

World Climate Research Programme

Ghassem R. Asrar
Director WCRP

Mission & Objectives



World Climate Research Programme supports climate-related decision making and adaptation planning by

- (1) encouraging and coordinating research for improved climate predictions and understanding of human influence on climate;
- (2) creating scientific knowledge to assess the impacts of climate change and variability.

Past & Present

- WCRP was established in 1980 after WCC-1 (1979)
- Sponsors: WMO, ICSU, IOC/UNESCO
- Predecessor: Global Atmospheric Research Programme (GARP) 1967
- 2005: Strategic Framework 2005-2015 (Coordinated Observation and Prediction of the Earth System - COPES)
 - *”to make new advances in the analysis and prediction of the variability and change of the Earth system for use in an increasing range of practical applications of direct relevance, benefit and value to society”*

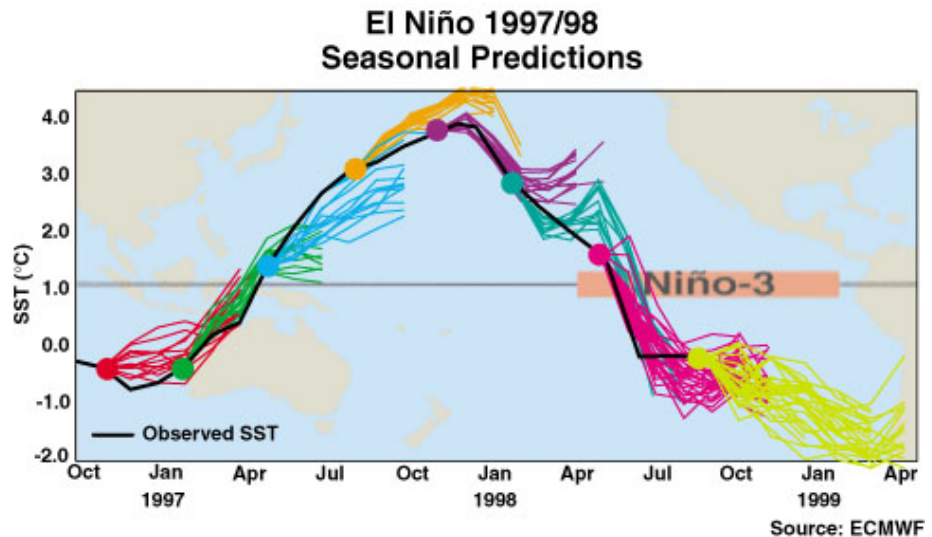


Past Accomplishments: TOGA (I)

Tropical Ocean and Global Atmosphere (1985-1994)

- WCRP project to study atmosphere-ocean interaction

TOGA led to a major breakthrough in seasonal climate forecasting and developed the capability to predict El Niño



Past Accomplishments: TOGA (II)

TOGA created the first operational element of the climate observing system in the tropical Pacific

The ENSO Observing System

The ENSO observing system build up during the TOGA period (right panel) is one of the main cornerstones for successful prediction of ENSO events. Without a continuous collection (in space and time) of different meteorological and oceanographic data using the capabilities of research vessels, ships of opportunity, surface and satellite observations and the evolving knowledge and technology of climate modelling successful forecasts of ENSO events would not be possible. Compared to the benefit of the society the cost for the maintenance of the observing system and the modelling resources are neglectable.

TOGA in Situ Ocean Observing System Pacific Basin

December 1994

Photos: above and right: maintenance of the TAO array (courtesy NOAA/PMEL), upper right: "classical" sea surface temperature measurements (bucket) (courtesy G. Meehl)

