The WCRP in support of the IPCC

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(WCRP Joint Planning Staff)

SBSTA 20, Bonn, Germany

21 June 2004

World Climate Research Programme (1980)

Objectives

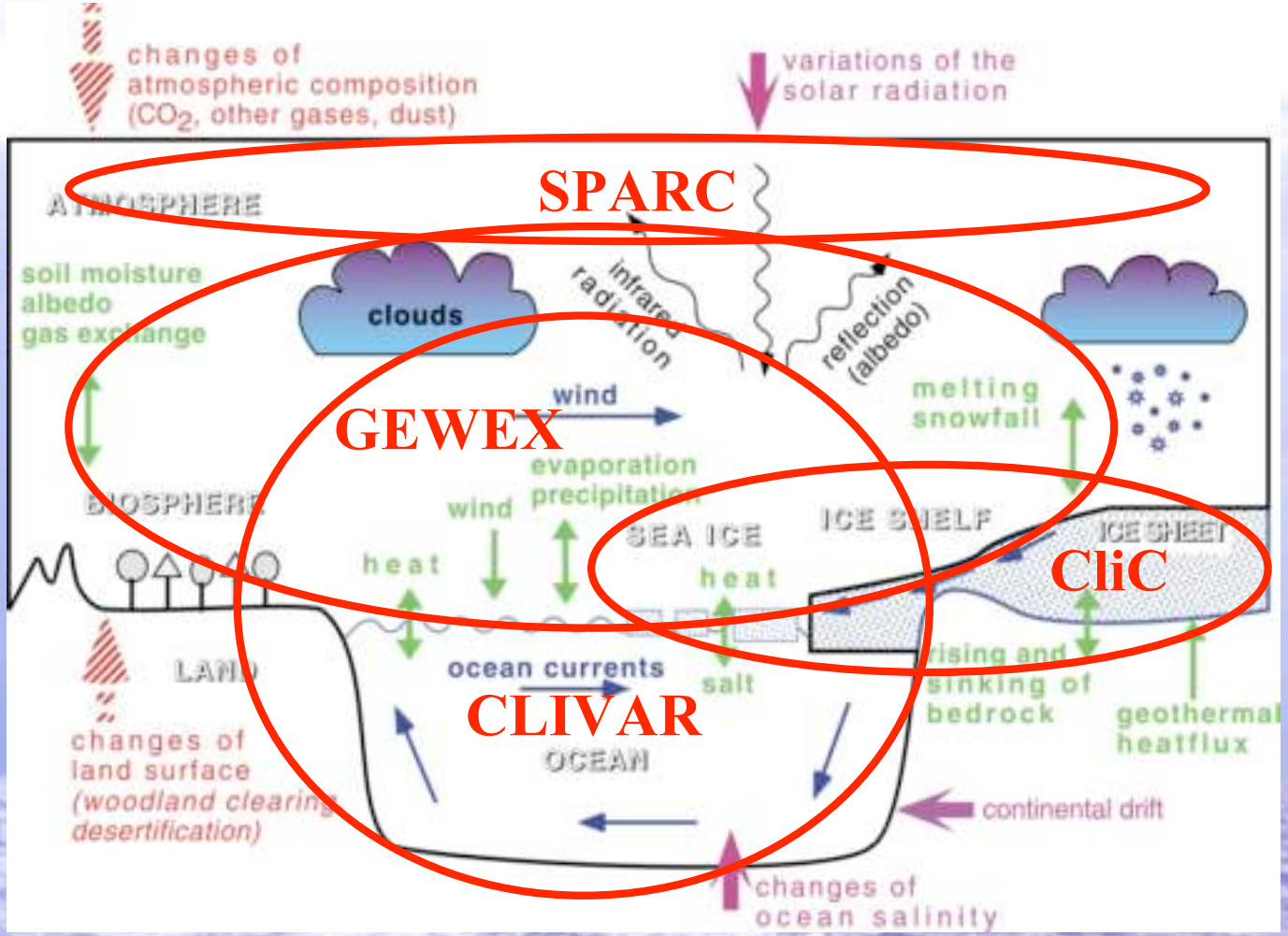
- To determine to what extent climate can be predicted
- To determine the extent of human influence on climate

Priorities

- Assessing the nature and predictability of seasonal to inter-decadal climate variations at global and regional scales
- Providing the scientific basis for operational predictions
- Detecting climate change and attributing causes
- Projecting the magnitude and rate of human-induced change (as input for IPCC, UNFCCC, ...)

WCRP Domains

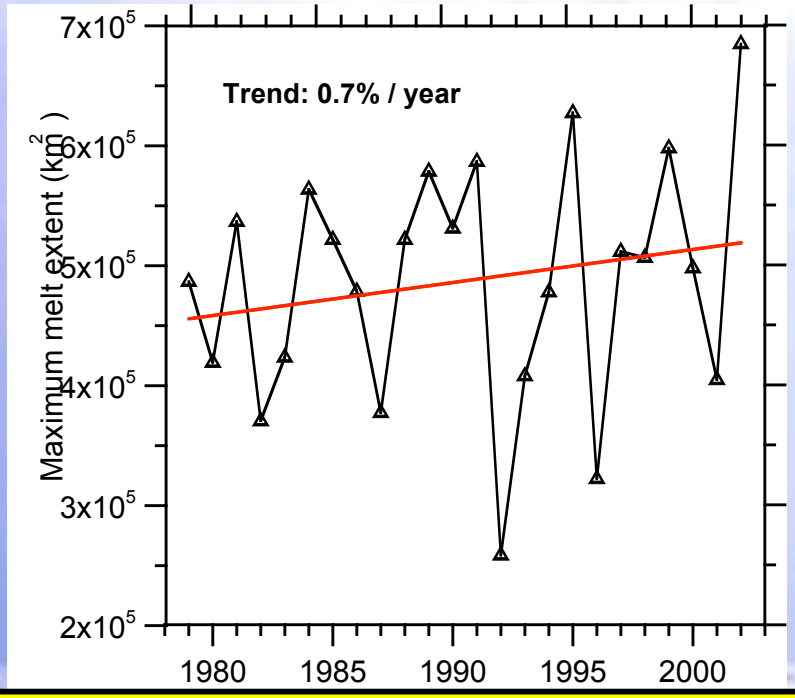
- **GEWEX** ➢ **Global Energy and Water Cycle Experiment**
- **CliC** ➢ **Climate and Cryosphere**
- **CLIVAR** ➢ **Climate Variability and Predictability**
- **SPARC** ➢ **Stratospheric Processes and their Relation to Climate**

