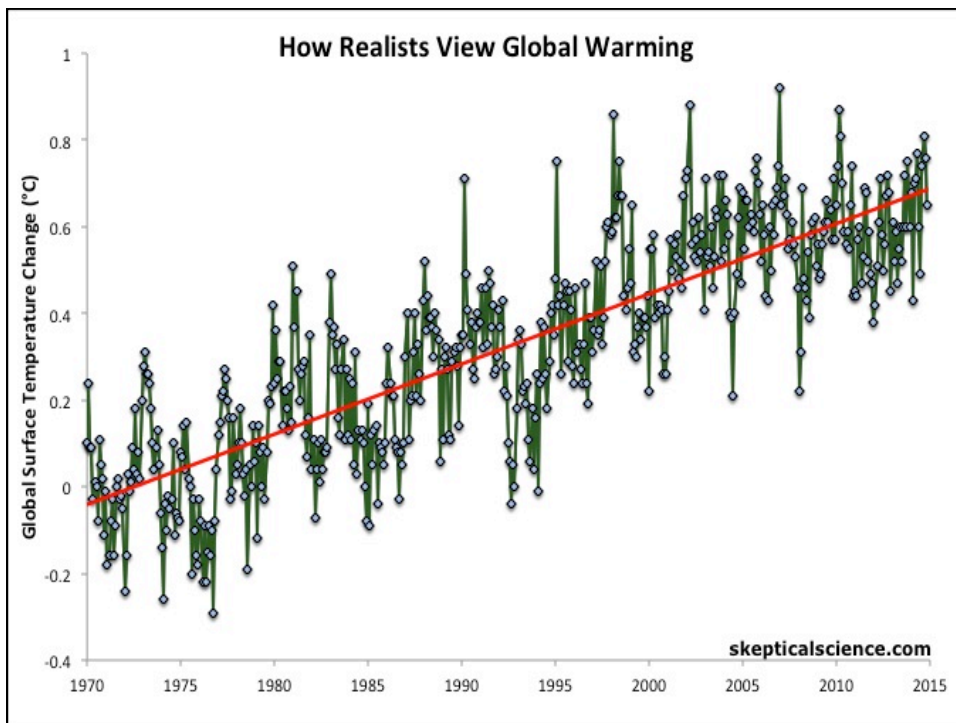
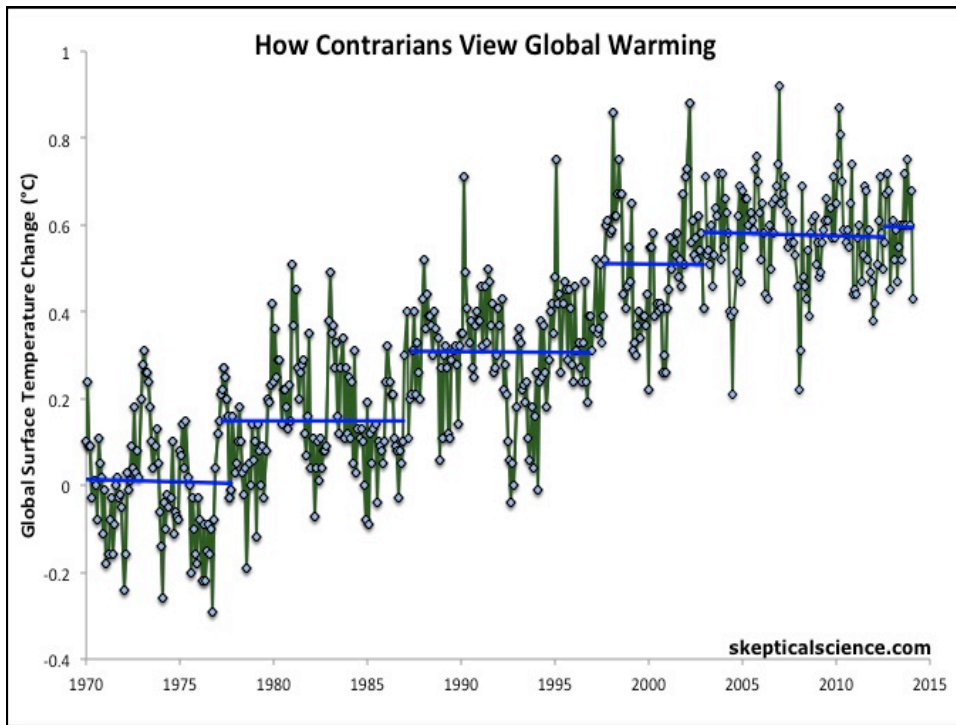
Glacial and inter-glacial periods