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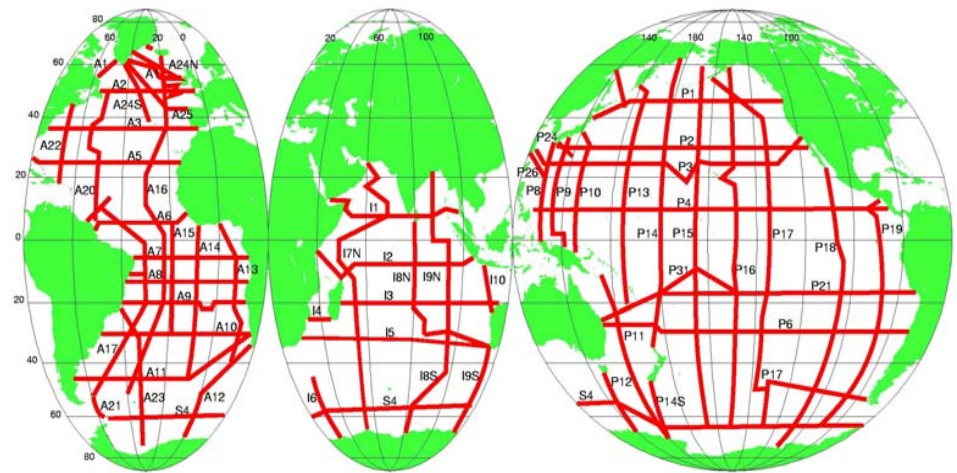
Past Accomplishments : **WOCE (I)**

World Ocean Circulation Experiment (1982-2002)



- largest and most successful global ocean research project

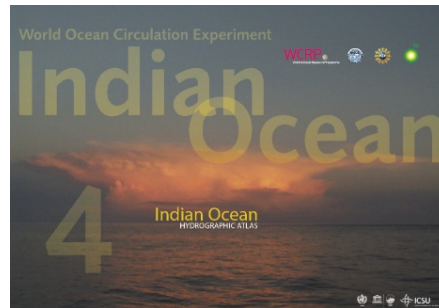
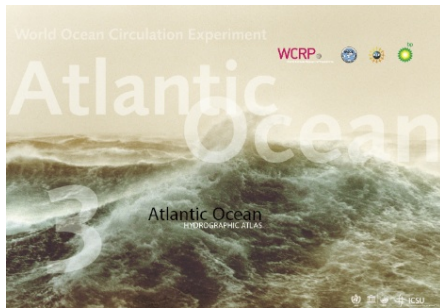
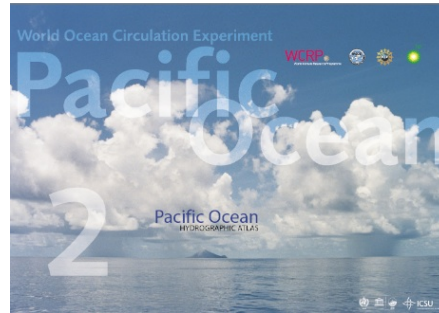
WOCE made the first global snapshot of the world ocean, estimated fluxes of mass and heat, and created the basis for Argo (see later) and the Global Ocean Observing System (GOOS)



WOCE Hydrographic Programme One-Time Survey
(Penny Holliday, WOCE IPO)

Past Accomplishments : WOCE (II)

World Ocean Circulation Experiment Atlases



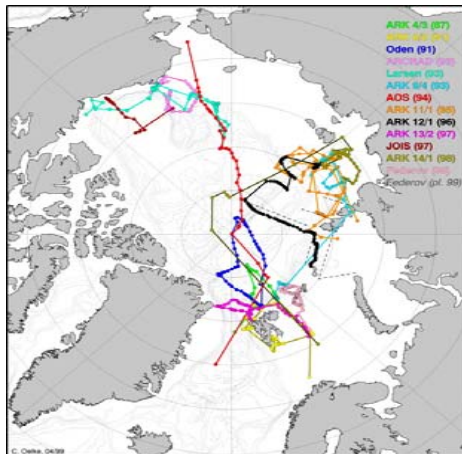
sponsors:



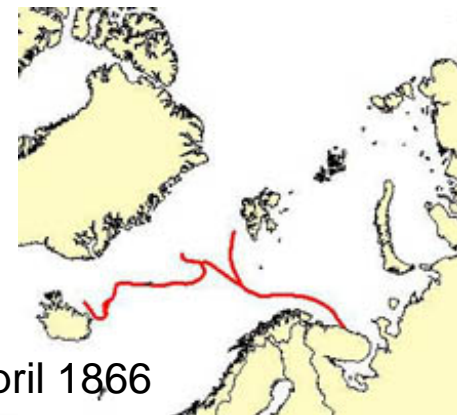
Past Accomplishments : Arctic Climate System Study

