International CLIVAR/WCRP Report

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WCRP World Climate Research Programme

US CLIVAR Summit
Annapolis 23-25 July 2007

Climate Variability & Predictability CLIVAR World Climate Research Programme

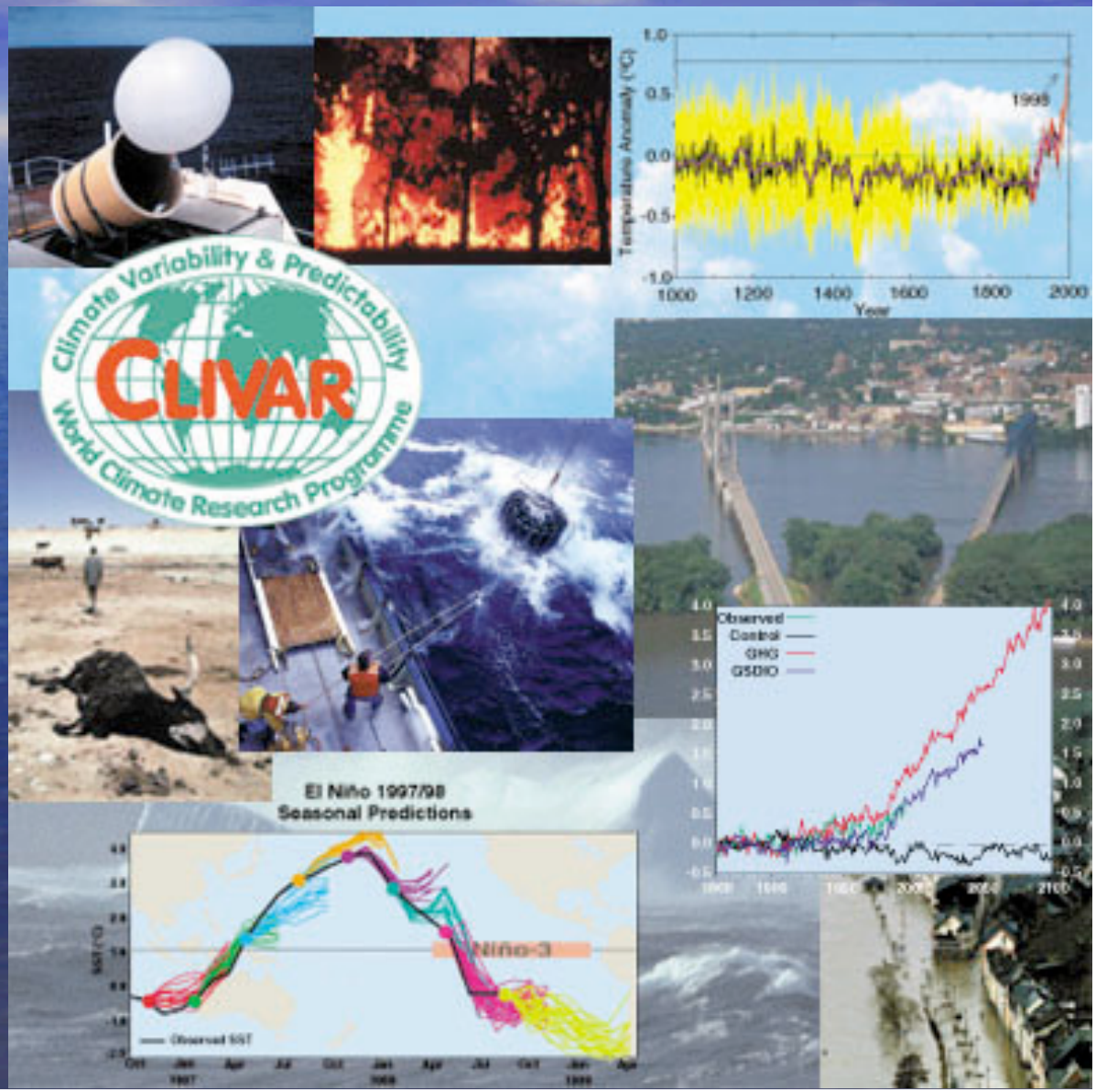
CLIVAR (Climate Variability and Predictability)

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.