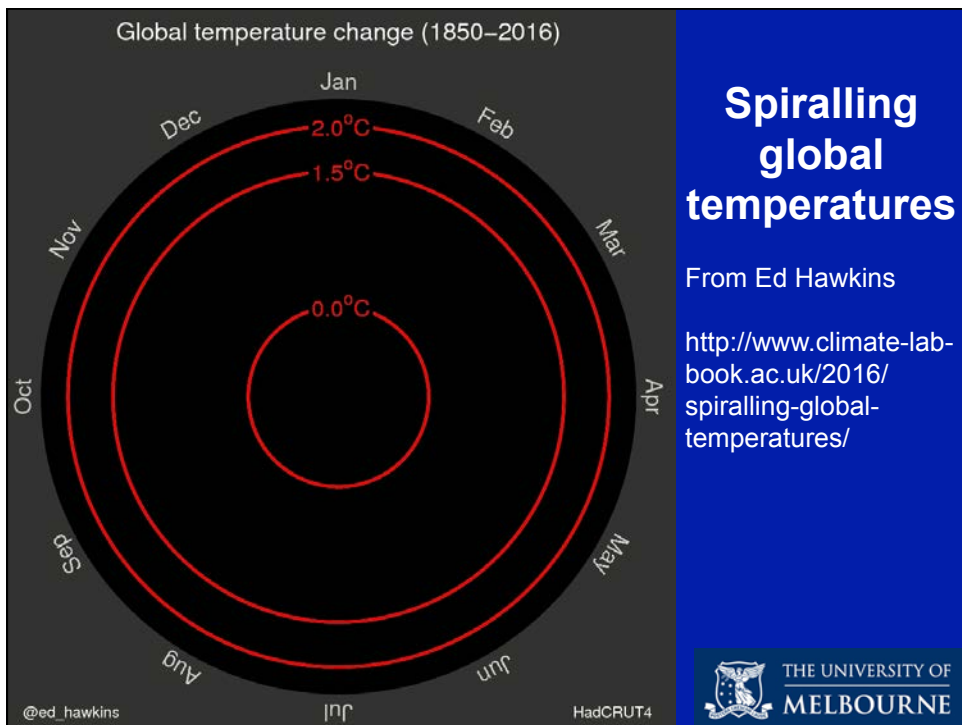
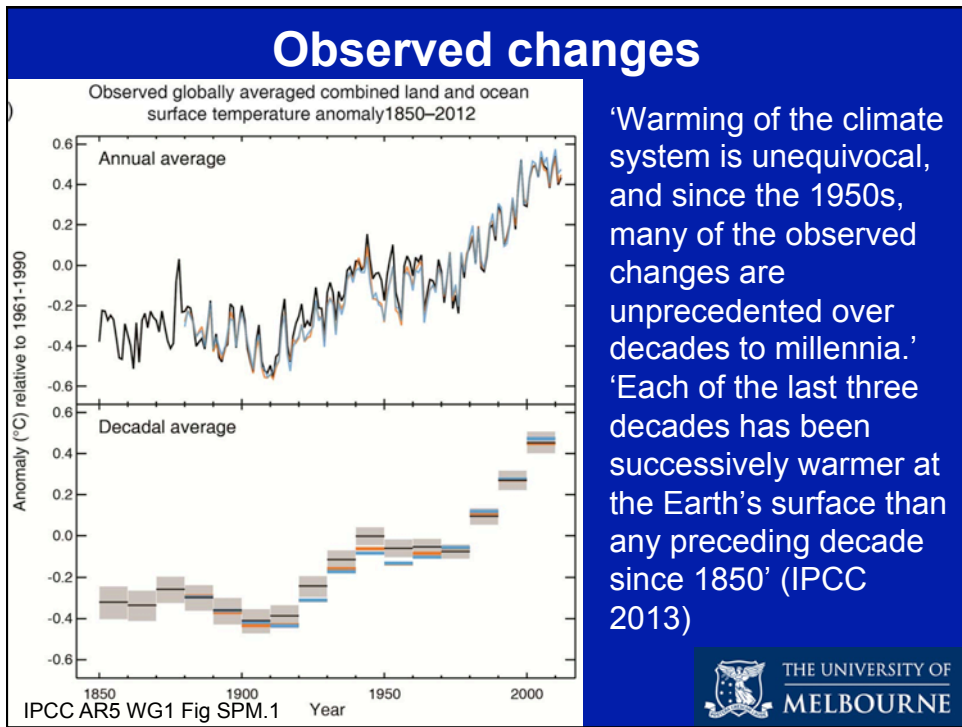