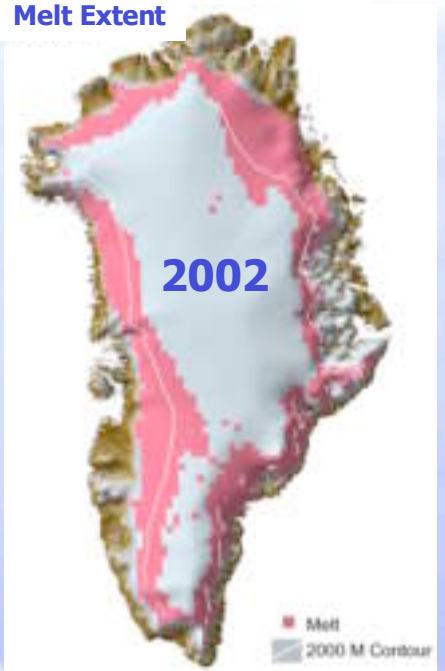


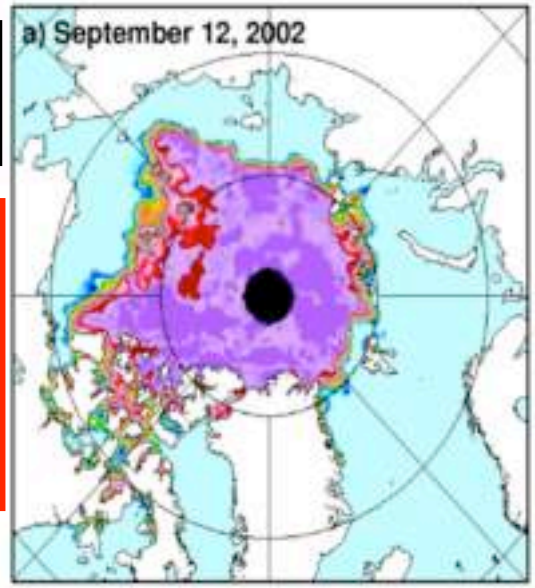
The perennial sea ice cover in the years 2002 and 2003 was the least extensive during the satellite era.

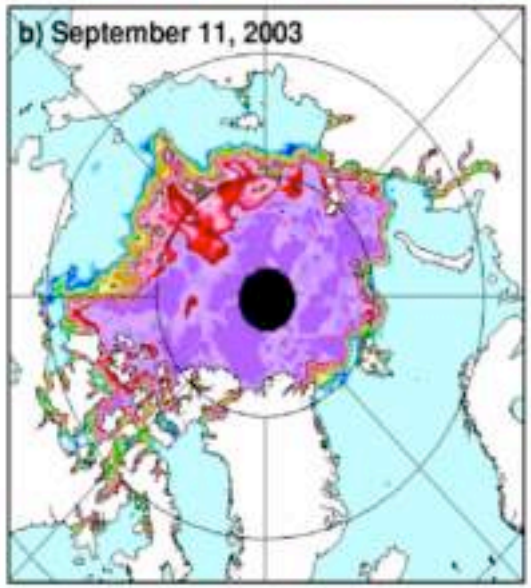
CliC:

- Processes of cryospheric change
- Contribution to sea level and ocean circulation





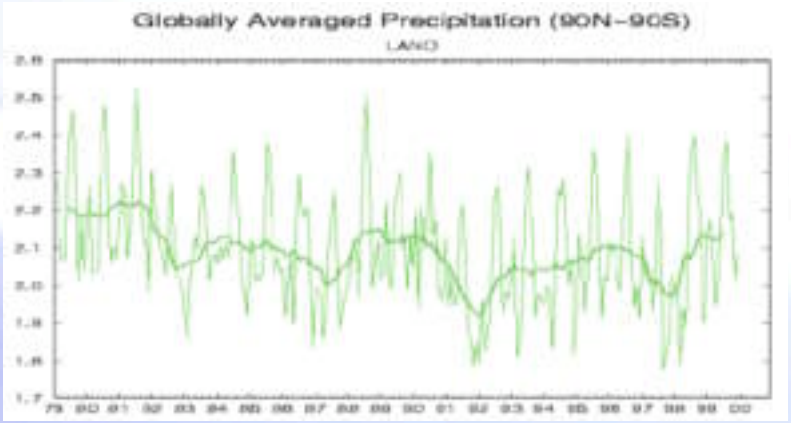




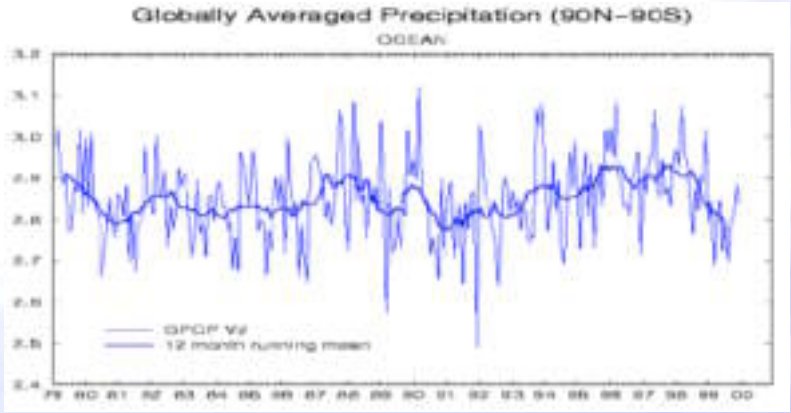
Greenland ice sheet melt area increased on average by 16% from 1979 to 2002. The smallest melt extent was observed after the Mt. Pinatubo eruption in 1992

