

# Mt Eliza welcomes delegates and presenters to the 2008 UNICON conference



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EXECUTIVE EDUCATION

## SUSTAINABILITY

or

## SURVIVAL

## in a Changing World

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# William Kininmonth



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# CLIMATE CHANGE IS NATURAL

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- **SUSTAINABILITY** implies managing a controlled steady-state system
- **SURVIVAL** requires ongoing adaptation to an ever-changing system

*The fear of climate change fails to recognize that climate is forever changing.*



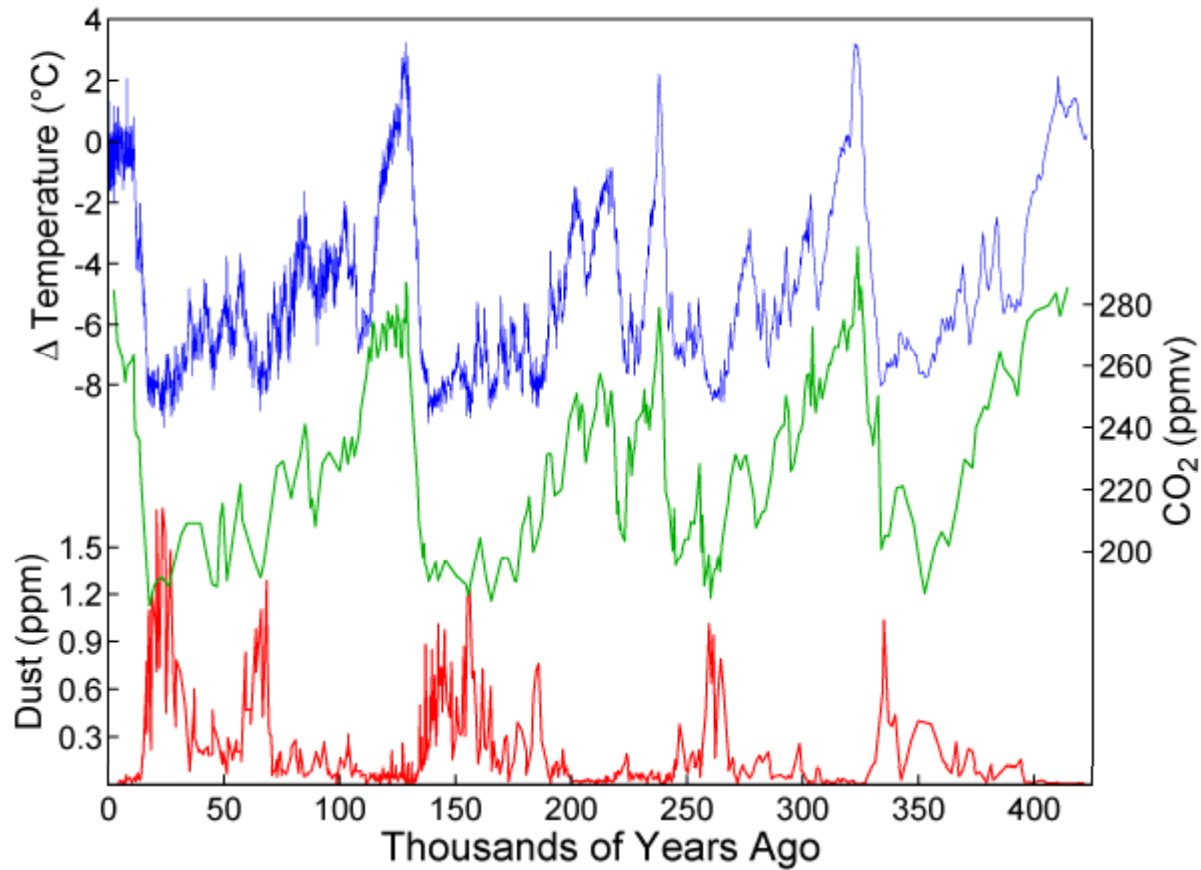
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# Climate History from Ice Cores