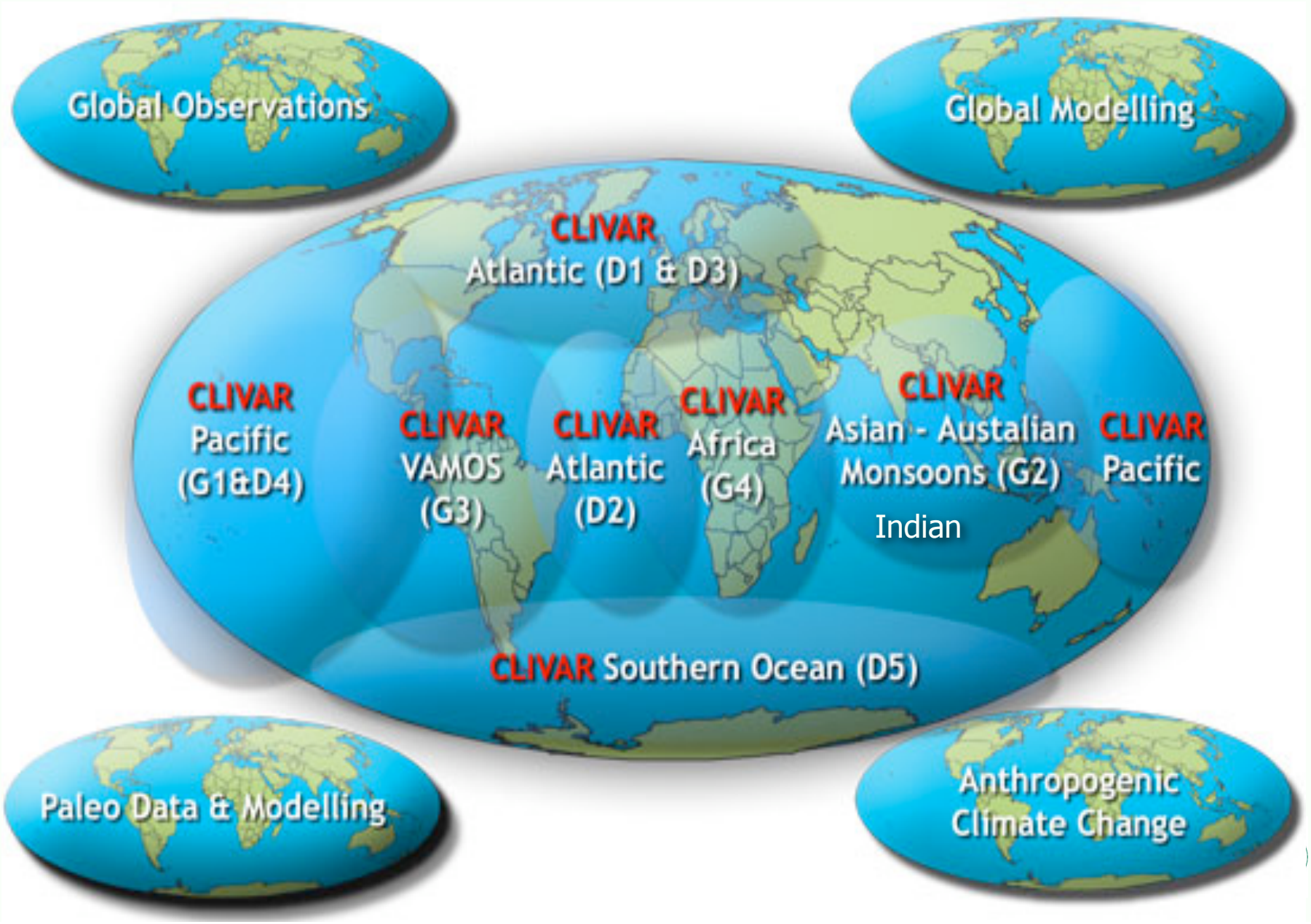
CLIVAR coordinates activities in support of its mission to observe, simulate and predict Earth's climate system, with focus on ocean-atmosphere interactions, enabling better understanding of climate variability, predictability and change, to the benefit of society and the environment in which we live.

Science -> Applications

http://www.clivar.org



CLIVAR - global view



CLIVAR 1998 →2013

WMP
WOAP
WGNE
WGCM
WGSF
IPAB

CliC 2000 →2015

WCRP

World Climate Research Programme

GEWEX 1988 →2012

SOLAS 2001 ->

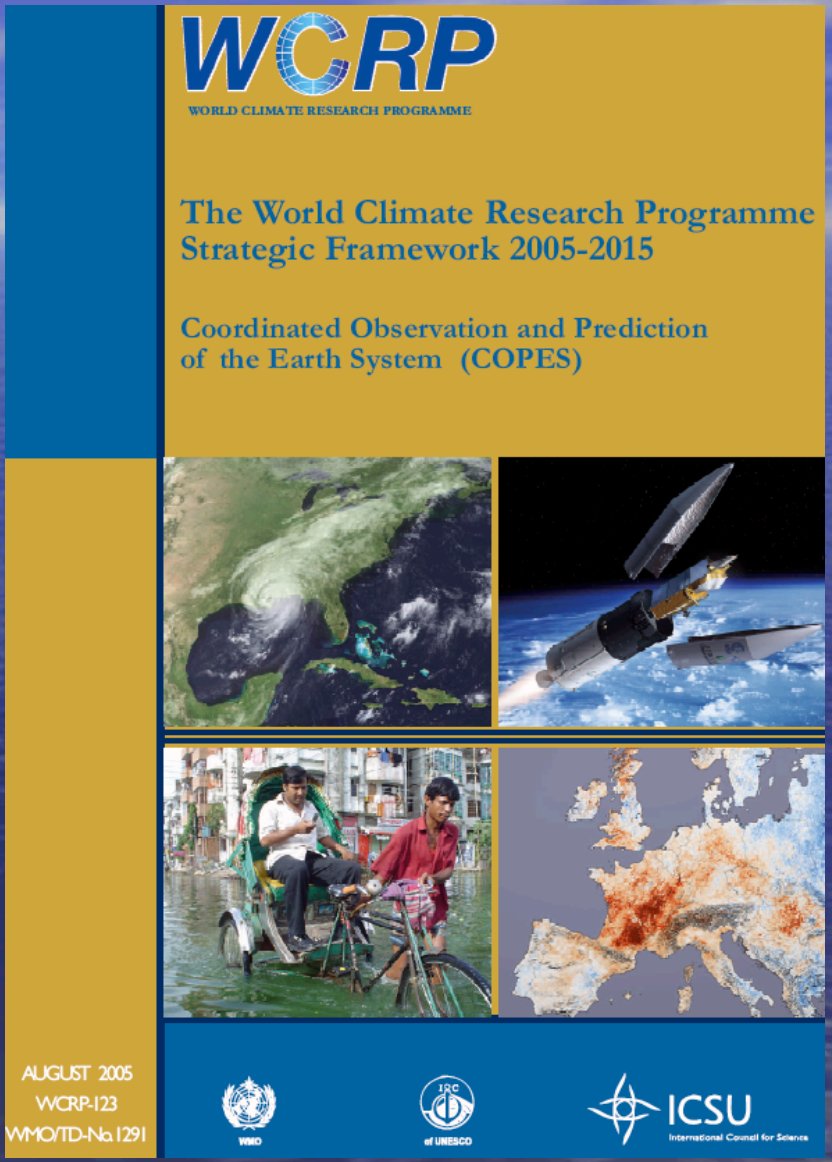
SPARC 1992→2010

WCRP Strategic framework 2005-15

Coordinated Observation and Prediction of the Earth System

- Reiterates WCRP objectives to determine the predictability of climate and the effect of human activities on climate