ACSYS 1994-2003

- first comprehensive study of the Arctic climate system and it's role in the global climate system



ACSYS created the science basis for the current understanding of the unique role of the Arctic in the global climate system and led to the discovery of the fast changes occurring in this polar region



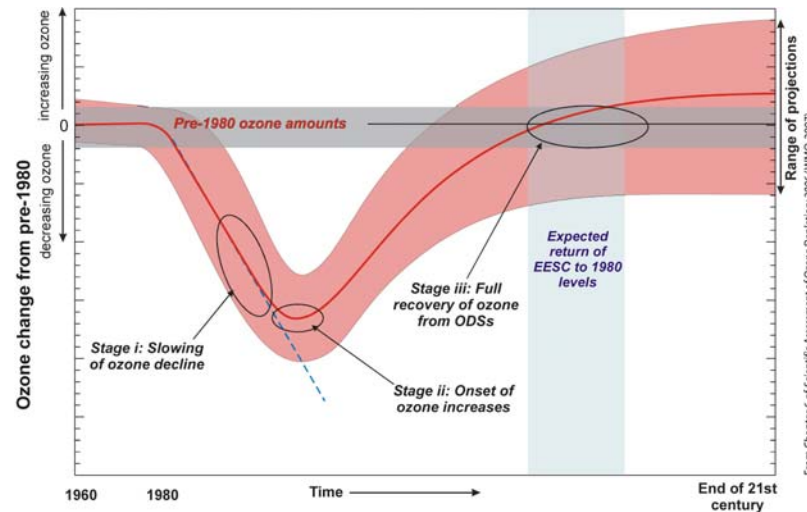
Expedition tracks during ACSYS

Sea ice extent on 22 April 1866

Recent Accomplishments: Assessment of Ozone Depletion

WMO/UNEP Scientific Assessment of Ozone Depletion (1998, 2002, 2006)

Scientific basis provided by WCRP/SPARC through model simulations and analyses



Recent Accomplishments: WCRP Contribution to IPCC AR4



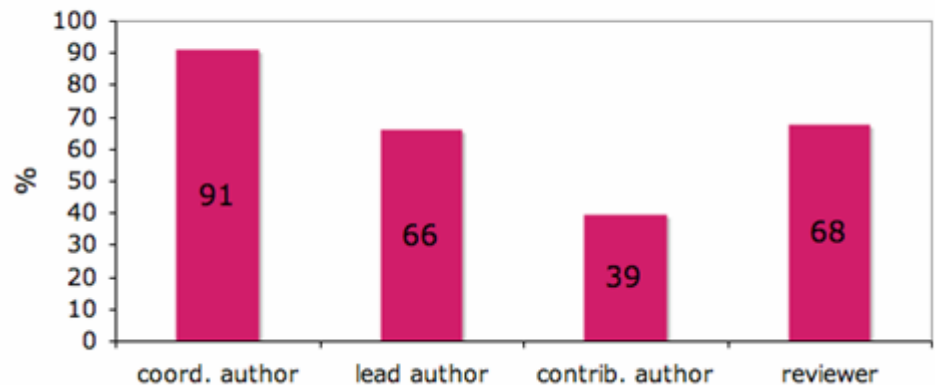
Almost half of the contributors to IPCC AR4 are WCRP-associated scientists

- mainly climate modelers, climate diagnostician experts, cryospheric scientists

“WCRP serves an irreplaceable role for coordination within the science community, which in turn is invaluable to the IPCC”

*Dr. S. Solomon,
IPCC Working Group 1 Co-Chair*

WCRP scientists' contribution to IPCC WG1 AR4



Recent Accomplishments: IPCC AR4 Climate Projections

 WCRP-IPCC Coupled Model Intercomparison Project 3 (CMIP3) archive, hosted at PCMDI

- made available to the entire world for free:
 - 1300 users,
 - 1100 diagnostic subprojects,
 - 300 new publications,
 - 33 terabytes of data ready for download
- for climate science + regional projections (WG 1)/ impact assessment studies (WG 2 & 3)



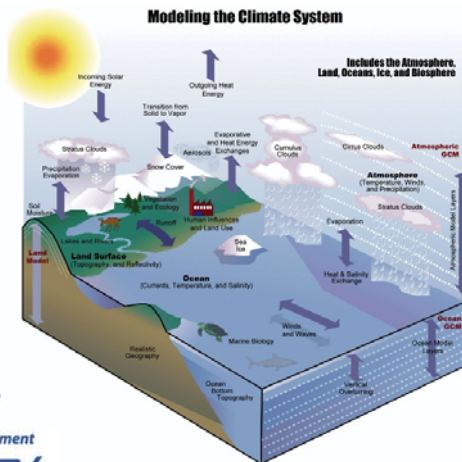
Current Structure and Activities

WCRP Core Projects on climate and...