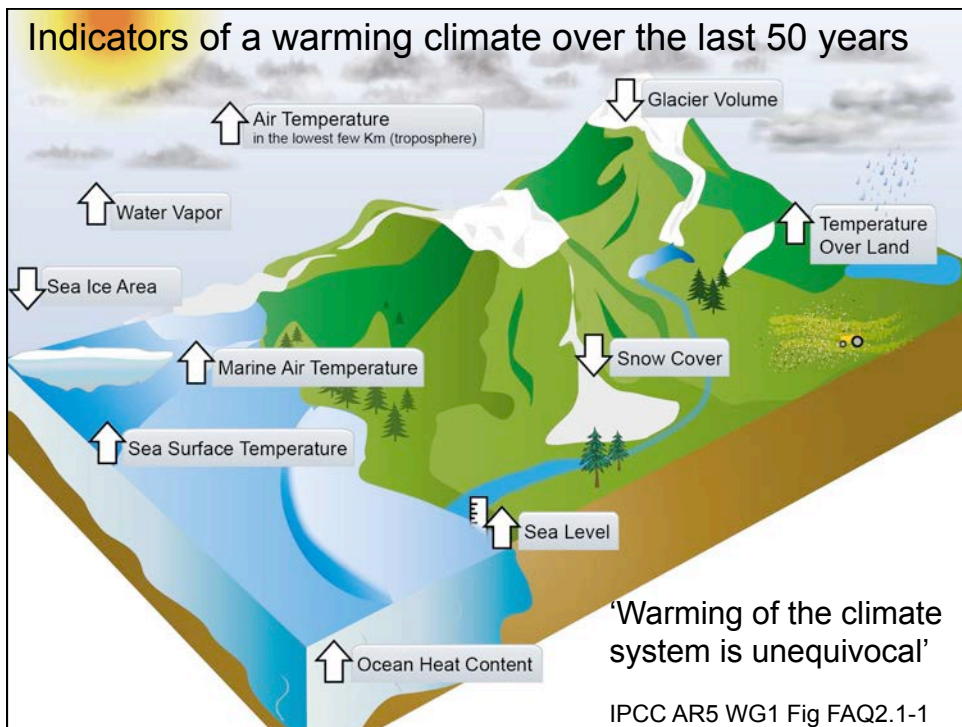
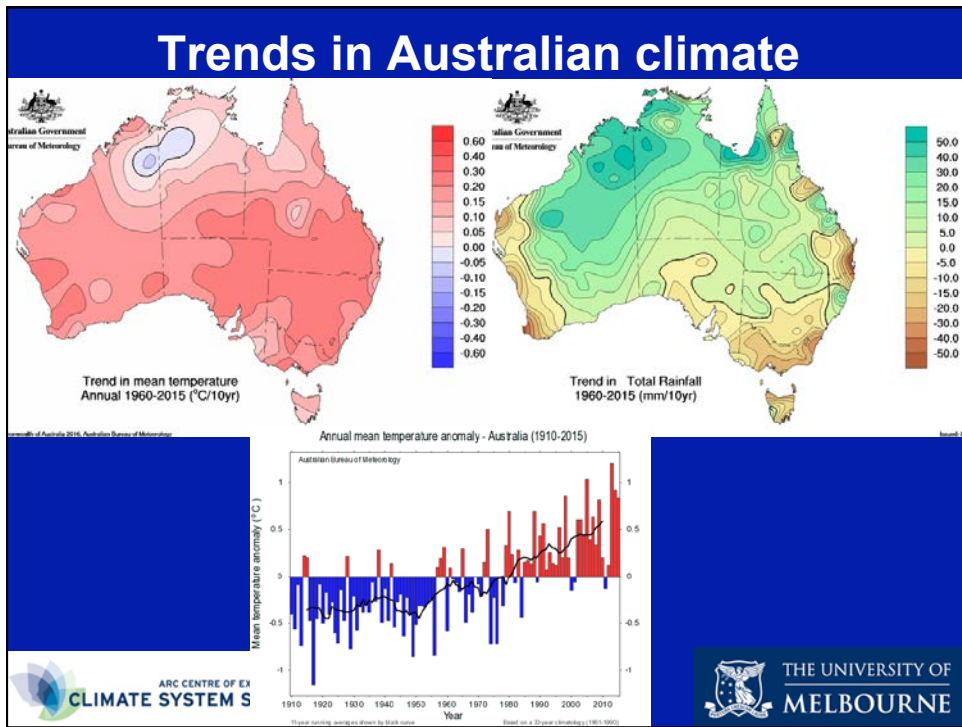
Roy Soc 'Clim change evidence & causes' Fig 3