Global Precipitation Climatology Project

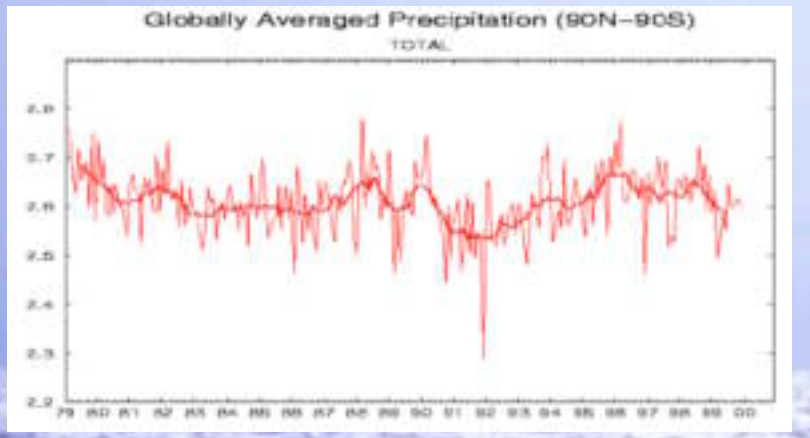
22 year pattern of global precipitation



LAND



OCEAN



TOTAL

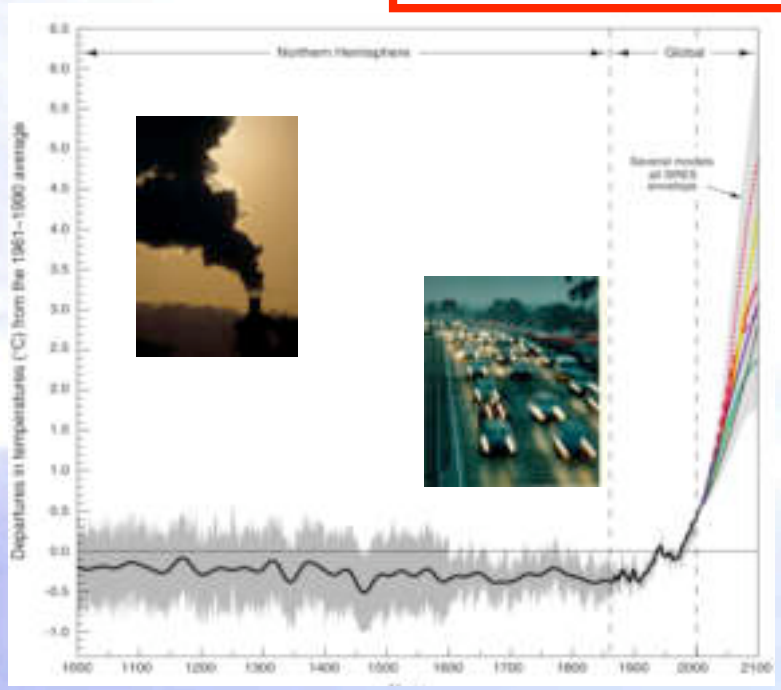
Three new GPCP products :

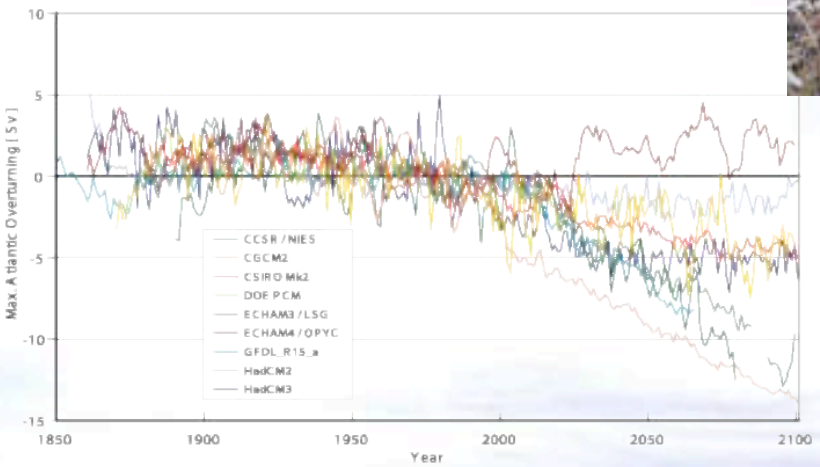
- *22 year monthly (2.5x2.5)*
- *22 year Pentad (5 dy)*
  (shows MJO)
- *1x1 degree daily since '97*

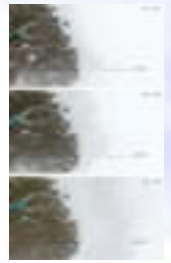
New satellites and GEWEX/CLIVAR campaigns provide opportunity for significant benefit from a more Coordinated Enhanced Observing Period (CEOP)

CLIVAR

Climate change assessment & projections







Greenland Ice melt

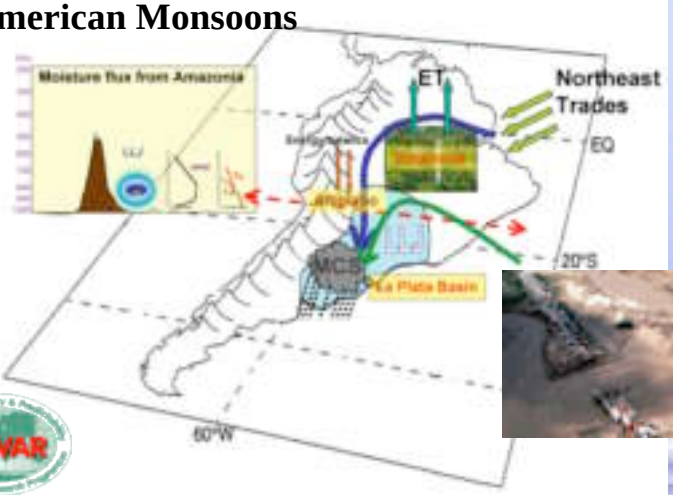
Observed and projected changes of surface temperature and Atlantic overturning (from IPCC)

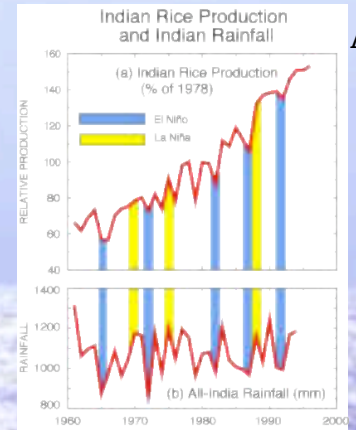
C20Cproject

Heat wave 2003 (right), Elbe Flooding 2002 (upper right)

