

# Climate Change WCRP Meeting the Needs of the UNFCCC

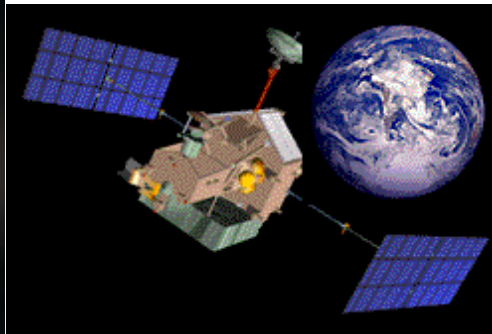
John Church,  
Chair, Joint Scientific Committee  
World Climate Research Programme

# WCRP

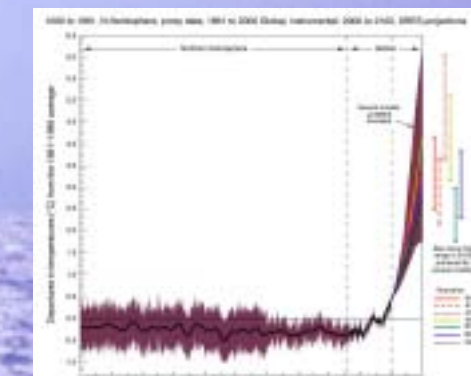
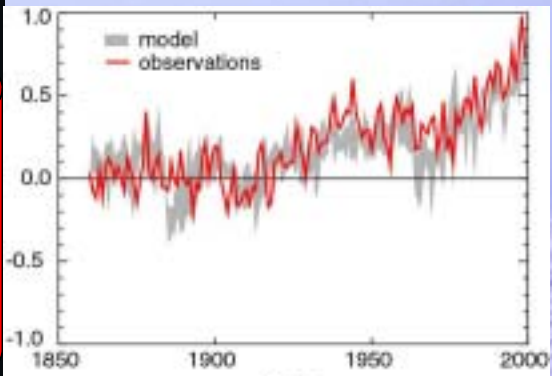


ICSU

# WCRP : 25 years of progress in understanding climate and its impacts



**1980 - 2005**  
**WCRP**  
World Climate Research Programme



# WCRP Science Underpins IPCC WG I

- WCRP Objectives to determine the:
  - extent to which climate can be predicted
  - extent of human influence on climate
- Observations, understanding, prediction and application of the (physical) climate system
- Coordinate much of the science reviewed by IPCC WG1
- Underpin assessment of "What is "dangerous?"
- Underpin impact/adaptation studies and Sustainable Development (CSD-14, UN)
- Collaborate with other GEC Programs to address other climate change issues and capacity building (START)

# Policy needs from research

- ▶ Detect/attribute changes and underpin impact and adaptation studies
- ▶ How much warmer will it get?
- ▶ How fast will sea level rise?
- ▶ When will the Arctic Ocean be ice-free?
- ▶ Will droughts and floods intensify?
- ▶ Are climate extremes increasing?
- ▶ Will there be abrupt changes?
- ▶ How will natural variability evolve under global change?