- Seeks to facilitate analysis and prediction of Earth System variability and change for practical applications of relevance to society



WCRP Strategic Framework

- Move from physics-only to Earth-System models (with IGBP)
- Prediction across all timescales “seamless prediction”.
- Develop sustained climate observing system with GCOS, GEOSS…
- Integration of models and data
  - Use of data assimilation to initialize models over widest range of climate prediction timescales possible
  - Synthesis through reanalysis (atmosphere, ocean, coupled)
- Link to applications through existing mechanisms (e.g. START, WCAP) & new ones
- Identifies need to develop cross-cutting activities between WCRP projects

WCRP Cross Cutting Topics JSC XXVIII, Zanzibar 2007

- Anthropogenic Climate Change (JSC-lead but key CLIVAR inputs)
- Atmospheric Chemistry and Climate (SPARC lead)
- Seasonal Prediction (CLIVAR lead)
- Monsoons (Joint CLIVAR/GEWEX lead)
- Decadal predictability (CLIVAR lead)
- Extreme Events and Climate (Joint CLIVAR/GEWEX lead)
- International Polar Year (CliC lead)
- Sea Level Rise (JSC-lead)
- Each topic has a JSC oversight group; key role of International Project Offices (with the JPS for WCRP) in management
- Seek to integrate and stimulate cross-WCRP activity
- Part of international CLIVAR share of WCRP budget set against cross cutting topic headings

CLIVAR SSGs 13 & 14

CLIVAR SSG-13 refocussed CLIVAR onto the 4 science themes of:

- ENSO and other modes of tropical variability
- Monsoons
- Decadal variability and the thermohaline circulation
- Anthropogenic climate change (ACC)
- Re-emphasized CLIVAR's responsibility for study of the role of the oceans in climate under WCRP
- CLIVAR's key role in climate modelling and prediction

SSG-14 developed a Roadmap ("Forward Look") for CLIVAR against these headings

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Anthropogenic Climate Change

WCRP/CLIVAR WGCM coordination of runs for IPCC

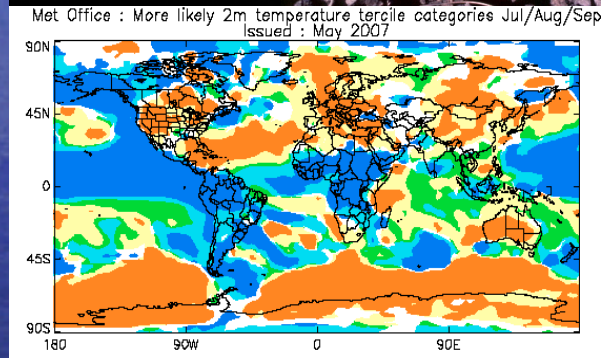
- WCRP/CLIVAR WGCM CMIP3 Archive for IPCC AR4 at PCMDI:

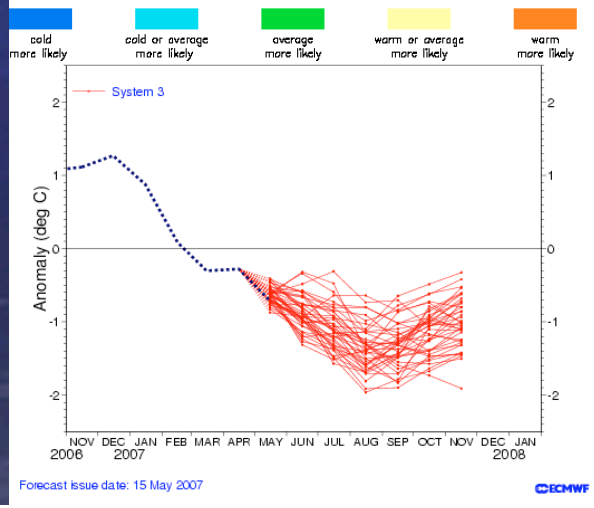
  IPCC climate projections widely available:
  > 1000 users,
  >550 diagnostic subprojects providing feed-in
  >260 publications,
  > 33 terabytes of data ready for download,
  >200 terabytes downloaded

- Additional CLIVAR contributions through:
  - CLIVAR/CCI Expert Team on Climate Change Detection
  - SSG encouragement of regional analysis of global runs by CLIVAR panels (individual scientist contributions)

Seasonal Prediction Cross Cut (CLIVAR lead)

- Key activity Pan-WCRP multi-model Global Seasonal Prediction Experiment -
  - Test of hypothesis that " there is currently untapped predictability due to the interactions and memory associated with all the elements of the climate system (atmosphere, ocean, land, ice).
  - Coordinated cross-WCRP/community global and regional analysis through diagnostic sub-projects
  - Launched at WCRP Workshop on Seasonal Prediction, Barcelona, Spain, 4-7 June 2007 - one output will be a consensus statement on SP
  - TFSP hand over coordination to WGSIP post workshop