Understanding and Predicting the Monsoons

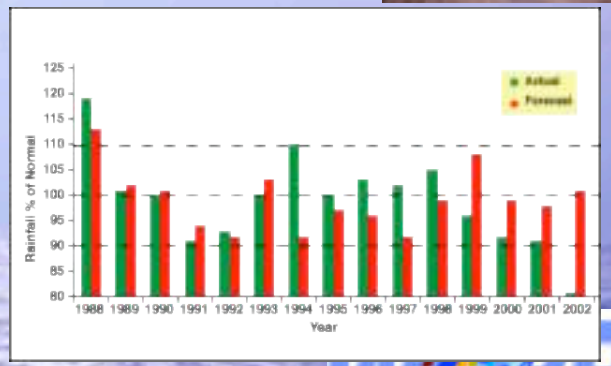
American Monsoons





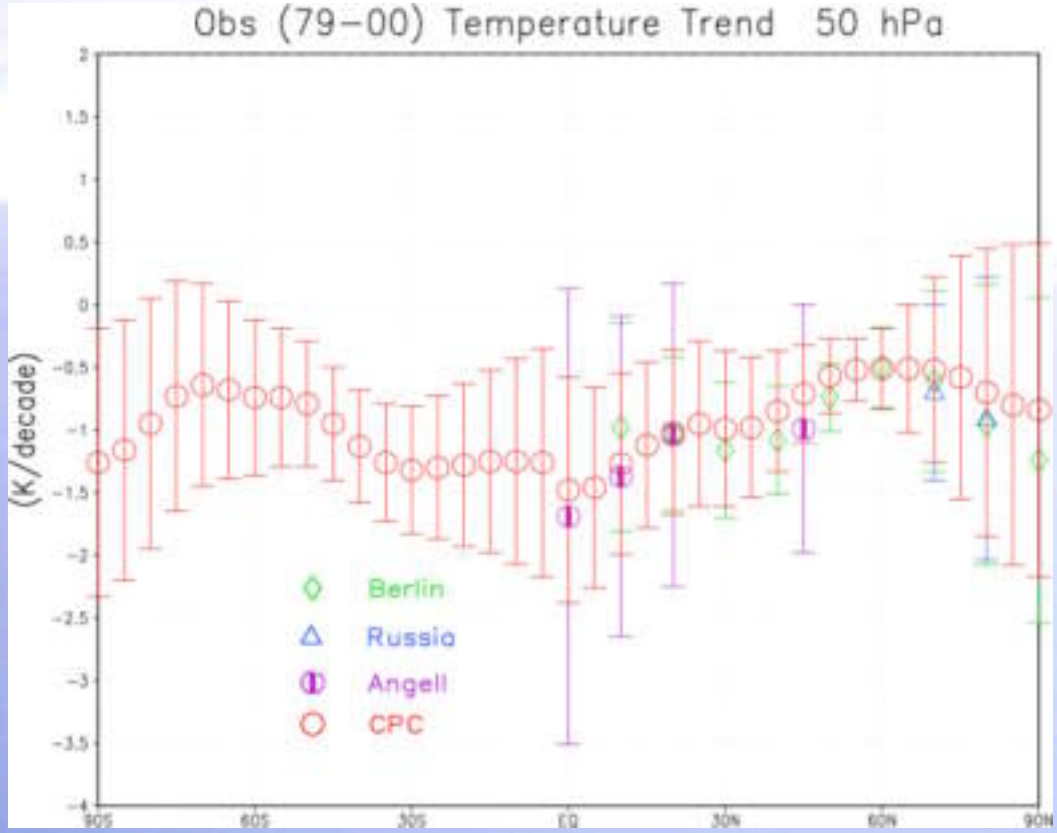
Courtesy Gadgil & Webster

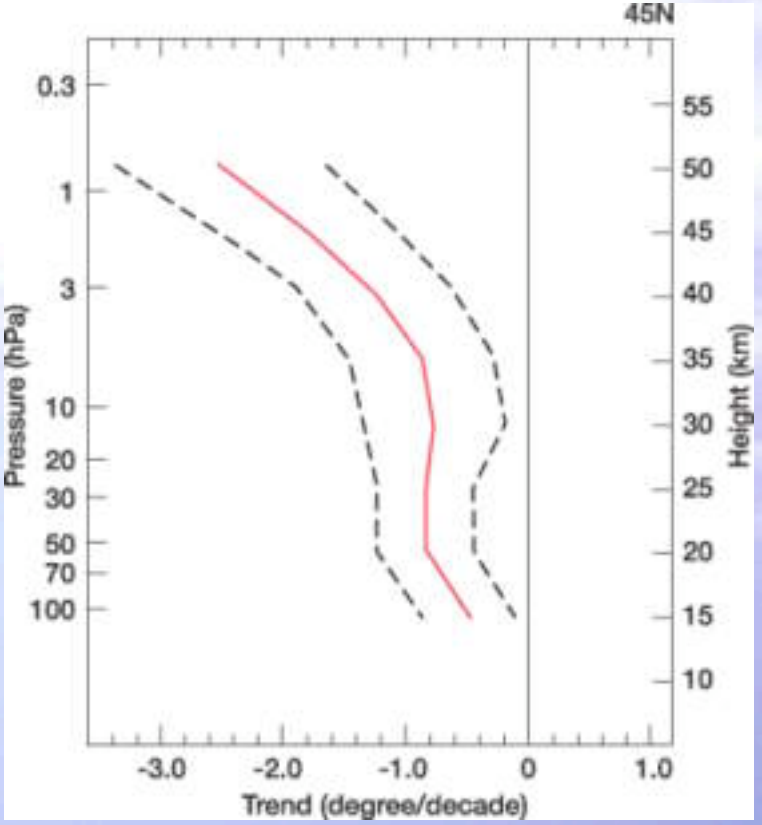
Asian Monsoon Predictions



Courtesy Kumar

SPARC:
Temperature Trends in the Stratosphere





WGNE: Working Group on Numerical Experimentation

- **Atmospheric Models Intercomparison Project**
- **Parametrisation studies: surface, boundary layers, clouds**
- **Intercomparison and validation of ocean-atmosphere fluxes**
- **Reanalyses (NCEP,ECMWF,JMA)**
- **C 20 C project**
- **Regional climate modelling**