Cryosphere



Energy & Water Cycle



Stratospheric Processes



Ocean



WCRP flexible response to current research needs:

Cross-Cutting Activities

- Anthropogenic Climate Change
- Atmospheric Chemistry & Climate (joint with IGBP)
- Extremes
- Monsoons
- Sea Level
- Seasonal & Decadal Predict.
- Regional Modeling etc.

Current Needs for Climate Research

Dr Ghassem Asrar

27-05-2008

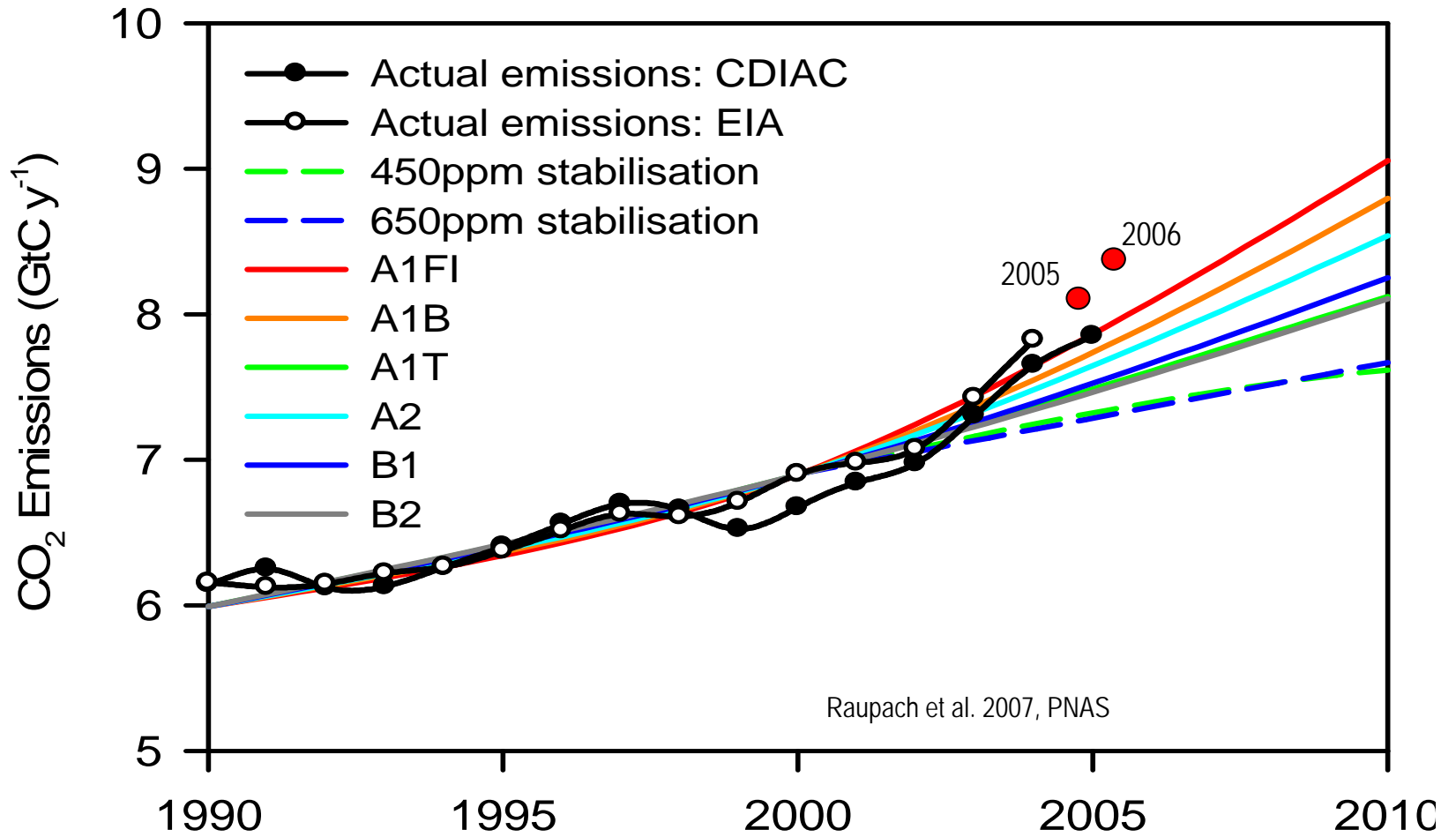
<http://wcrp.wmo.int>



Science is Needed Urgently (I) for

Mitigation





Science is Needed Urgently (I) for

Mitigation (cont.)

- What level of mitigation? What stabilisation scenarios?
- Can we detect and attribute regional impacts?