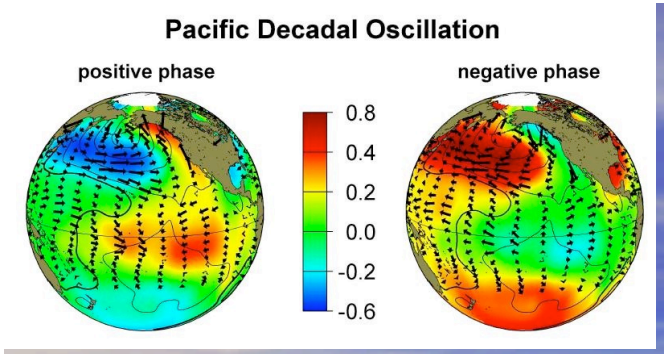




Monsoon cross cut CLIVAR/GEWEX lead)

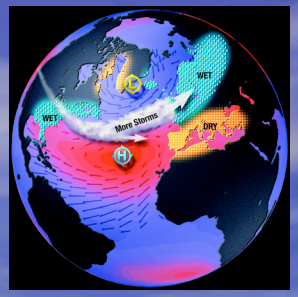
- Key CLIVAR inputs through its American*, Asian-Australian Monsoon & Variability of the African Climate System Panels
- GEWEX inputs through the CEOP Integrated Monsoon Study; MAHASRI; AMMA (also co-sponsored by CLIVAR) as a GEWEX CSE
- Year of Tropical Convection (YOTC): Various programmes spinning up in Asia including concept of an "Asian Monsoon Year"; US CLIVAR MJO WG activity
- JSC looking to integrate existing efforts in an overarching 5-year "Integrated Monsoon Study 2007-11" with global focus building on from AMY and YOTC and including links to THORPEX
- Scoping team - AMY and IMS Workshops September.

* Joint with GEWEX

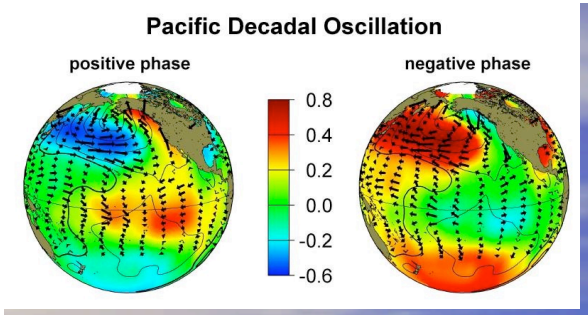


Decadal Prediction

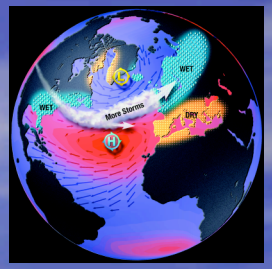
(CLIVAR lead)



- Scientific basis:
  - Decadal-scale variability seen in most climate records
  - In many cases associated with remote SST anomalies (e.g Sahel, US drought, E African rainfall linked to PDO)
  - Evidence for decadal predictability e.g EU PREDICATE project for N Atlantic/Europe; role of Atlantic MOC
  - Atlantic Decadal Predictability Workshop, GFDL, June 2006 - evidence from coupled GCMs that the AMOC partly predictable on decadal timescales
- Consider decadal modes of variability in the context of increasing greenhouse gas concentrations.
- Monitoring, prediction and understanding of Atlantic MOC key focus of CLIVAR's Atlantic Panel; Pacific Panels focus on PDO …



