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## Climate change: farming in an even more sunburnt country

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CSIRO Sustainable Ecosystems

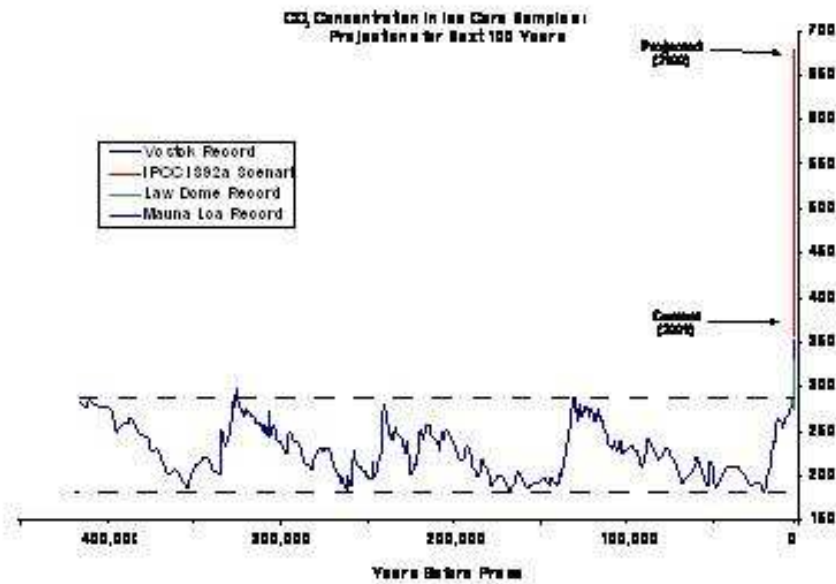


## RGA-CSIRO Climate Change Project

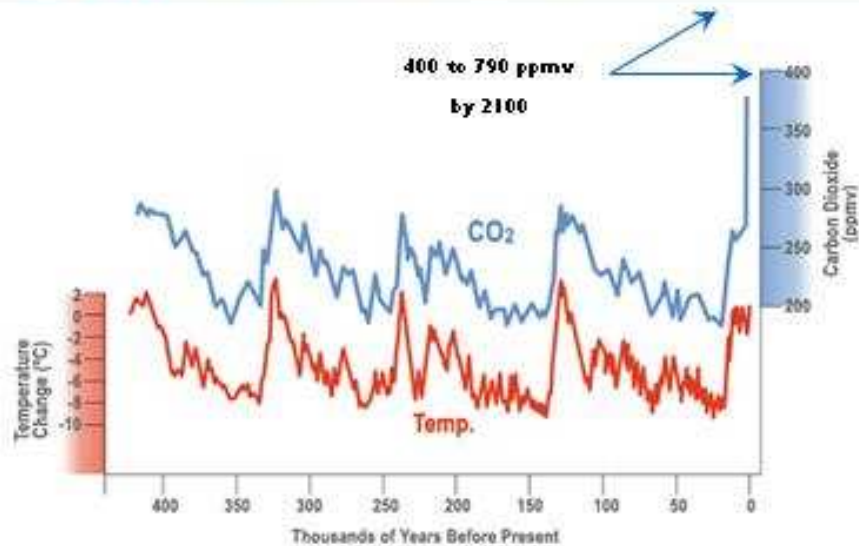
- Funded by DAFF under their National Agriculture and Climate Change Action Plan (2006-2009)
- Co-funded by RGA and CSIRO Sustainable Ecosystems
- AIMS.....
  - Evaluate the impact of projected climate change scenarios on current Riverina farming systems (production, risk etc)
  - Evaluate the impact on biodiversity in irrigation areas
  - Together with growers, subsequently consider a range of possible farming system adaptation options and evaluate their long-term viability using simulation modelling as a tool. ie production risk, gross margins under a range of projected climates.
  - Evaluate the biodiversity implications of these potential changes