- What is dangerous? - short-term, long-term, irreversible (scale)
- How are emission reductions verified?



Science is Needed Urgently (II) for

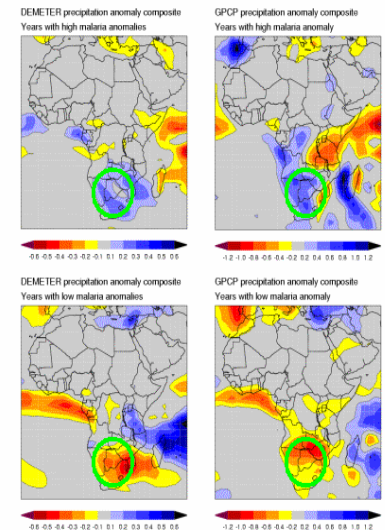
Adaptation

(even with successful mitigation, adaptation will be essential!)

- Regional and local scales
- What do we need to adapt to? How fast? Where?
- Detecting and attributing regional impacts
- Extreme events are critical
- Adaptation in the near-term and long-term
- Urban environments

Science is Needed Urgently (III) for

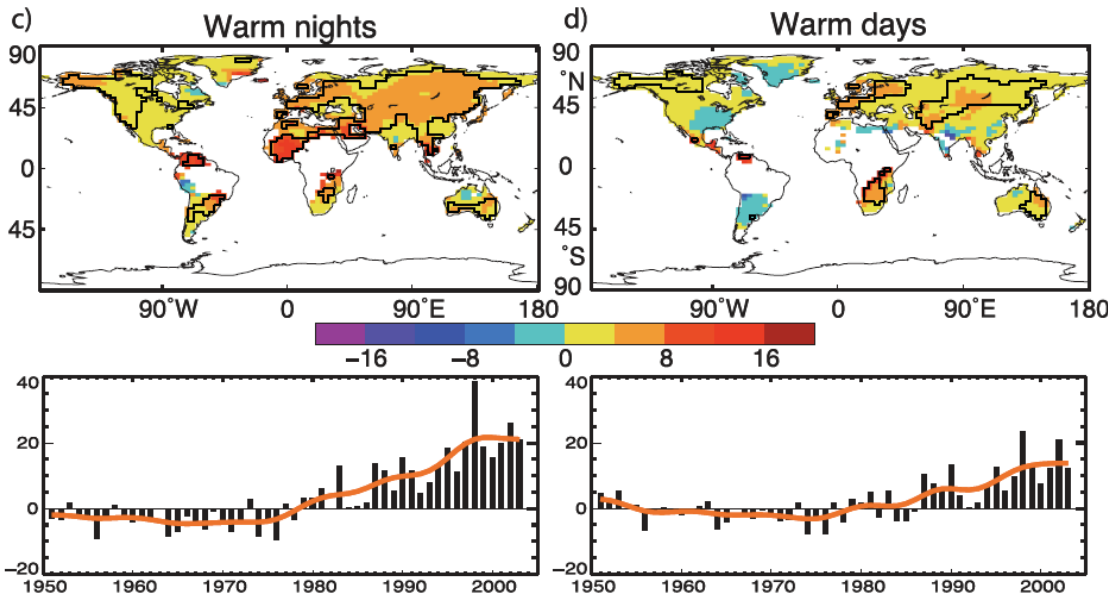
Intra-seasonal
Seasonal
Multi-Year
Decadal
Centennial Prediction



- Prediction of El Niño – La Niña, monsoons, drought/excessive precipitation etc.