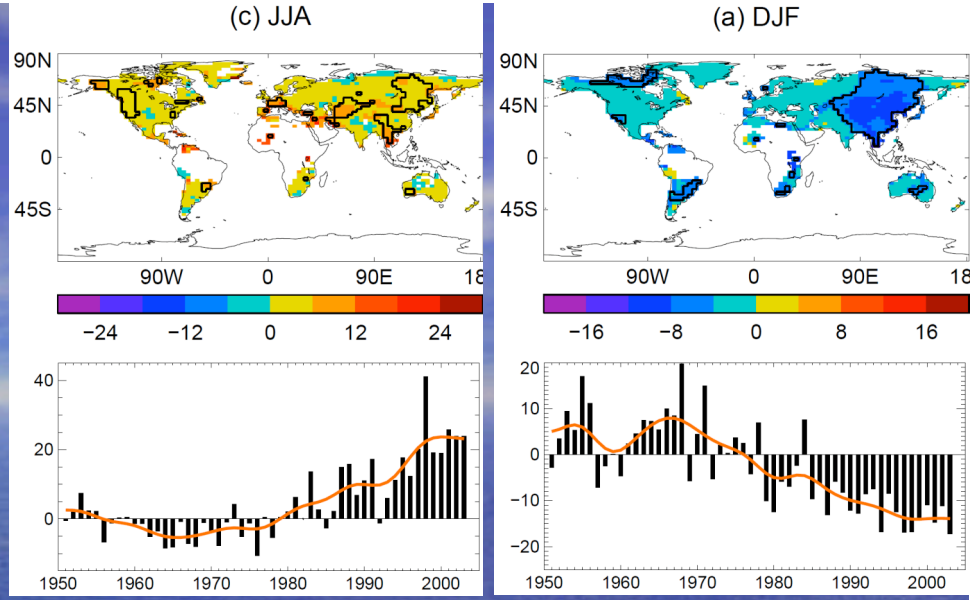
Decadal Prediction Activity



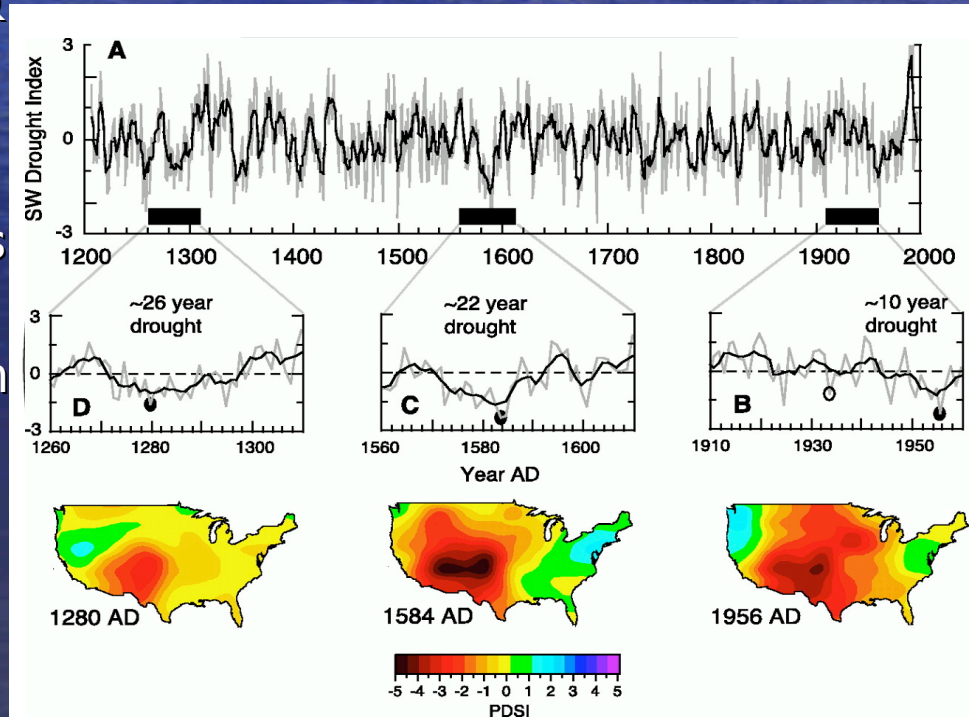
- Proposed cross-cut modelling activity (Tim Palmer)
  - Internationally coordinated multi-model decadal prediction experiment using coupled models
    - Seek to obtain ocean initial conditions through ocean syntheses
    - Initial dates from distinct decades with four 20-year 3-member ensemble hindcast runs designed to:
      - Gauge overall predictability arising from having different initial conditions and different GHG forcings
      - Provide two estimates of decadal predictability arising from different initial conditions & the same GHG forcing
      - Provide two estimates of the impact of GHG forcings …
  - Plus a series of short term climate projections (to 2030) for IPCC AR5 (under discussion)
- Coupled model runs driven jointly by WGCM and WGSIP
- Global and regional analysis through diagnostic sub-projects and CLIVAR ocean basin and other panels

Extreme Events and Climate
(CLIVAR/GEWEX lead)

- Contributions through:
  - CLIVAR/CCI Expert Team on Climate Change Detection and Monitoring
    - inputs to IPCC e.g via coordinated paper on observed changes in daily extremes of T & Ppn, incorporating results from capacity-building workshops
  - WGCM
    - Analysis of Extremes in AR4 runs
  - CLIVAR Pacific Panel/CP links
    - Long-term US drought in relation to decadal variability of Pacific SSTs
  - GEWEX WISE activity
    - Current focus on drought



Anthropogenic influence detected in indices of cold nights, warm nights, and cold days



JSC cross cut on Extreme Events and Climate (under discussion)

- Develop protocol for analysis of Extremes in models and observations, including appropriate definitions for extremes
- Through diagnostic sub projects seek to apply to analysis of Pan-WCRP Seasonal Prediction Experiment and Decadal Predictability runs and to observed data.
- Encourage and link to studies of both “acute” (e.g. windstorm, flood event) and “chronic” (e.g. drought) extremes in models and observations.
- In particular link to DRICOMP (joint workshop?)
- Seek to link to user needs e.g re-insurance, water agencies, impact studies …

CLIVAR SSG-15, Geneva, 11-14 September 2007
Co-chairs Jim Hurrell and Tim Palmer

- Review Panel and WG progress overall against sponsor needs
- Consider CLIVAR role in WCRP cross cuts
- Review CLIVAR Roadmap - focus down on specific activities and deliverables, including links to applications
- CLIVAR science beyond 2013, the legacy of CLIVAR and legacy activities
- CLIVAR structure and resources

- US CLIVAR representation - inputs appreciated

Climate Variability & Predictability

CLIVAR

World Climate Research Programme

Thank you

www.clivar.org

JSC-XXVIII, Zanzibar, March 2007

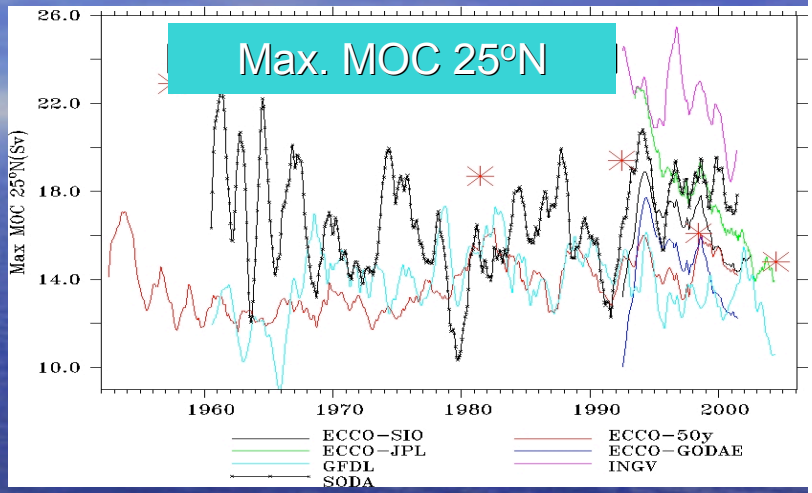
- Role of the JSC, WCRP future directions in the contexty of the Strategic Plan
- Review of WCRP "cross-cutting topics"
- Review of WCRP core projects (CLIVAR, CliC, GEWEX, SPARC)
- Reports of other WCRP activities
  - Overarching WCRP modelling and observation & assimilation panels
  - JSC-sponsored Working Groups (Coupled Modelling, Numerical Experimentation, Surface Fluxes)
- Review of Partner activities
  - Earth System Science Partnership
  - **GCOS, OOPC, GEO, THORPEX**
- African Networking day
- Budgets, sponsors views of WCRP priorities, memberships …
- Report on CLIVAR website