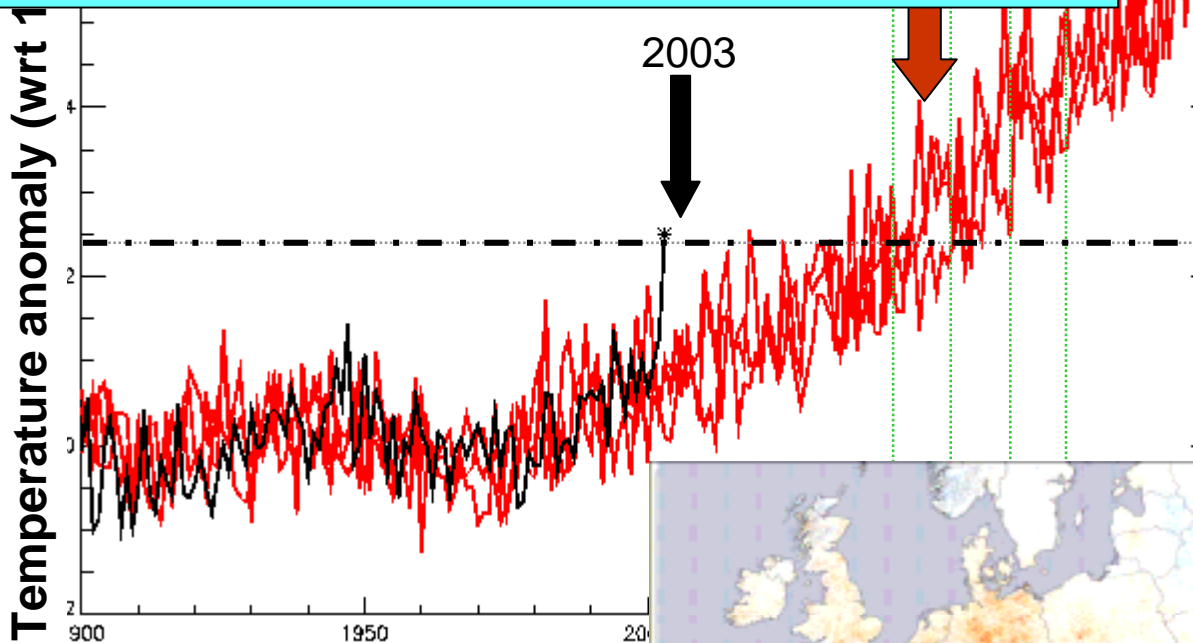
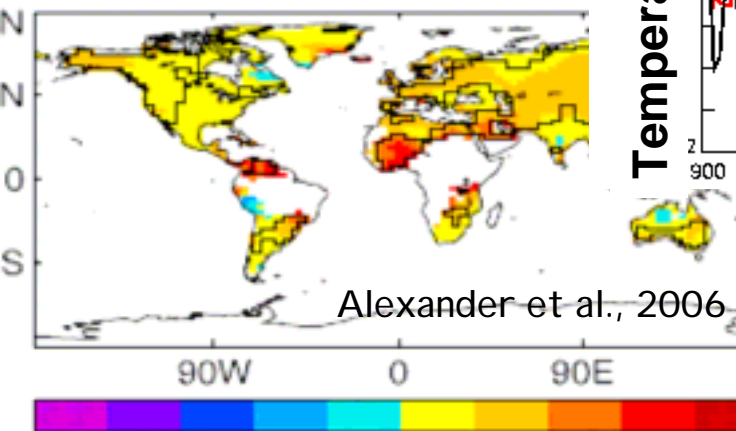


# Warming Impacts on Human Health

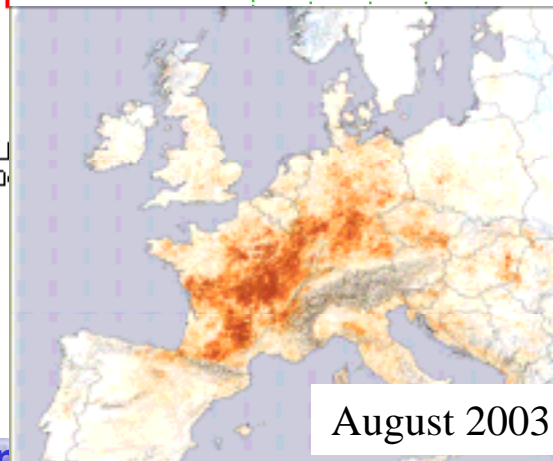
(one example)

- European Aug 03 heat wave killed 30,000
- and cost more than US\$ 1.3 billion

WCRP co-ordinated simulations for IPCC AR4 and made available in a central system to enable regional evaluations