On longer timescales, there have been pronounced periods of much colder temperature at regular intervals over the last million years. These ice ages are relatively stable climate states with similar total solar irradiance at the top of the atmosphere, but a much higher albedo. Global temperature decreases during past ice ages are ~5°C.



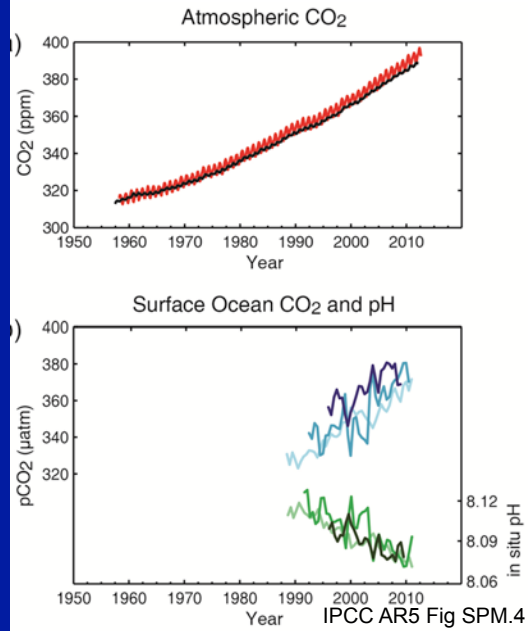






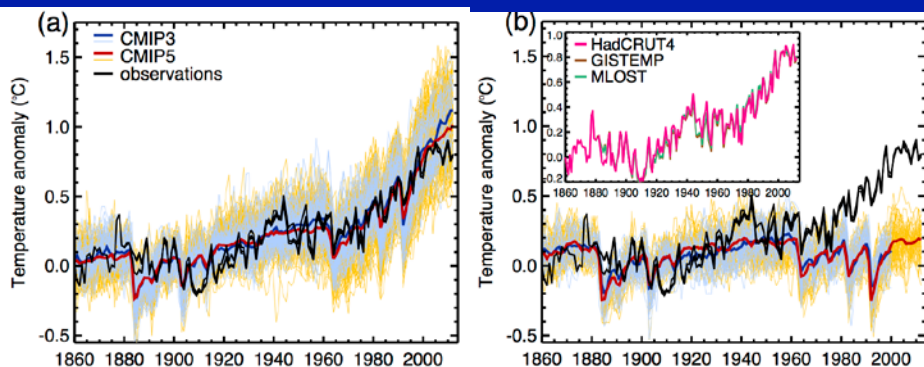
Observed changes

'The atmospheric concentrations of carbon dioxide (CO₂), methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. CO₂ concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification' (IPCC 2013)