Science is Needed Urgently (IV)

Prediction of Changes in Extreme Events





- Prediction of tropical cyclone and storm intensity



IPCC FAQs (2007)

Future Horizons

 2008-2013: WCRP activities and core projects implement the Strategic Framework **COPES** (Coordinated Observation and Prediction of Earth System)

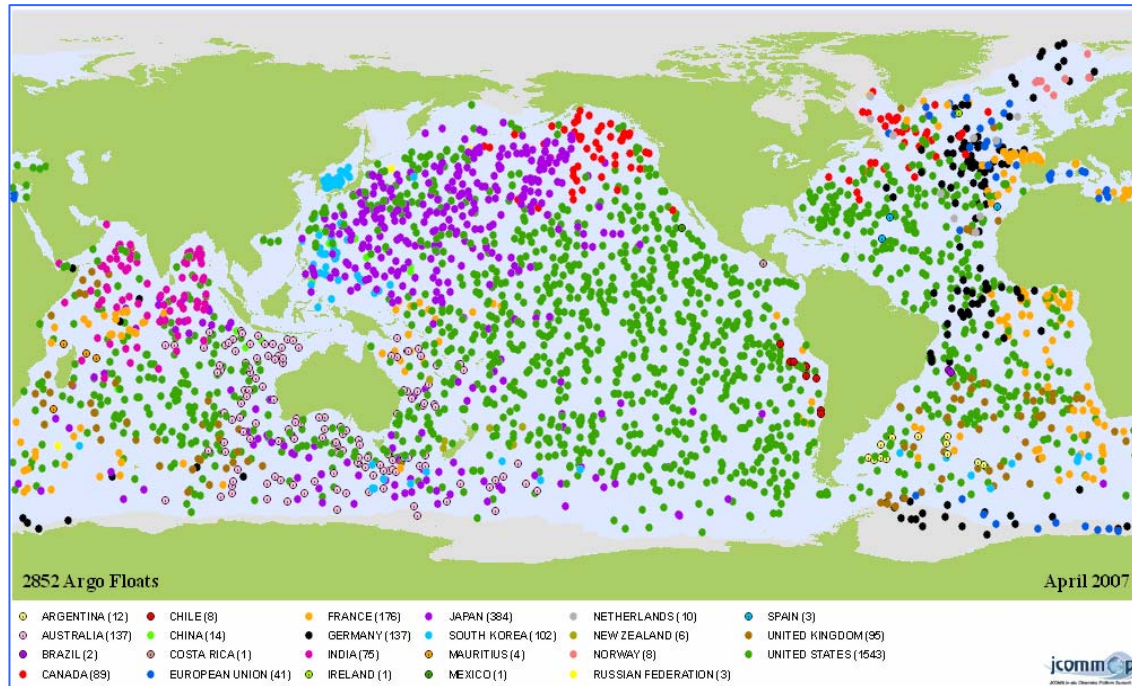
 post-2013: to achieve a more effective interface with the users of climate information, products and services a new WCRP structure will be needed (JSC-29, Arcachon, France, April 2008)

What do we need to do?

Key Steps (I)



Observe the climate system



Observations are critical and urgent – atmosphere, terrestrial, ocean, cryosphere, biosphere – We can not take today's observation tomorrow!