Established an ACC Working Group



# Increasing concern about ice-sheet stability and a substantially larger rise in sea level

Years  
0 — 600 — 1200 — 1800 — 2400 — 3000 → Surface

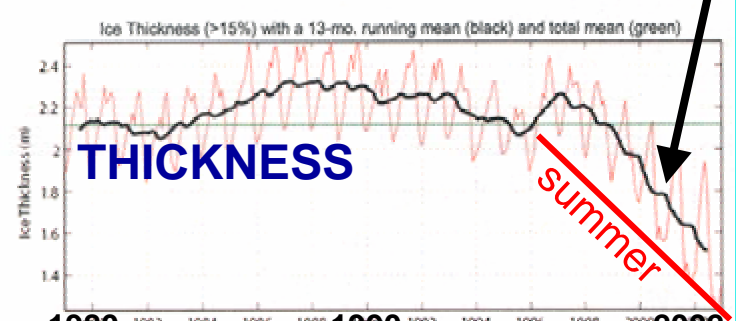
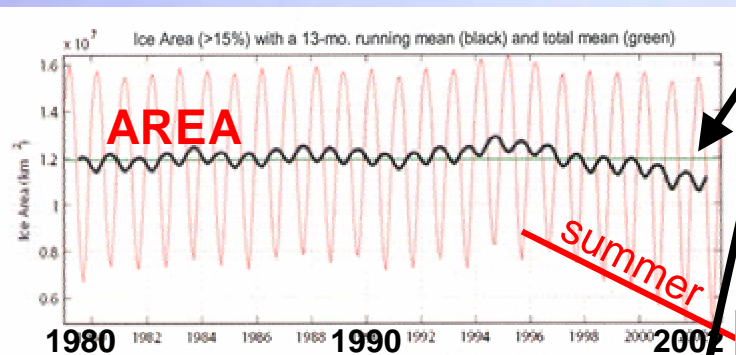
- ½ world's population live within 60 km of coasts
- By 2040 > ¾ of us will live on or close to coasts
- Environmental refugees a here and now issue
  - Not "if" but "when and where and how will we respond"
- Sea level part of cryosphere and ocean projects
  - interdisciplinary workshop

Are we uncomfortably close to a tipping point and the melting of the Greenland Ice Sheet?

# Will the arctic be ice free in summer?



Area of Arctic sea ice in summer has been declining ~10%/decade.



Thickness of sea ice is reducing even faster than the area (Maslowski, Naval PS).

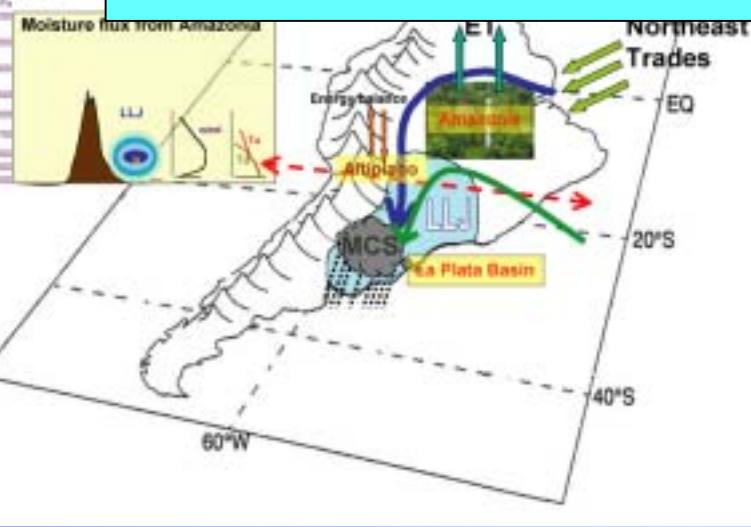
Verification of thickness change is critical.

Arctic changes will have regional and global impacts

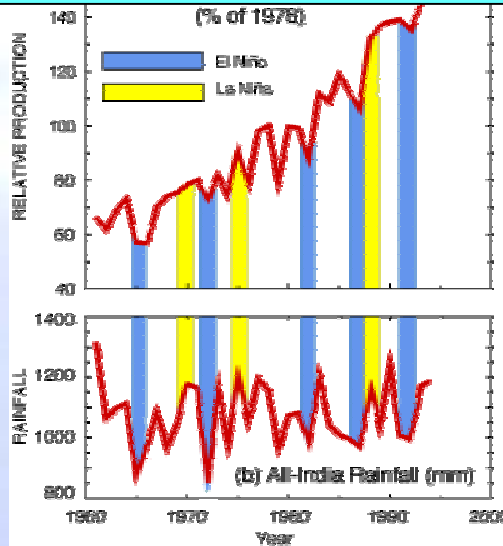


# Changes in the World's Monsoons

- 60% world's population live in monsoon regions
- Over 80% of crops depend on monsoon rains