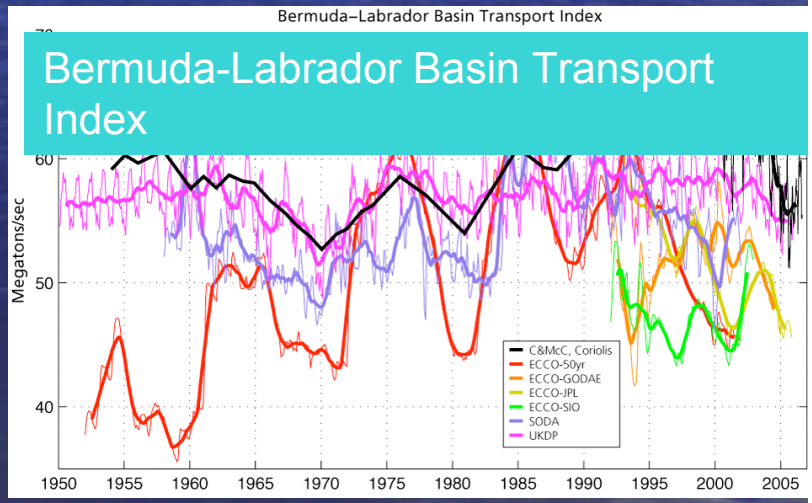
Global Synthesis and Observations Panel (GSOP)

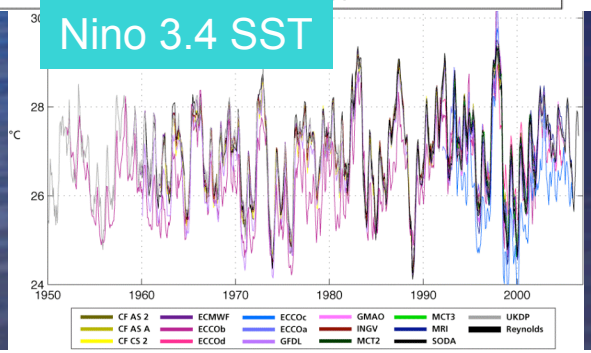
1st CLIVAR/GODAE Meeting on Ocean Synthesis Evaluation, ECMWF, Reading UK, 31 August to 1 September 2006

- Attracted some 38 [illegible]
- Products from 16 centres
- Identified strengths and weaknesses of current state of the art

2nd CLIVAR/GODAE Ocean Synthesis Evaluation Workshop, MIT, USA, 24-25 September 2007