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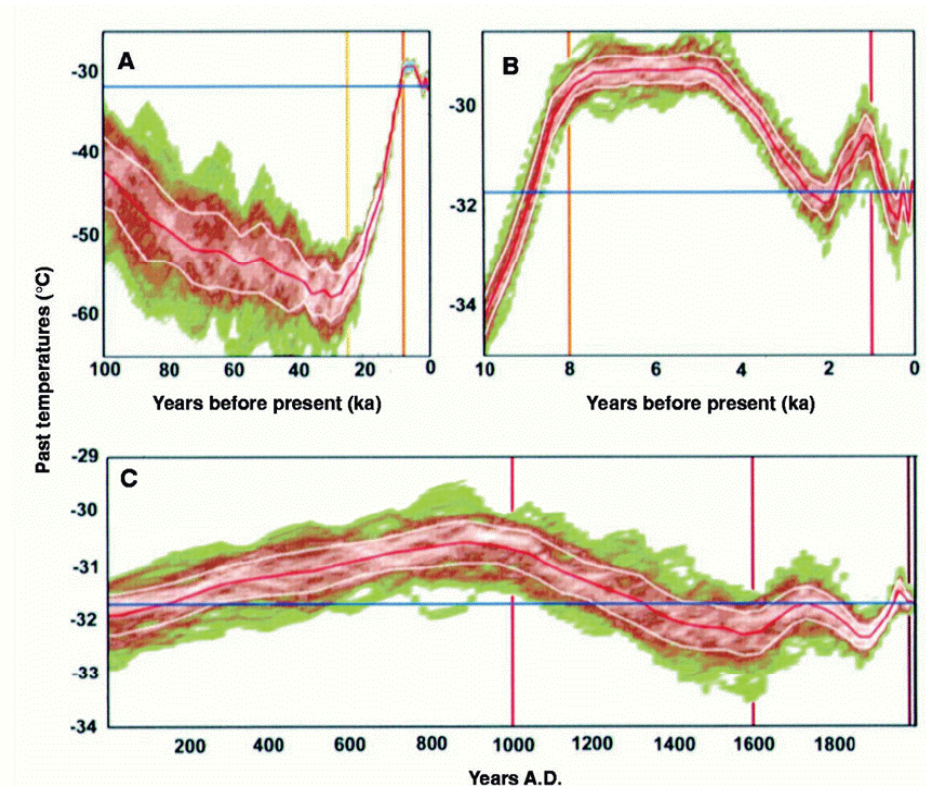
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**Vostok, Antarctica**

# Earth is slowly cooling

Temperature values from the GRIP ice-core borehole in Greenland.

- ❑ The top left graph shows the past 100,000 years.
- ❑ The top right graph shows the past 10,000 years (the interglacial Holocene).
- ❑ The bottom graph shows the past 2,000 years.



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# Drying since the Holocene Optimum

**Hanakaya, Saudi Arabia**

**Rock carvings of grazing animals – 4,000 years old**



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**Evidence for a drying climate from North Africa,  
through the Middle East, and to Mongolia**

# Alpine Glaciers Advance and Retreat

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As climate cooled from the Medieval Warm Period to the Little Ice Age glaciers advanced worldwide. Warming again set in during the early 18<sup>th</sup> century and the glaciers have retreated.

Today there is no sign of the glacier that had extended to the French village of Chamonix.