## CO<sub>2</sub> levels - unprecedented in entire history of our species



## Carbon dioxide and temperature are linked



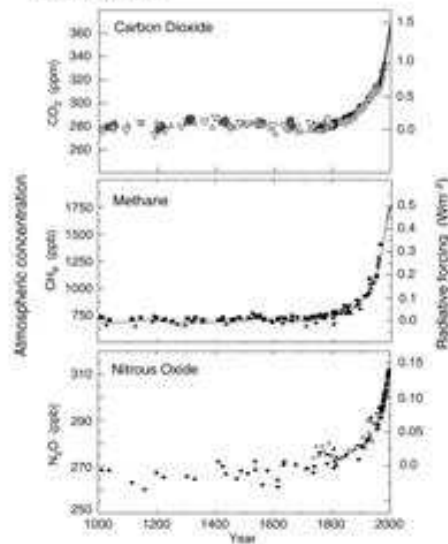
Source: IPCC 3AR



# Human Impacts

## Indicators of the human influence on the atmosphere during the industrial era

(a) Global atmospheric concentrations of three well mixed greenhouse gases

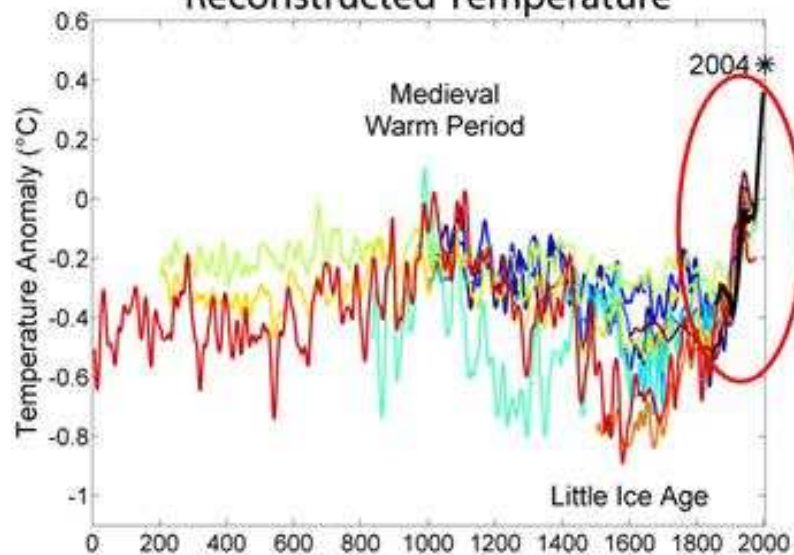


- CO<sub>2</sub> up 35%
- CH<sub>4</sub> up 151%
- N<sub>2</sub>O up 17%
- O<sub>3</sub> up 36%



# Over history of our species....

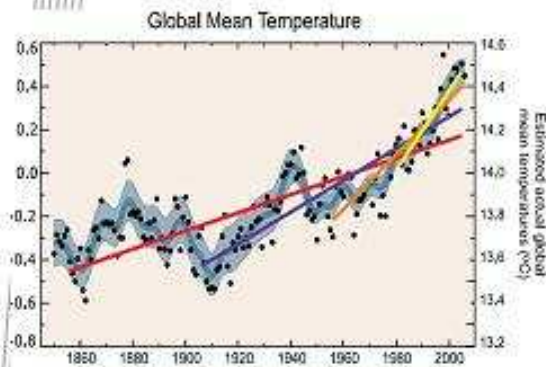
## Reconstructed Temperature



Mann *et al.* 2005

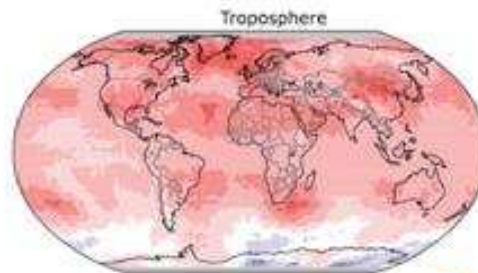
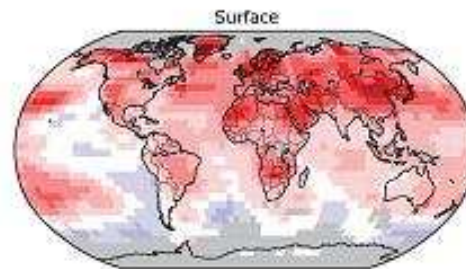