WGCM: Working Group on Coupled Models

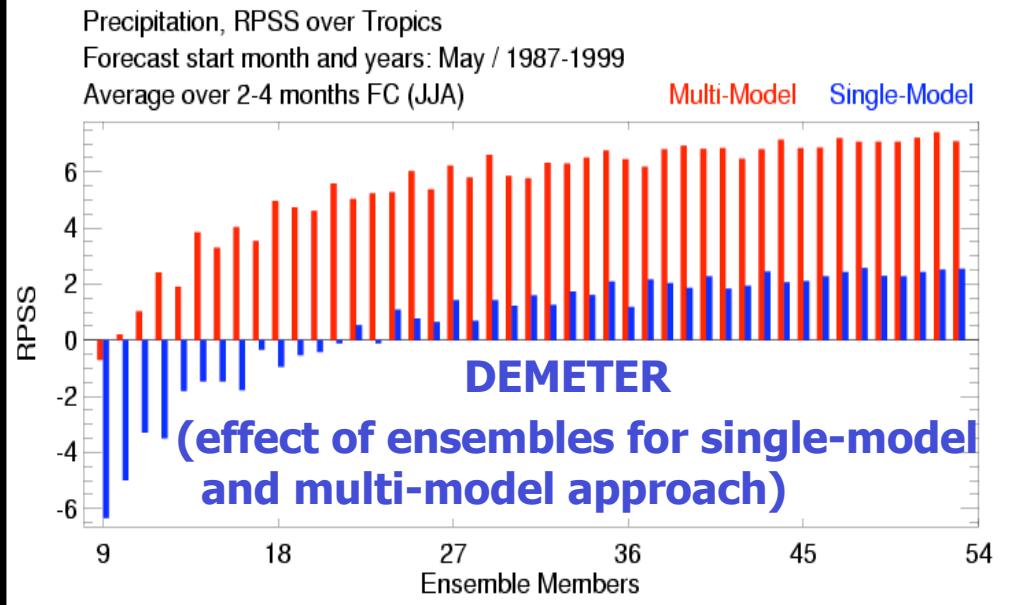
- **Close coordination with IPCC**
- **Coupled Models Intercomparison Project:20th and 21th Century simulations with IPCC scenarios.**
- **Cloud feedback intercomparison experiment**
- **Initialisation of coupled models**
- **Decadal variability**
- **Ocean model development**
- **Detection and attribution of climate change**
- **Paleo-climate modelling**

COPES

Coordinated Observation & Prediction of the Earth System

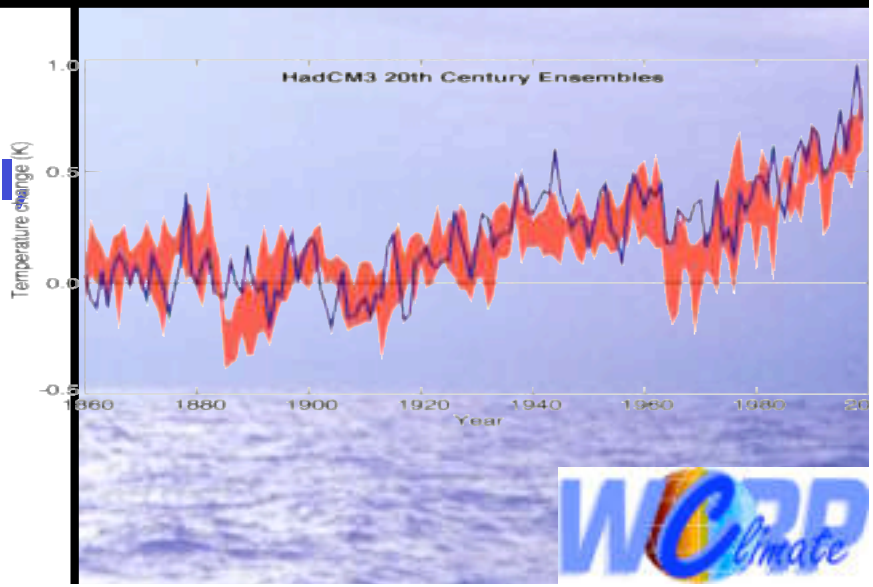
AIM

- To facilitate prediction of the climate/earth system variability and change for use in an increasing range of practical applications of direct relevance, benefit and value to society