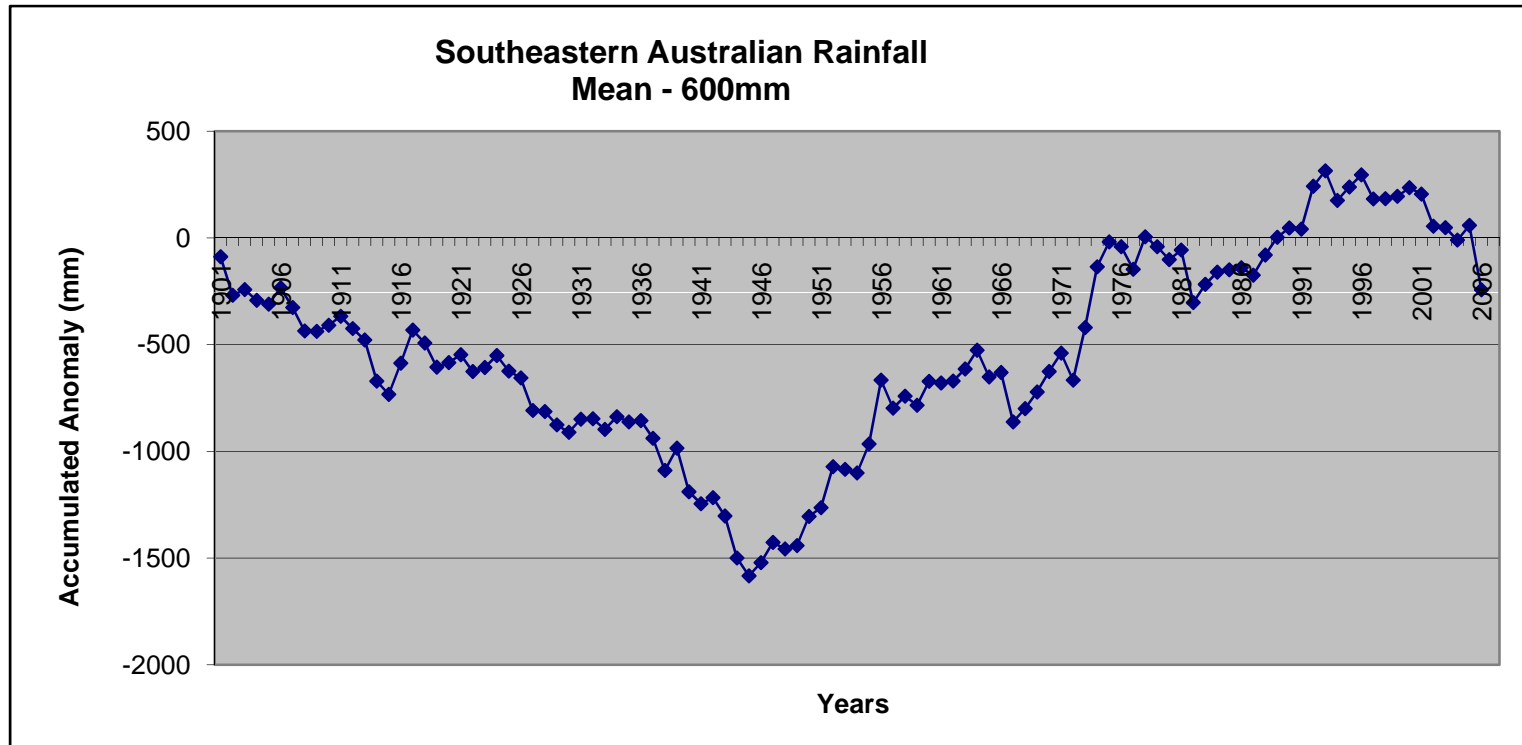
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# Cyclic Rainfall Patterns