## Instrumental observations of Global Warming



Warmest 12 years:  
1998, 2005, 2003, 2002, 2004, 2006,  
2001, 1997, 1995, 1999, 1990, 2000

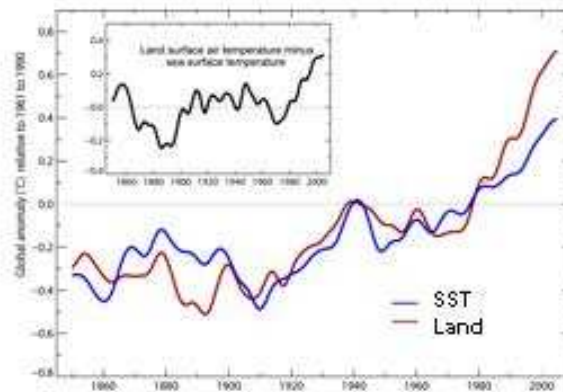
Warming not only at the surface but  
in the lower atmosphere as well



Source: IPCC 4AR



## Land and sea warming

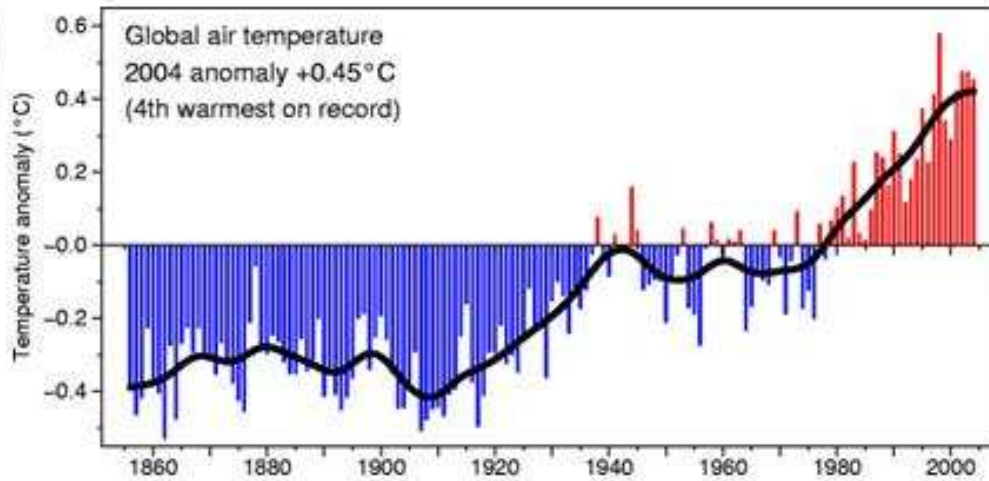


- Warming has also been observed in the deep ocean, often referred to as the thermohaline circulation, global conveyor belt. The Warm Deep Water (WDW) was found to warm at a rate of  $\sim 0.010^{\circ}\text{C}$  per year for the period 1912 to 1999.

Source: IPCC 4AR



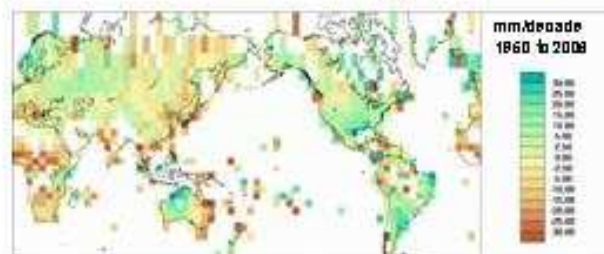
## Global temperature 1856-2004



## Changes in global and regional rainfall



- Rainfall trends are regionalised.
- Since 1950 large scale regional declines have occurred.



- Declines seem aligned with more rapid warming although could be part of longer term variability.



## Decrease in Sea Ice



## Sea level has risen