American Monsoons



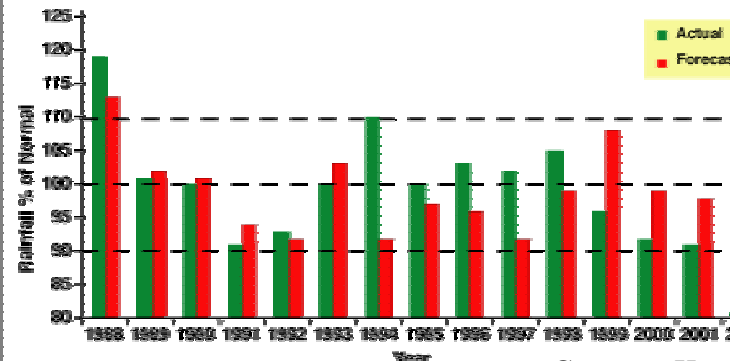
Courtesy Gadgil & Webster



WCRP

**Monsoon variability affects food security. Knowledge needed for building stability and informing national policy and**

Asian Monsoon Predictions





# How are extreme events changing?

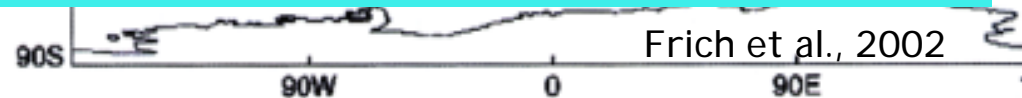
## Regional climate change workshops

- Workshops aimed at helping to fill in the blank places on this 2002 extremes analysis
- However, still need enhanced engagement in Africa

papers on climate change

- In time to contribute to IPCC AR4

Percent of time  $T_{min} > 90^{th}$  percentile (194 Tn90)  
Change (%) between two multi-decadal averages during 2<sup>nd</sup> half of 20<sup>th</sup> Century



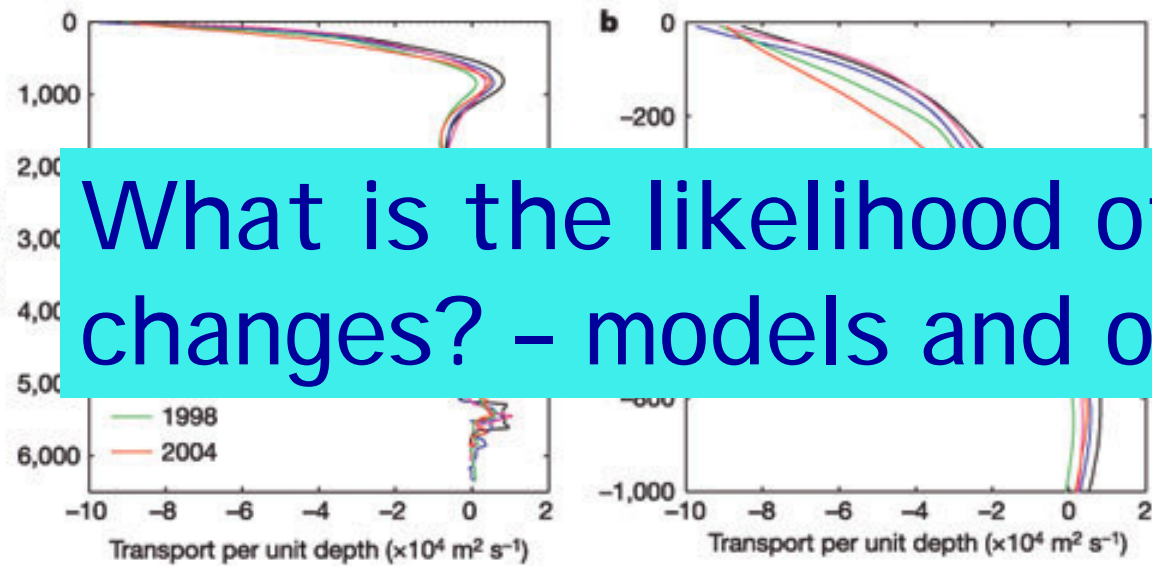
Red is a positive change. Filled circles are significant at 95% level of confidence