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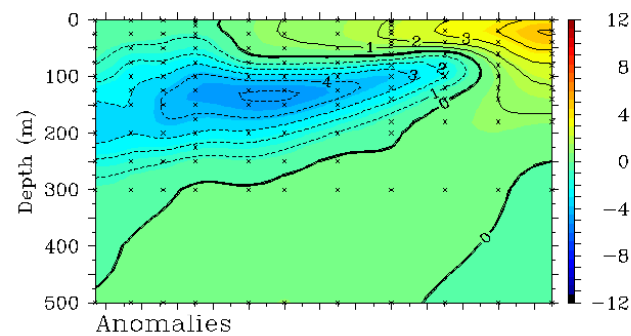
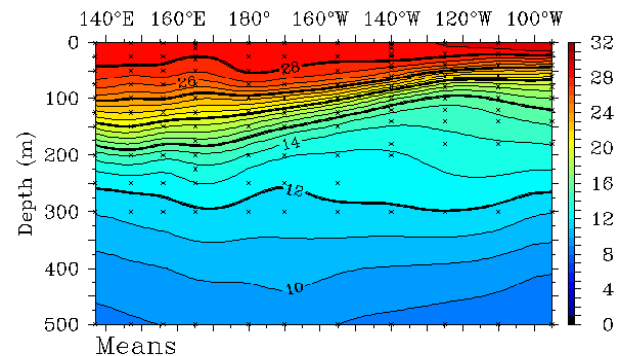
Rainfall over Southeastern Australia was greater in the second half of the 20<sup>th</sup> century than the first half.



## Internal Climate Variability

### El Nino – March '98

Monthly Mean TAO/TRITON Temperatures (°C)  
March 1998 2°S to 2°N Average



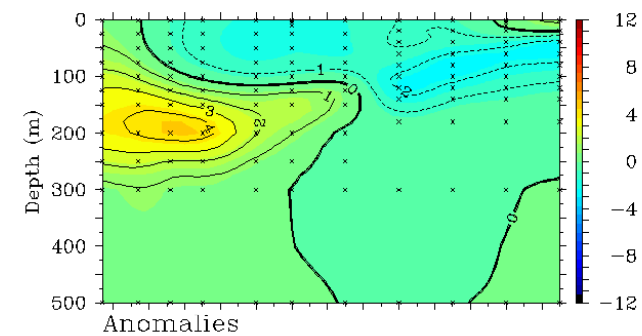
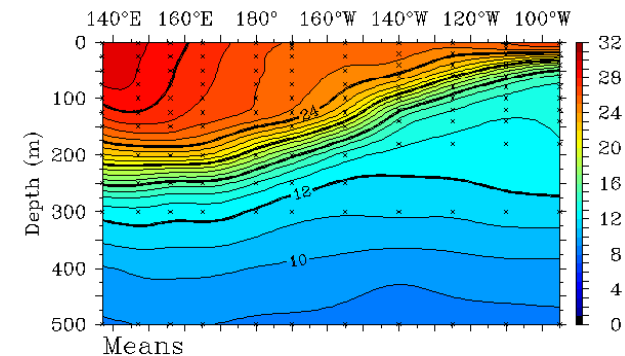
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### La Nina – March '08