Dr Ghassem Asrar

27-05-2008

<http://wcrp.wmo.int>

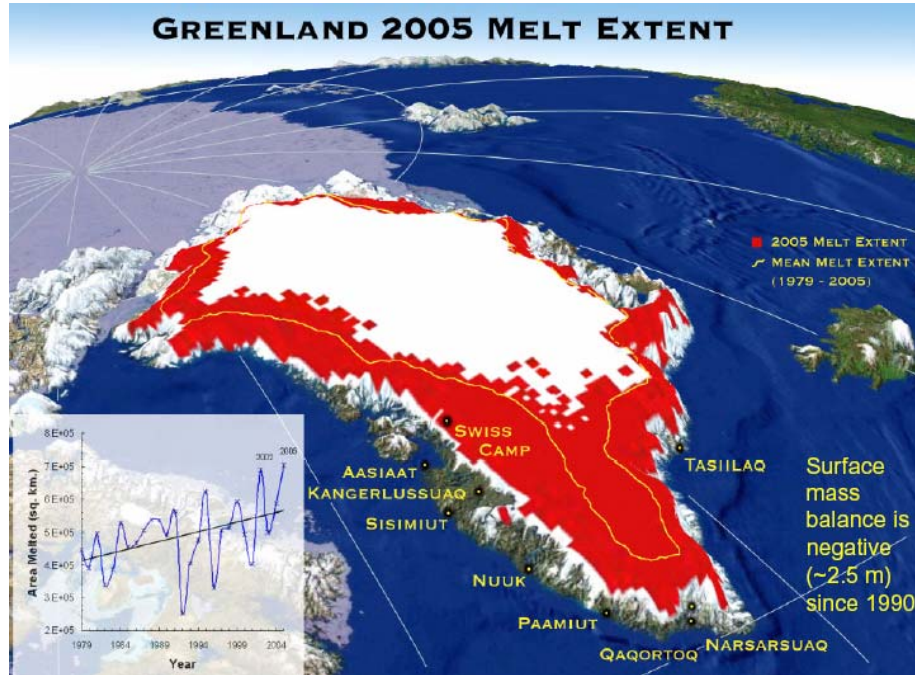


What do we need to do? Key Steps (II)



Address scientific uncertainties

Uncertainties in ice-sheet stability and its impact on sea level rise a major concern for tens to hundreds of millions of people!

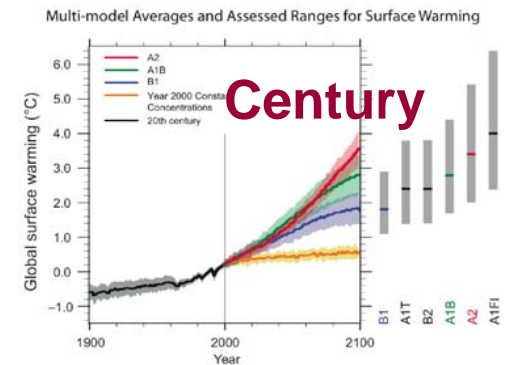
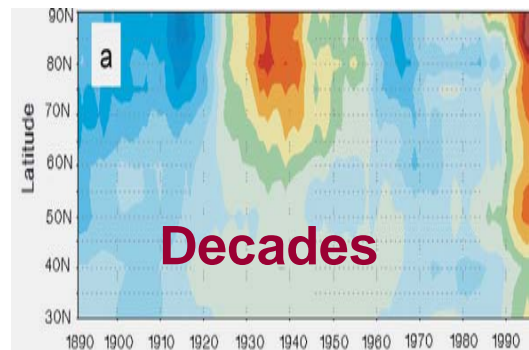
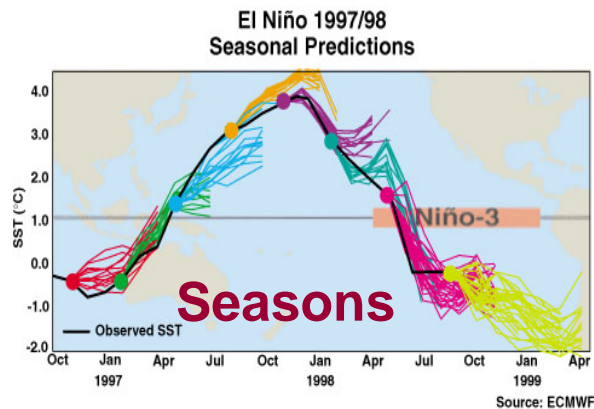


What do we need to do?