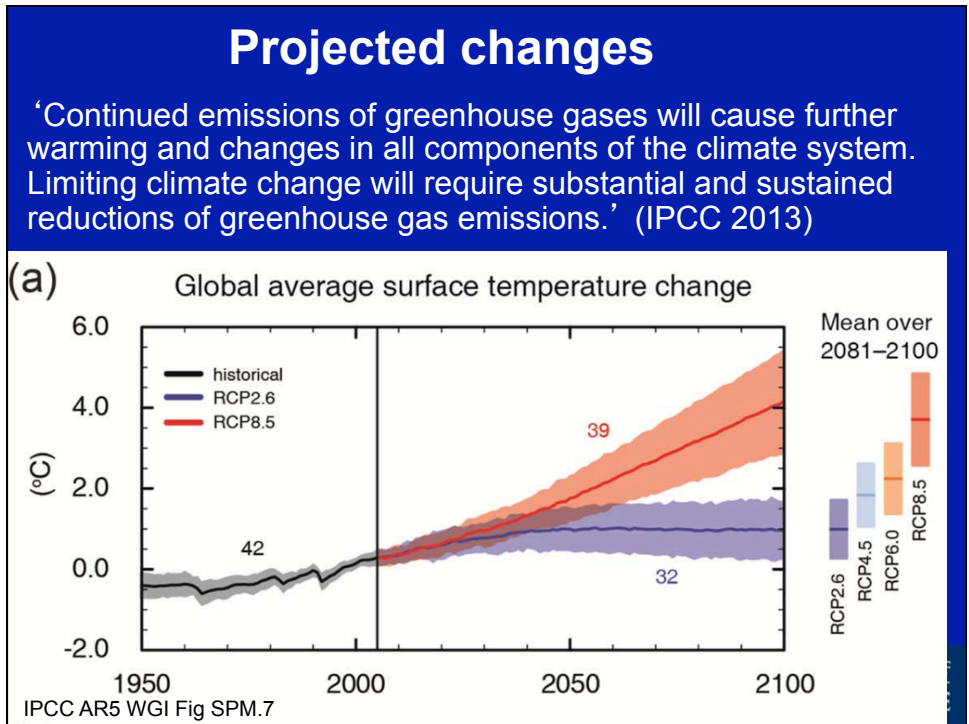
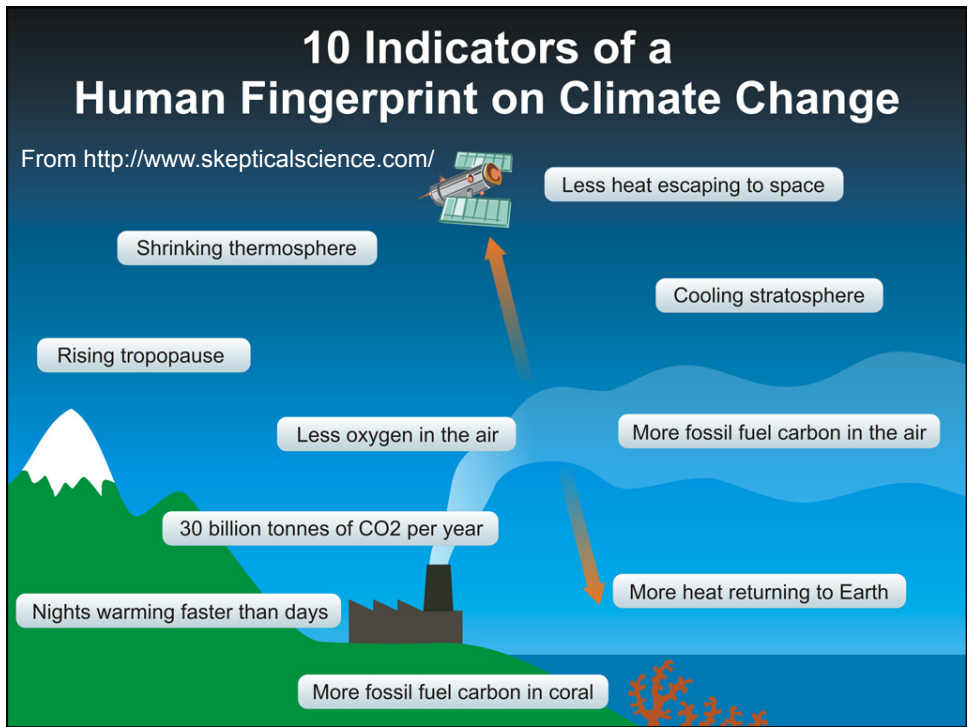