Monthly Mean TAO/TRITON Temperatures (°C)  
March 2008 2°S to 2°N Average

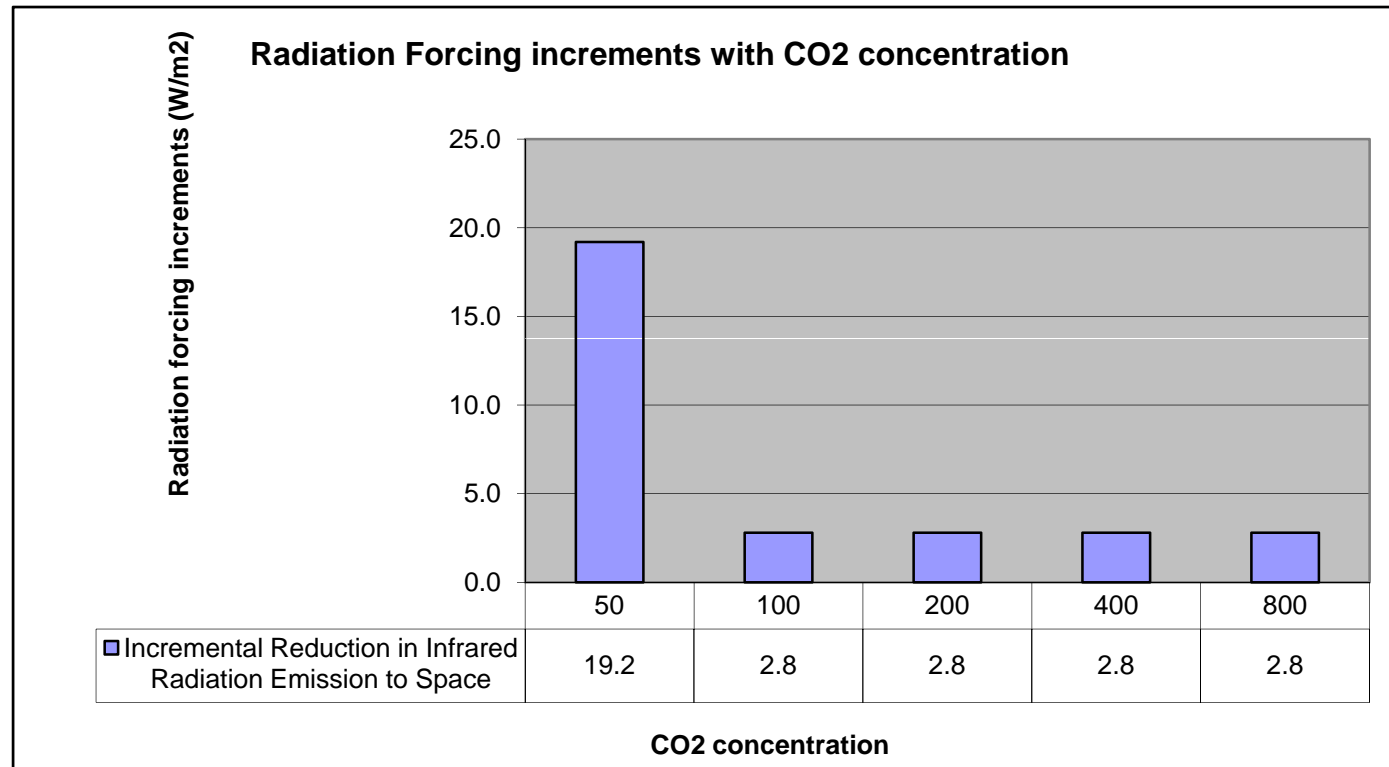


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# CO<sub>2</sub> Forcing Needs VIAGRA!



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**CO<sub>2</sub> is a potent greenhouse gas but its Radiation Forcing potential is now nearly expended.**

# Evaporation constrains Surface Temperature

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- More than 70 percent of Earth's surface is ocean or well-watered land
- As surface temperature rises by 1°C:
  - IR emission increases 5.4 W/m<sup>2</sup>
  - Latent heat loss increases 6.0 W/m<sup>2</sup>
- The radiation forcing from a doubling of CO<sub>2</sub> concentration (3.7 W/m<sup>2</sup>) can only sustain a surface temperature rise of 0.3°C



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# Computers Cannot Predict Climate

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- The climate system is complex and subject to many interacting processes.
- It is only in the last 5 years that routine measurements of the subsurface ocean circulations have been available.
- Models cannot represent deep convection.
- Models grossly underestimate evaporation increase with temperature.



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- Climate is:
  - Naturally variable
  - Regulated by a variety of influences
  - Not predictable
- Variations of climate have profound impact



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- Geosequestration (burying) CO<sub>2</sub>
  - Burn fossil fuels (non-renewable) faster!
- Redirect agricultural focus
  - Bio-fuels replace food crops to the detriment of the world's poor?
- Environment policies focus on reducing CO<sub>2</sub> emission rather than clean air, clean water, ecosystem preservation, etc



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- Humankind faces real problems but human-caused global warming is not one!
  - Climate will change faster than we are prepared for
  - Water, renewable energy and food production are each regulated by changing climate
- **SURVIVAL** requires different policies to those for **SUSTAINABILITY**



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