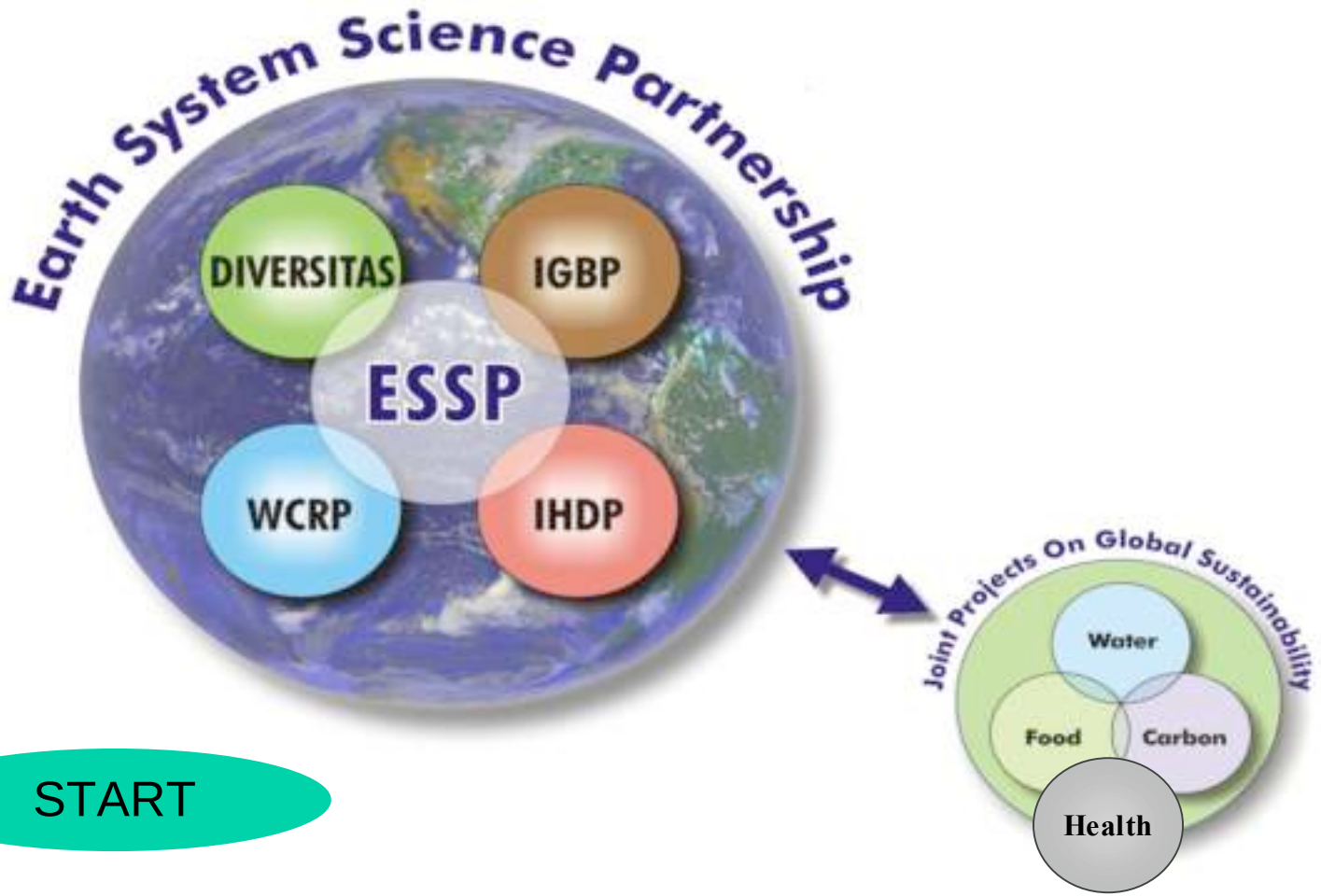
Goals

- Determine what aspects of the climate/earth system are and are not predictable, at weekly, seasonal, interannual and decadal through to century time-scales
- Utilise improving observing systems, data assimilation techniques and models of the climate/earth system



Earth System Science Partnership

Earth System
Science Partnership



START

WCRP Climate

diversitas

GLOBAL CHANGE
IGBP


FAO
WMO
ICSU
Global Ocean Observing System
UNEP
GTOS
IGOS Partnership
CEOS
Committee on Earth Observation Satellites
GCOS
GLOBAL CLIMATE OBSERVING SYSTEM
IGFA
UNESCO
WCRP
UNESCO
GLOBAL CHANGE
IGBP
WCRP Climate

END

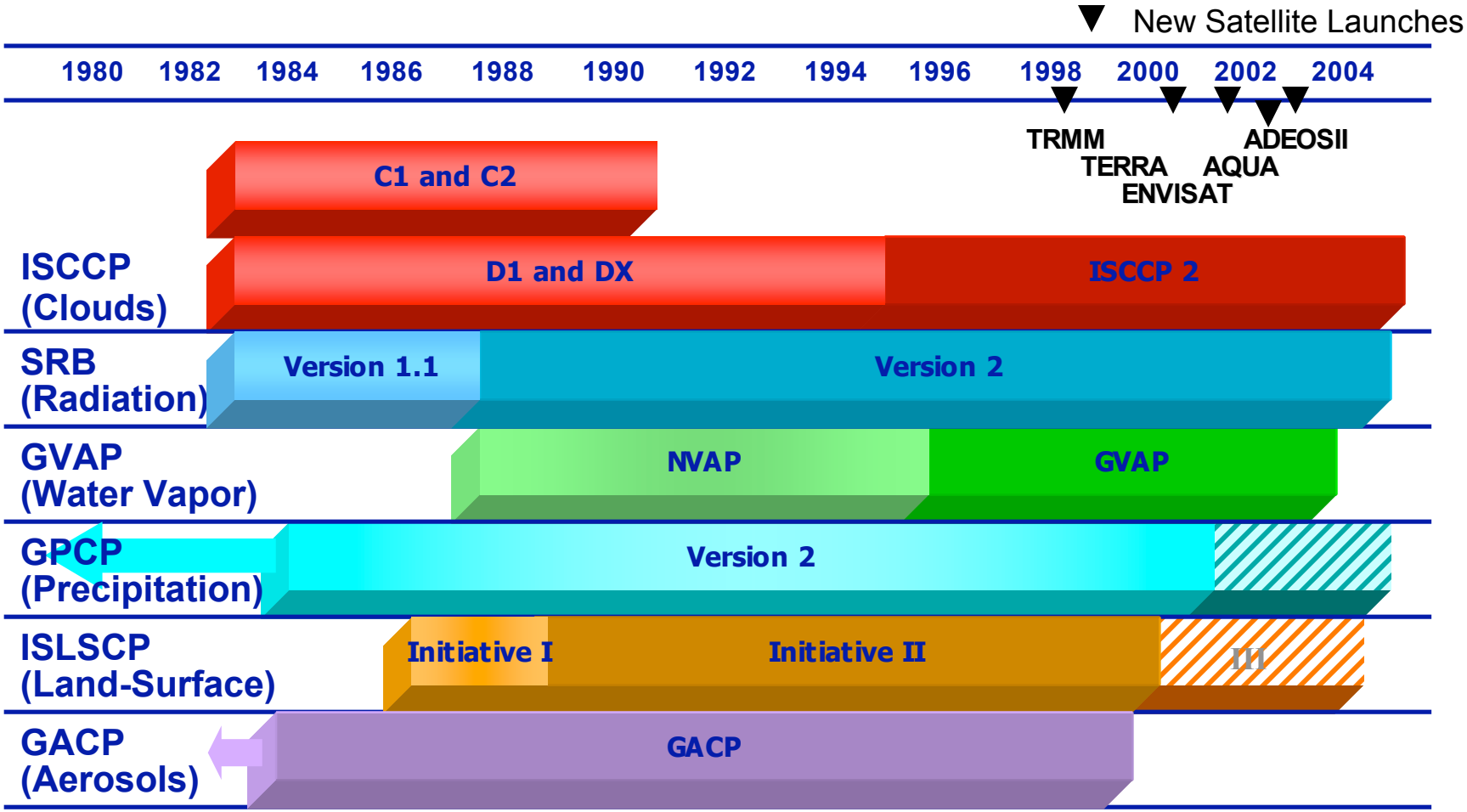
Thank you

GEWEX Phase II Primary Objectives

- Produce consistent descriptions of the Earth's energy budget and water cycle and their variability and trends, and data sets for the validation of models
- Enhance the understanding of how energy and water cycle processes contribute to climate feedbacks
- Develop improved parameterisations encapsulating these processes and feed-backs for atmospheric circulation models
- Interact with the wider WCRP community in determining the predictability of energy and water cycles
- Interact with the water resource and applications communities to ensure the usefulness of GEWEX results.