Causes of change

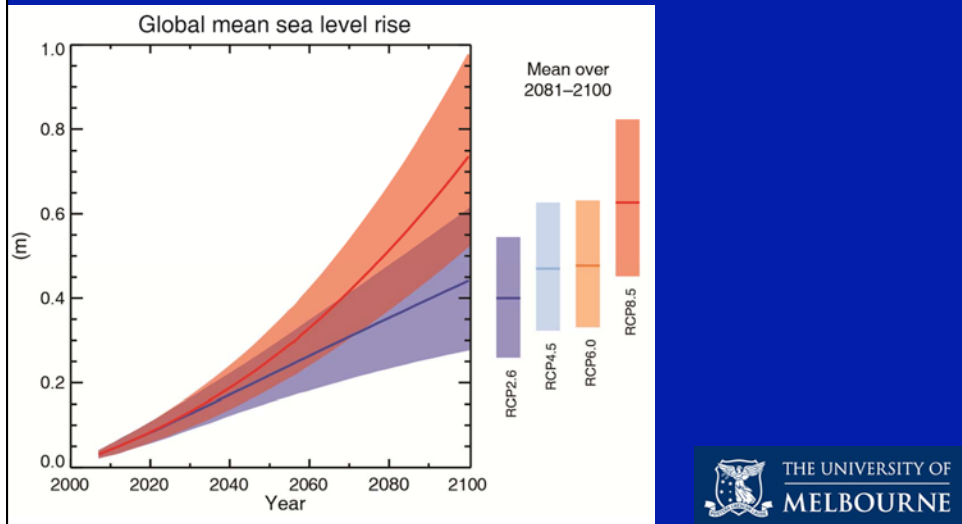
'It is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century.' (IPCC 2013)



IPCC AR5 WGI Fig 10.1



‘Global mean sea level will continue to rise during the 21st century. Under all RCP scenarios the rate of sea level rise will *very likely* exceed that observed during 1971–2010 due to increased ocean warming and increased loss of mass from glaciers and ice sheets.’



CLIMATE CHANGE RISKS TO VICTORIA

Irrigated agriculture across the Murray Darling Basin could decline by up to **70% by 2050.**

Rainfall has decreased and is expected to **decrease further across Victoria**

Declines in **snow cover** are expected to continue

The Gippsland Lakes is one of Australia's most vulnerable regions **to sea-level rise**

Average number of **hot days over 35°C in Melbourne could double by 2070**

Dangerous **bushfire weather** has increased and is expected to increase further

Stream flow into Melbourne's catchments expected to **decline 10% by 2030**

27,600-44,500 residential buildings at risk from 1.1m sea-level rise

Please refer to The Original Decade 2011 Climate Change Science, Risk and Response for references.

Find out more: www.climatecommission.gov.au

CLIMATE COMMISSION

UN Framework Convention on Climate Change (UNFCCC)