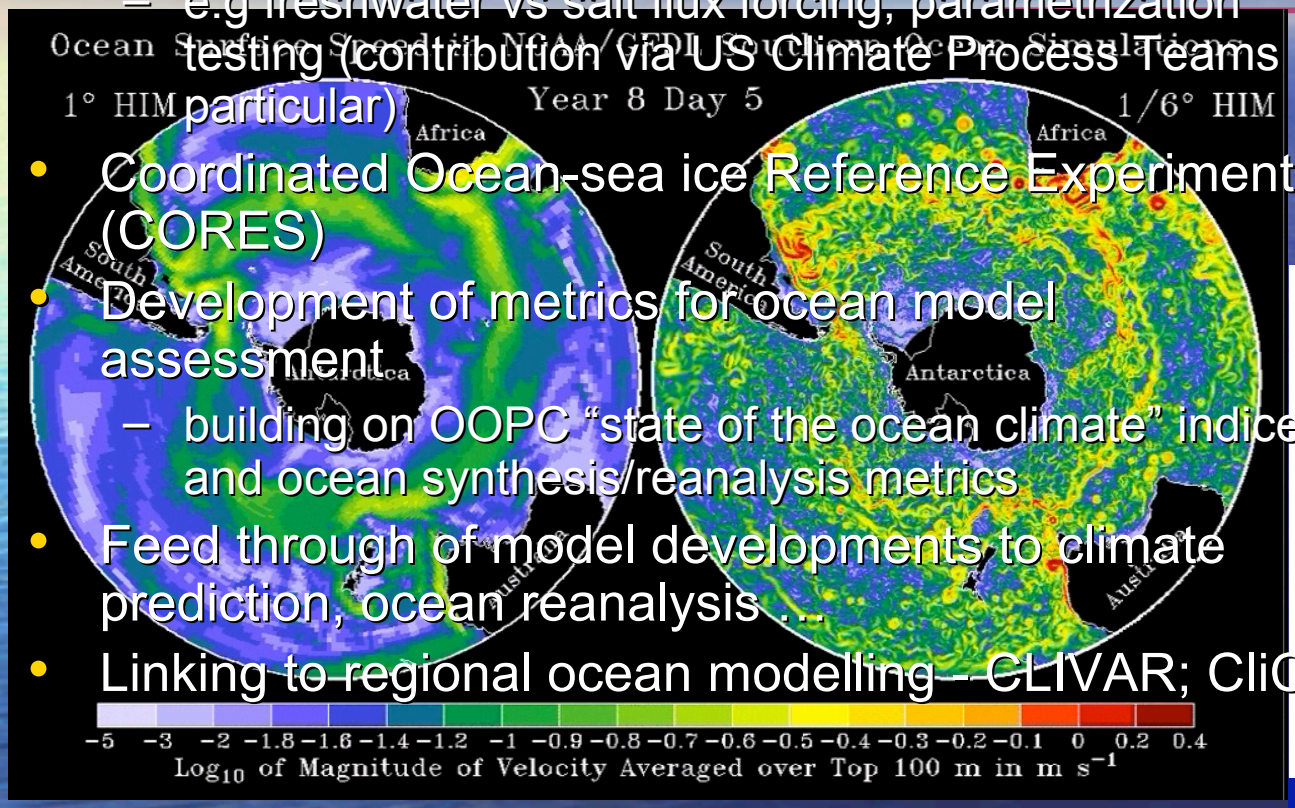


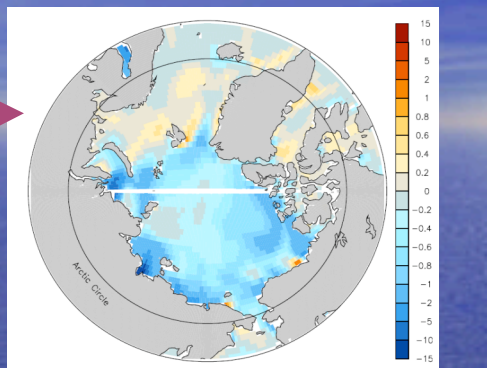


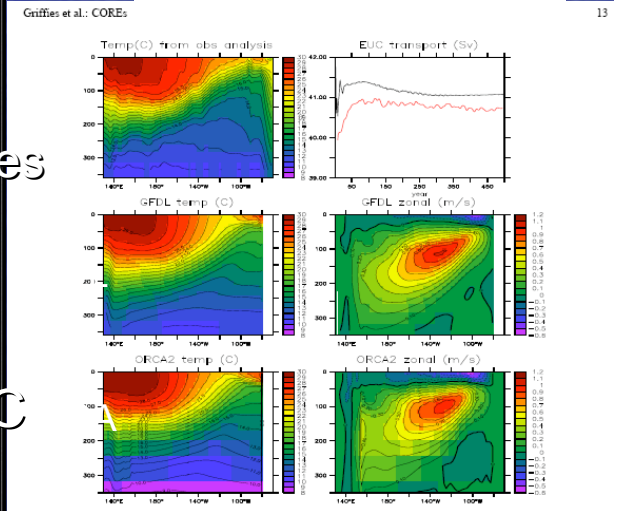


Working Group on Ocean Model Development: Assessment and applications

- Numerical Experimentation
  - e.g freshwater vs salt flux forcing; parametrization testing (contribution via US Climate Process Teams in particular)
- Coordinated Ocean-sea ice Reference Experiments (CORES)
- Development of metrics for ocean model assessment
  - building on OOPC "state of the ocean climate" indices and ocean synthesis/reanalysis metrics
- Feed through of model developments to climate prediction, ocean reanalysis …
- Linking to regional ocean modelling -- CLIVAR; CliC