Ref: JSC XXII

GLOBAL DATA SETS



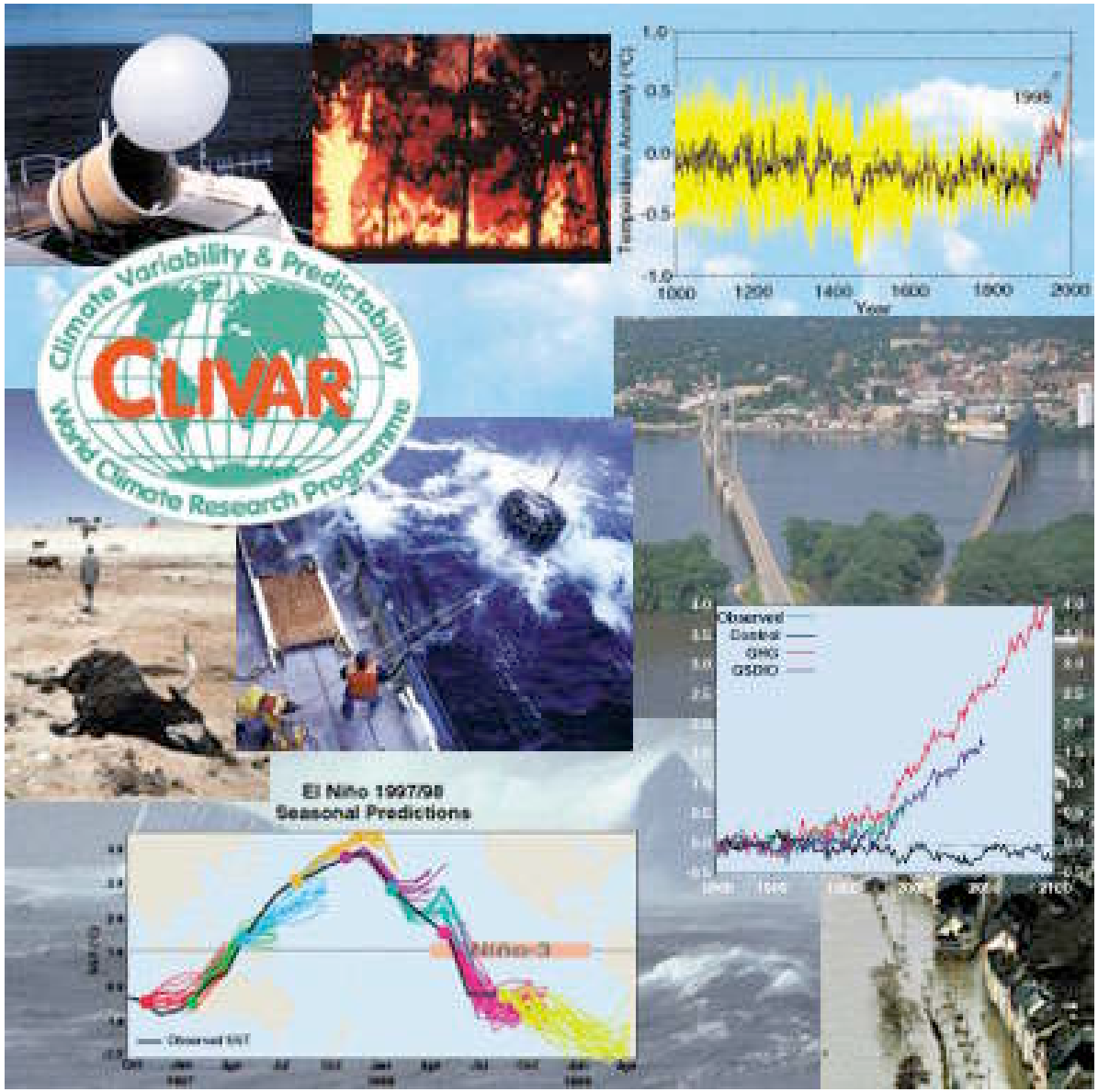
*Hatched lines represent planned data sets

CLIVAR (Climate Variability and Predictability)

CLIVAR is an interdisciplinary research effort within the World Climate Research Programme (WCRP) focusing on the variability and predictability of the slowly varying components of the climate system.

CLIVAR investigates the physical and dynamical processes in the climate system that occur on seasonal, interannual, decadal and centennial time-scales.

http://www.clivar.org



NAO +

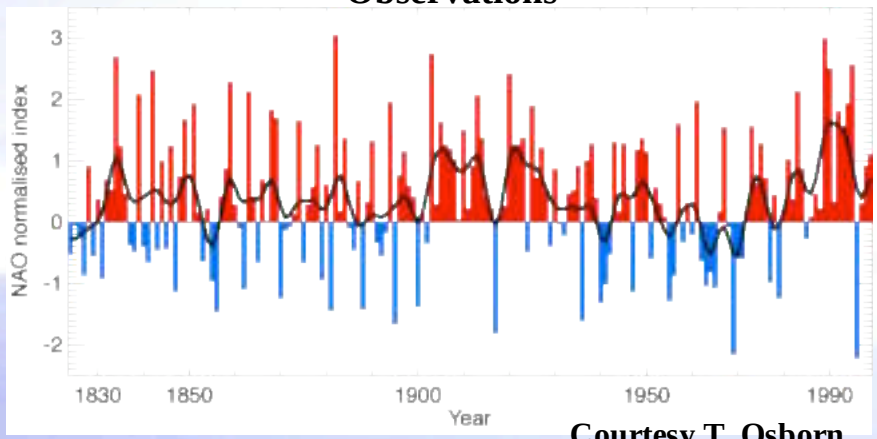
CLIVAR

NAO -

The North Atlantic Oscillation

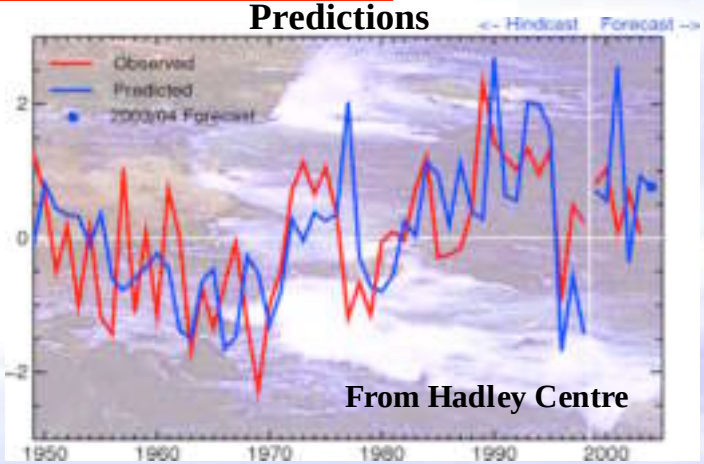
Perspectives for successful seasonal predictions?