Key Steps (III)

Develop and test next generation climate models (projection, attribution and prediction), confront with observations and build confidence

- At various time scales: focus on seasonal to decadal prediction and attribution ('seamless prediction')

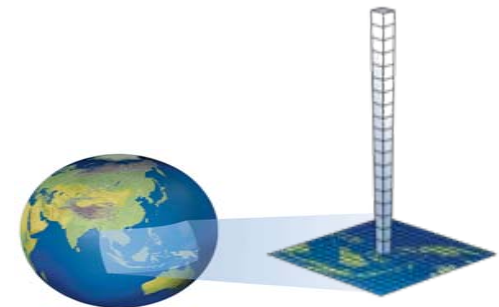
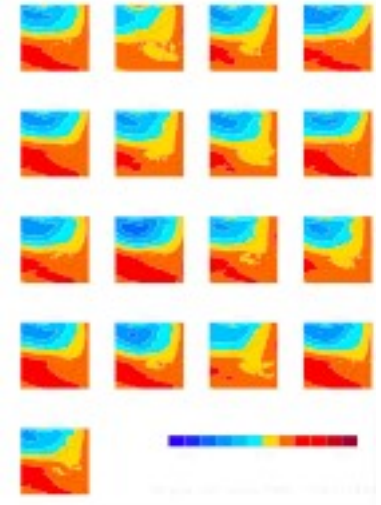


What do we need to do?

Key Steps (IV)

Develop and test next generation climate models (cont.)

- At various space scales: global to regional prediction
- Generate better ensembles to account for uncertainty
- Improve Earth System Models
(physics, biogeochemistry, biology of the atmosphere, oceans, land, cryosphere and all elements of human dimensions)



What do we need to do?

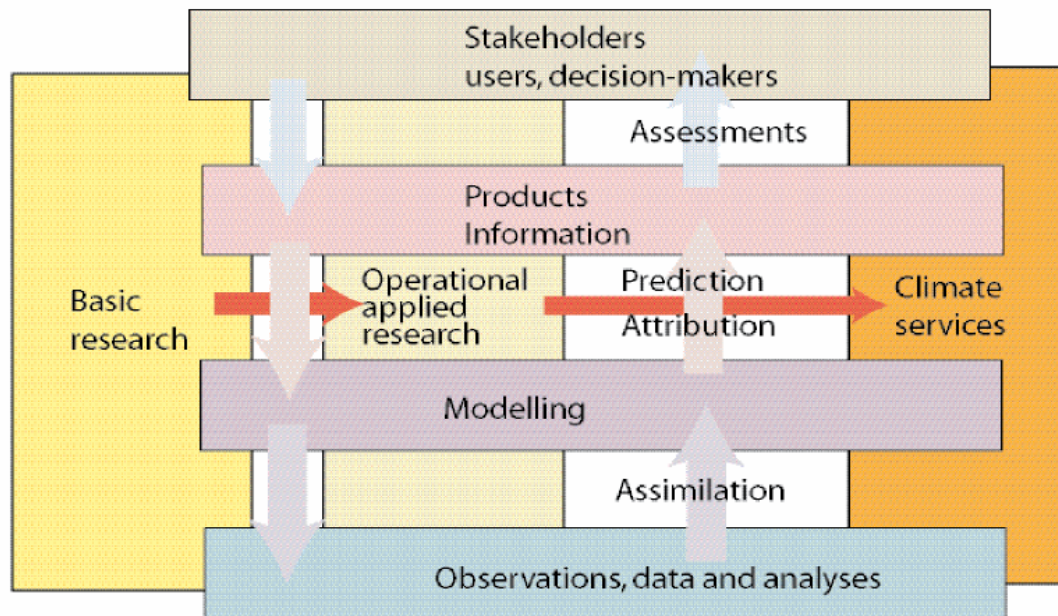
Key Steps (V)

- Efficiently use the knowledge we already have
- Develop the capability to effectively use state-of-the-art climate models (capacity building)
 - WCRP-ICTP training seminar on using AR4 simulations' database (CMIP3), Trieste Nov. 2007
 - Easy portal for access to climate models' results: African Climate Atlas for regional projections

What do we need to do?

Key Steps (VI)

Develop a Climate Information System



Need more efficient delivery to users: timely, up-to-date, and easy access....

Modelling Summit World Climate Conference-3



World Modelling Summit for Climate
Prediction, Reading, UK, 6-9 May 2008

Establish a World Climate Research Facility!

*'Editorial' and 'news' on the Modelling
Summit, Nature 15 May 2008*