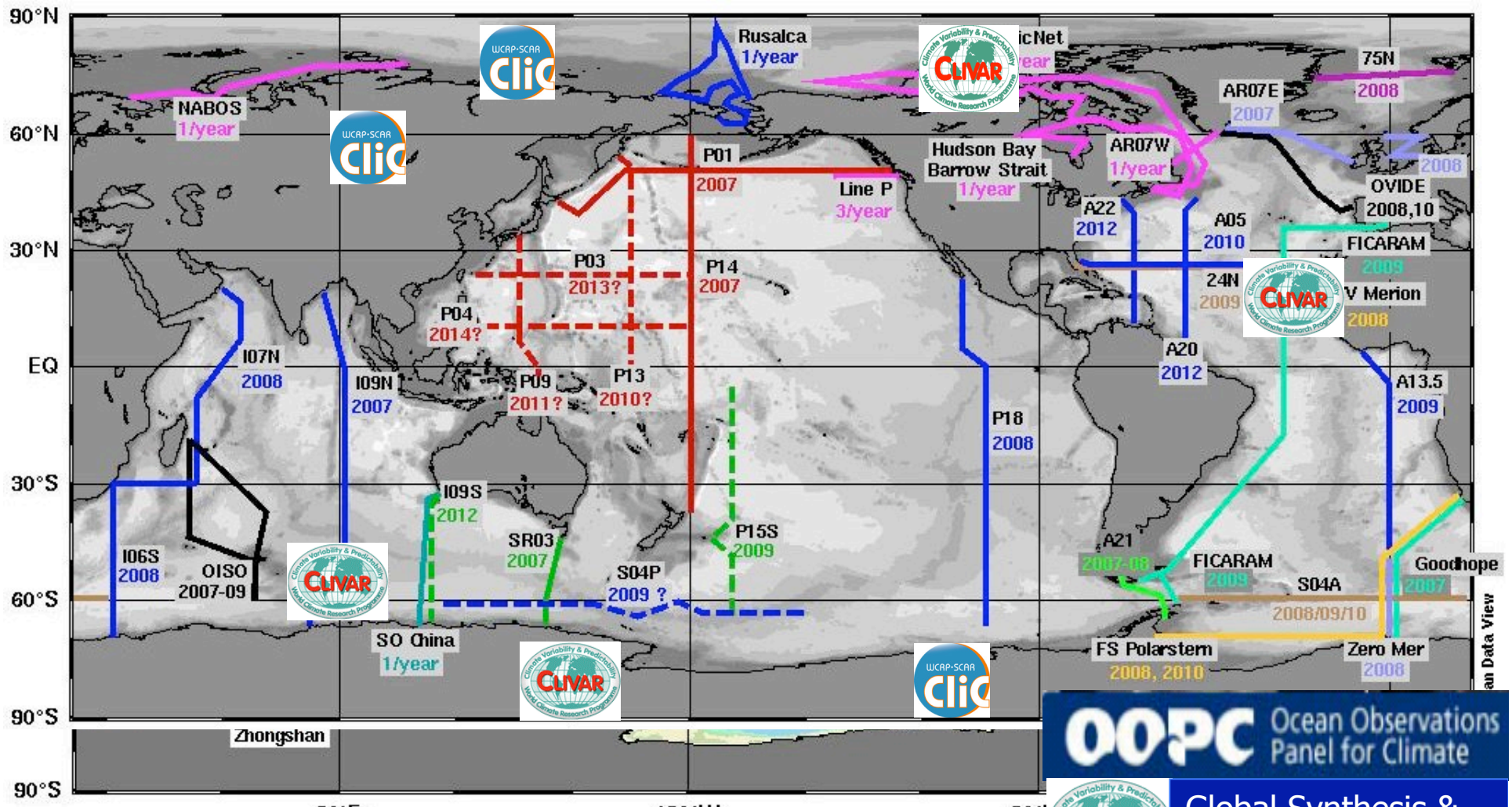




Comparison of simulations with observed - equatorial thermocline and undercurrent

Ocean timeseries, with IOC

Ocean Carbon, IOCCP of IOC



OOPC Ocean Observations Panel for Climate

Global Synthesis & Observations Panel

+ JCOMM & other systems

With IOC, GOOS

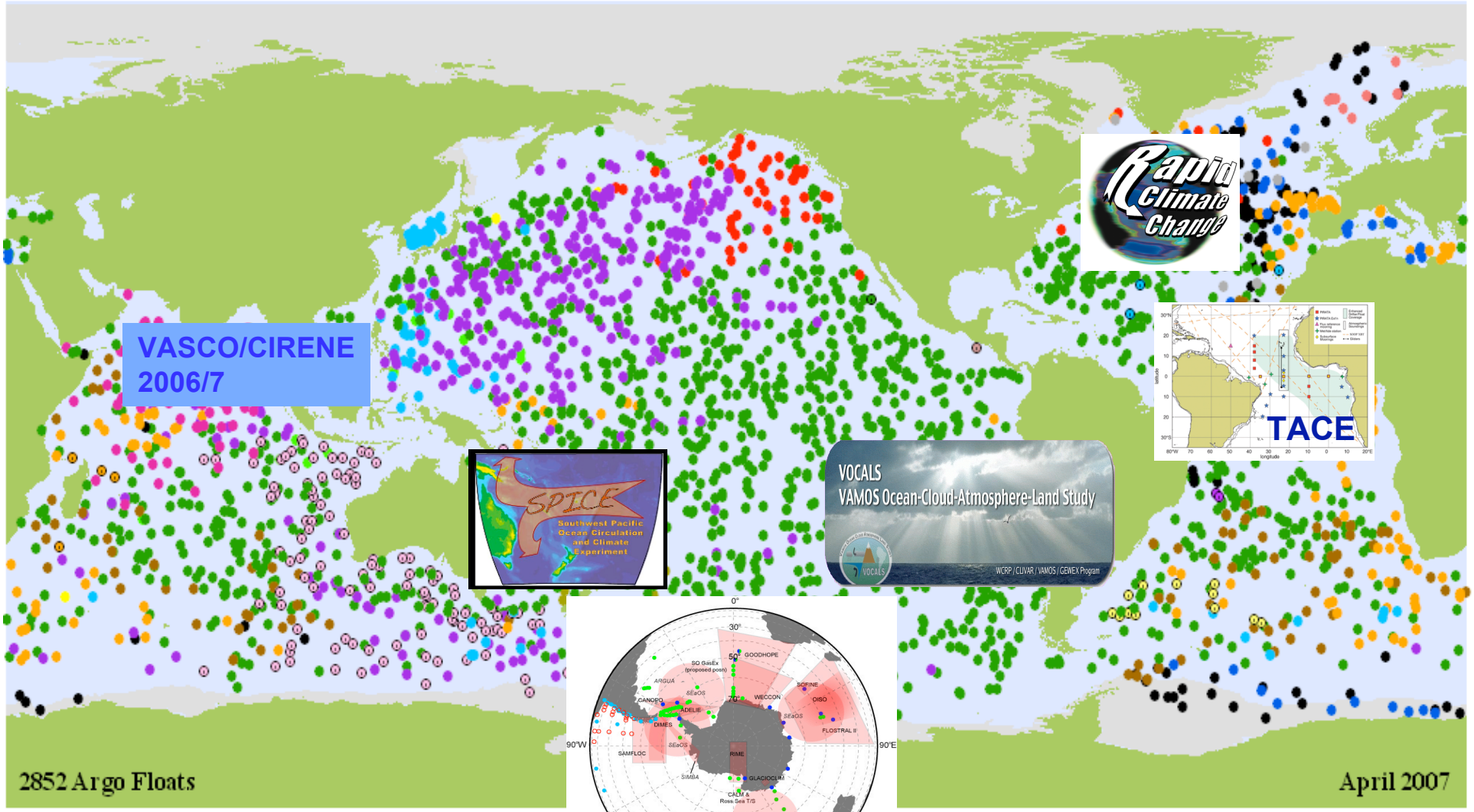
With SCAR, SCOR

2852 Argo Floats

ARGENTINA (12) · CHILE (8) · FRANCE (176) · JAPAN (384) · NETHERLANDS (10) · SPAIN
AUSTRALIA (137) · CHINA (14) · GERMANY (137) · SOUTH KOREA (102) · NEW ZEALAND (6) · UNITE
BRAZIL (2) · COSTA RICA (1) · INDIA (75) · MAURITIUS (4) · NORWAY (8) · UNITE
CANADA (89) · EUROPEAN UNION (41) · IRELAND (1) · MEXICO (1) · RUSSIAN FEDERATION (3)

Global Ocean Observing System

Ocean Process Studies



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jcommops