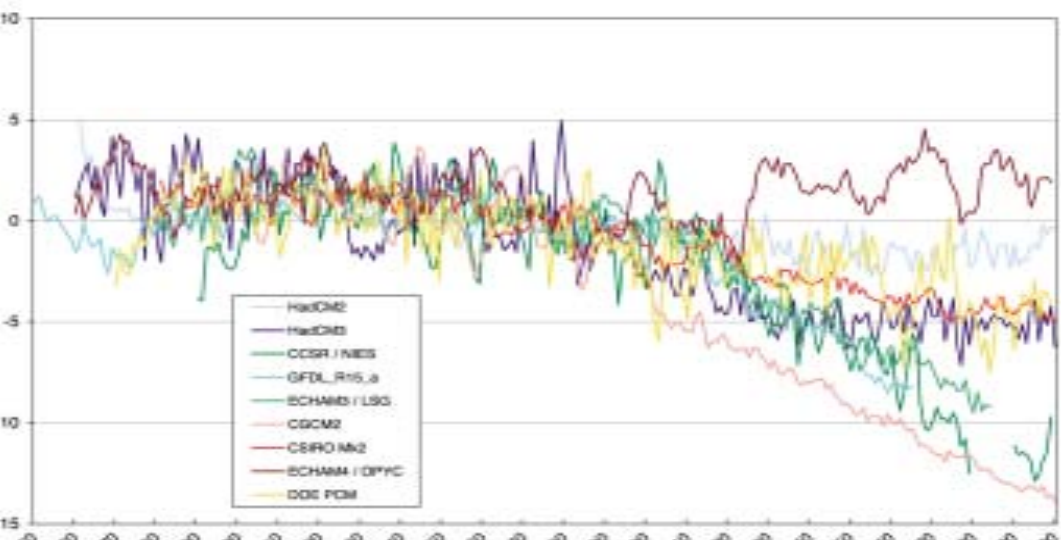
# Evidence of changes in the North Atlantic circulation?

5 sections at 25N over the past 5 decades

What is the likelihood of abrupt changes? – models and observations.



transport is weaker in 2004.