Observations



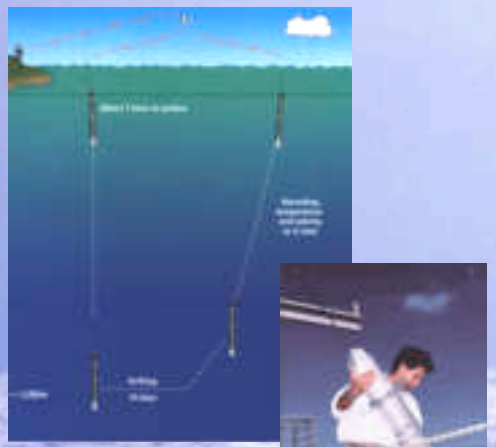
Courtesy T. Osborn

Predictions

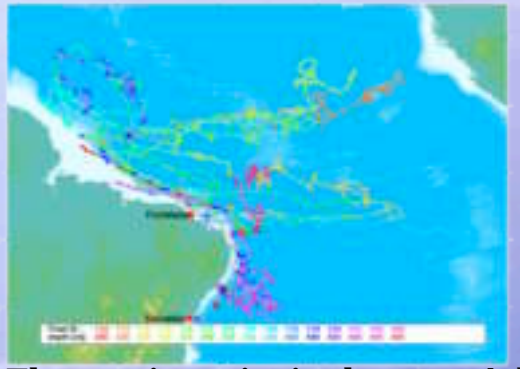


From Hadley Centre

ARGO - an important element for an ocean observation system



Current coverage

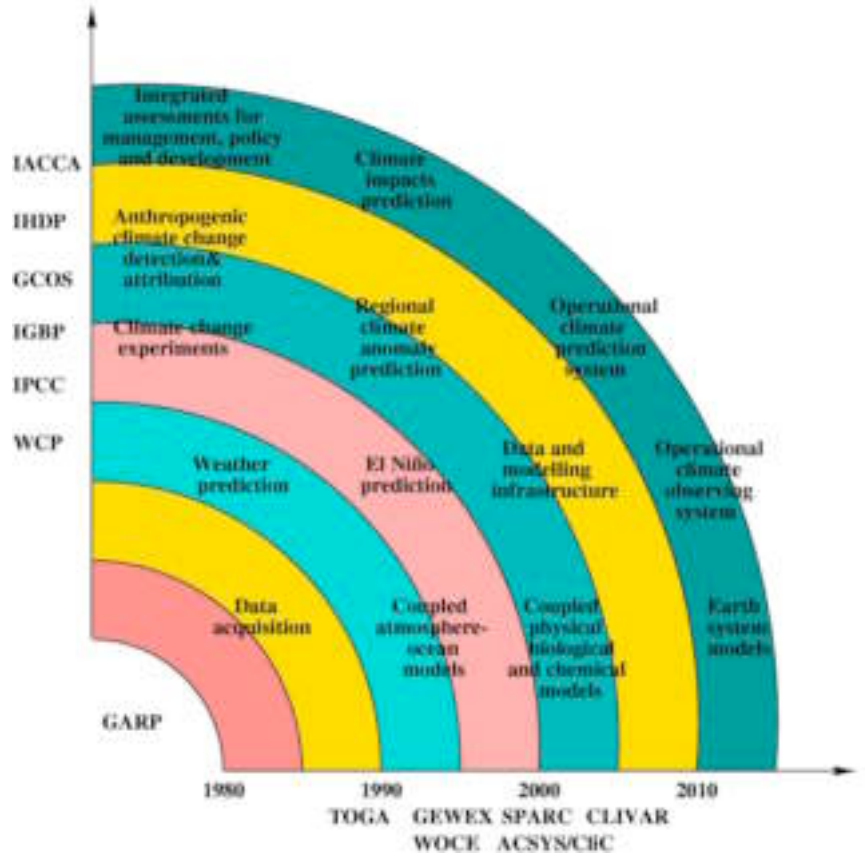


Float trajectories in the trop. Atl.
(Courtesy IfM-Geomar)

Some Challenges for WCRP in 2004

- **Address seamless prediction problem**
- **- weeks, decades, centuries**
- **Address prediction of the broader climate/Earth system**
- **Demonstrate the use to society of WCRP-enabled predictions**
- **Coordinate & implement activities to exploit**
- **- new & increasing data streams (environmental satellites; Argo system)**
- **- growth in capability & availability of computing**
- **- increasing complexity & breadth of models**
- **- increasing data assimilation ability**
- **Interact with other ESSP Programmes**

Long-Range Vision



Requirements:

- Earth system models
- improved modelling infrastructure
- operational climate (->Earth system) prediction centers
- operational climate (->Earth system) observing systems
- integrated assessment for management, policy and development

IPCC WGI TAR
High-priority areas for action

- **Systematic observations and reconstructions**
- **Modelling and process studies:**

  - Improve understanding of the mechanisms and factors leading to changes in radiative forcing

  - Understand and characterise the important unresolved processes and feedbacks, both physical and biogeochemical, in the climate system

IPCC WGI TAR
High-priority areas for action

- **Modelling and process studies (ctd.):**

  - Improve methods to quantify uncertainties of climate projections and scenarios, including long term ensemble simulations using complex models
  - Improve the integrated hierarchy of global and regional climate models with a focus on the simulation of climate variability, regional climate changes and extreme events
  - Link more effectively models of the physical climate and the biogeochemical system, and in turn improve coupling with descriptions of human activities