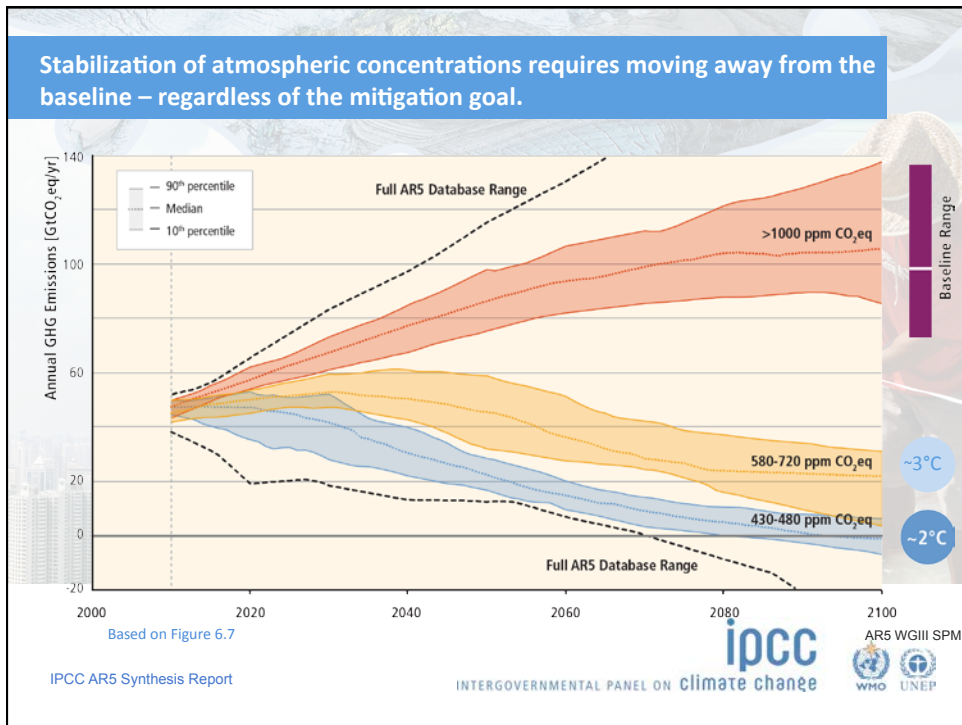
- Established at the United Nations conference on Environment and Development in Rio de Janeiro in 1992
- Objective is “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”
- “Parties should protect the climate system... on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change” (UNFCCC, Art.3.1).
- Ratified by 192 countries, and came into force in March 1994







UNFCCC COP21 in Paris

- Countries met to approve a binding agreement on targets for emission reductions, for future review and verification, and support for developing countries
- Different from Kyoto, countries provided their own targets in advance, Intended Nationally Determined Contributions (INDCs)
- Major outcomes:
 - Agreement reached, goal to limit warming to below 2°C aspirational target to limit warming to less than 1.5°C
 - Targets not yet strong enough to limit warming below 2°C
 - Increase Green Climate Fund for developing countries





Mitigation Measures

- 
More efficient use of energy
- 
Greater use of low-carbon and no-carbon energy
 - Many of these technologies exist today
- 
Improved carbon sinks
 - Reduced deforestation and improved forest management and planting of new forests
 - Bio-energy with carbon capture and storage
- 
Lifestyle and behavioural changes

AR5 WGIII SPM

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INTERGOVERNMENTAL PANEL ON climate change

WHO UNEP

IPCC AR5 Synthesis Report

Ambitious Mitigation Is Affordable

- Economic growth reduced by ~ 0.06% per year (BAU growth 1.6 - 3%)
- This translates into delayed and not forgone growth
- Estimated cost does not account for the benefits of reduced climate change
- Unmitigated climate change would create increasing risks to economic growth

AR5 WGI SPM, AR5 WGII SPM

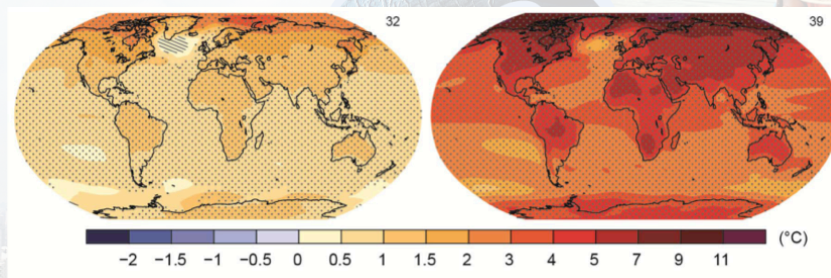
IPCC AR5 Synthesis Report



The Choices We Make Will Create Different Outcomes

With substantial mitigation

Without additional mitigation



Change in average surface temperature (1986–2005 to 2081–2100)

AR5 WGI SPM

IPCC AR5 Synthesis Report



Key Messages

- Human influence on the climate system is clear
- The more we disrupt our climate, the more we risk severe, pervasive and irreversible impacts
- We have the means to limit climate change and build a more prosperous, sustainable future

AR5 WGI SPM, AR5 WGII SPM, AR5 WGIII SPM

IPCC AR5 Synthesis Report

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INTERGOVERNMENTAL PANEL ON climate change



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- CSIRO & Bureau of Met State of the Climate 2014
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