Bryden et al. NATURE Dec 2005

Model results assembled and freely available,  
encourage regional  
assessments

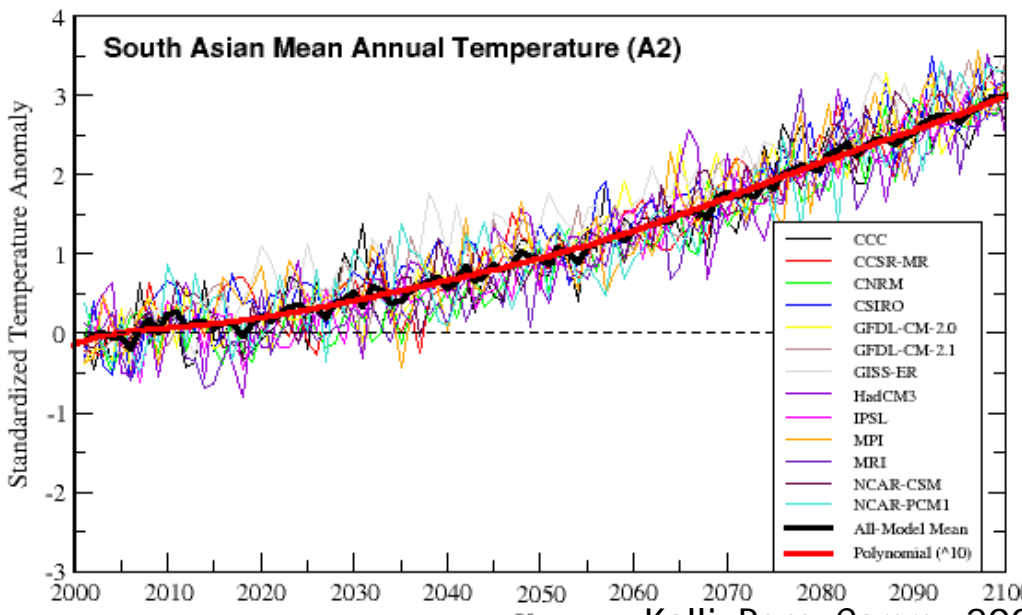
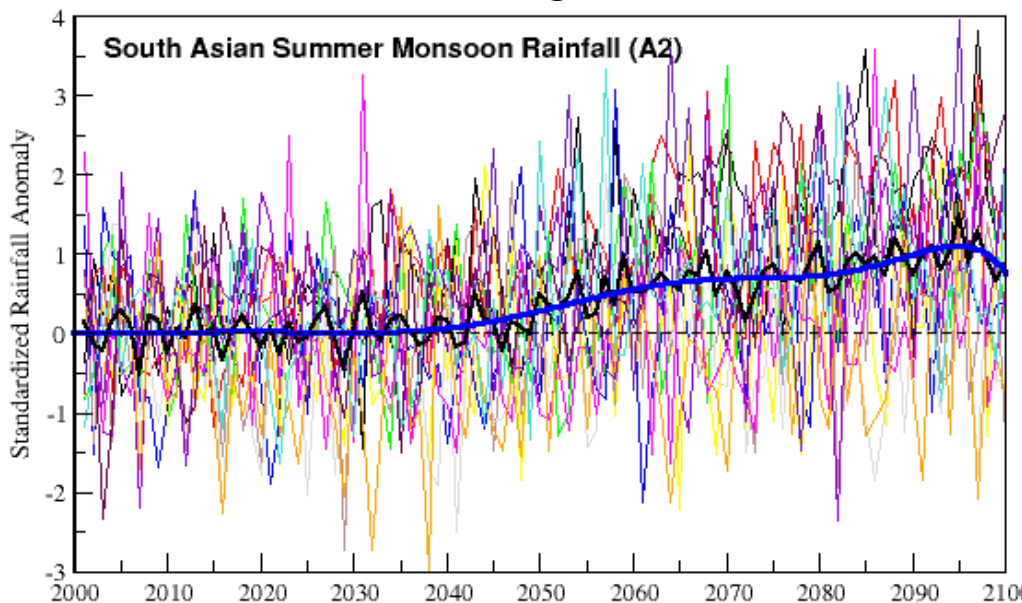
## Analysis for India

Future Scenarios for  
Summer Monsoon  
Rainfall and Annual  
Temperature over  
South Asia under A2  
Scenario (High  
Emissions)  
based on IPCC AR4  
Simulations of AOGCMs

(Anomalies relative to current period)



World Climate



# STEPS TO DELIVER RELEVANT RESEARCH OUTCOMES

*How is climate changing and what is driving the change?*

- Complete the global observing system
- Understand and quantify change in greenhouse gas and aerosol role in forcing climate change
- Understand role of land use change, aviation, solar variations and volcanic eruptions
- Climate reanalysis

*How to deliver more useful projections of future climate?*

- Improve climate models (clouds, aerosols, oceans)
- Multinational plan for providing regional projections of climate variability and change and extreme events
- Dialogue on specification of emission scenarios

# STEPS TO DELIVER RELEVANT RESEARCH OUTCOMES

*How to support management of climate-related risks?*

- Support implementation of the UNFCCC
- Identify “dangerous” interference with the climate system
- Identify thresholds (tipping points)
- Produce and communicate credible information about regional climate on multiple time scales
- Work with stakeholders to define climate deliverables and products (assess their value in end-to-end approach)

Thank you.

More Details at WCRP Side Event at 6 pm