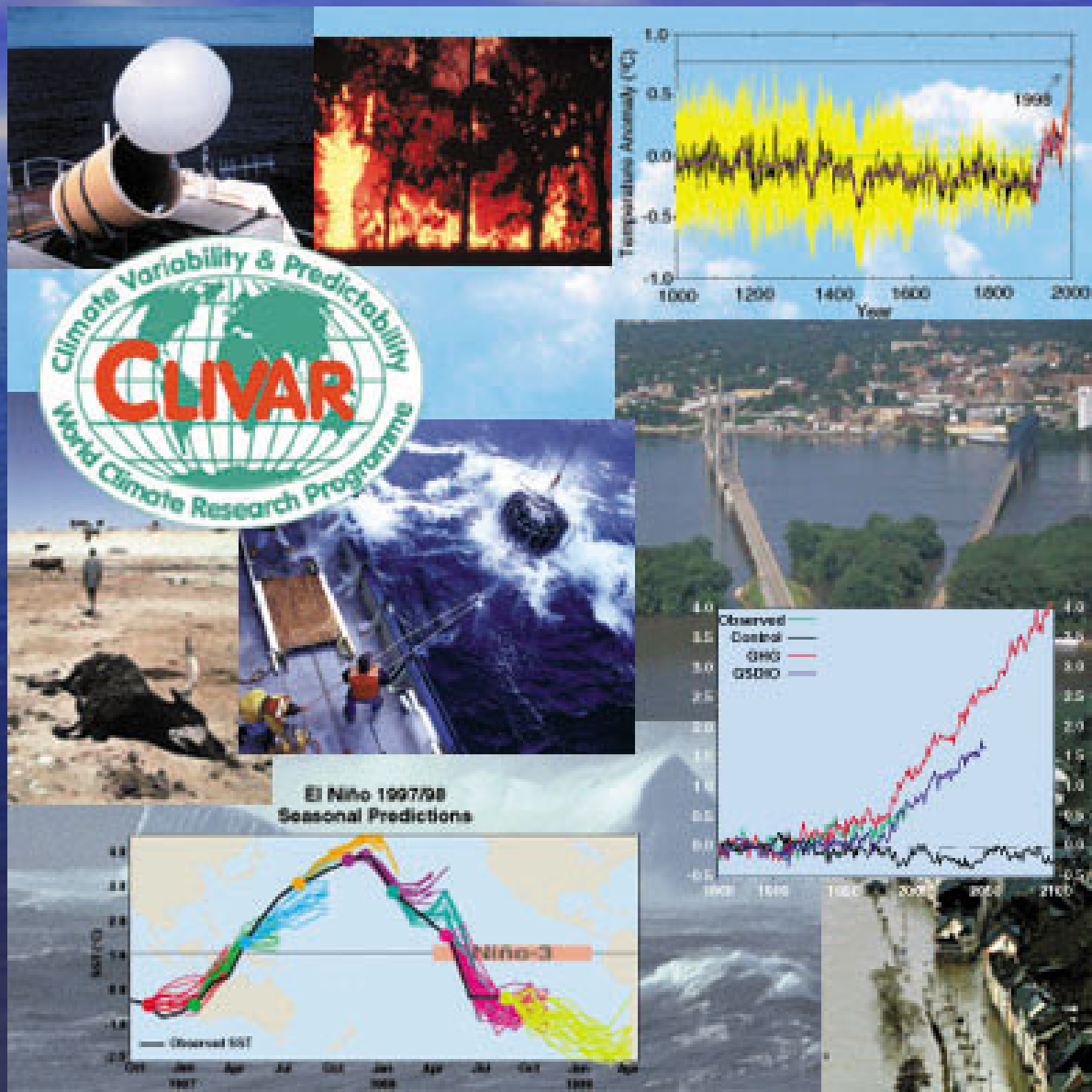


CLIVAR (Climate Variability and Predictability)

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>



CLIVAR 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

Advances in our knowledge of the coupled climate system require that we:

- Describe and understand the physical processes responsible for **climate variability and predictability on seasonal, interannual, decadal, and centennial time-scales**, through the collection and analysis of **observations** and the development and **application of models of the coupled climate system**, in cooperation with other relevant climate-research and observing programmes.
- Extend the record of climate variability over the time-scales of interest through the assembly of **quality-controlled paleoclimatic and instrumental data sets**.
- Extend the range and accuracy of **seasonal to interannual climate prediction** through the development of global coupled predictive models.
- Understand and predict the **response of the climate system to increases of radiatively active gases and aerosols** and to compare these predictions to the observed climate record in order to detect the anthropogenic modification of the natural climate signal.

CLIVAR 2004

1st International CLIVAR Science Conference
June 21-25, 2004, Baltimore, USA

Understanding and Predicting Our Climate System



The international research program on CLimate VARIability and predictability (CLIVAR; www.clivar.org) under the auspices of the World Climate Research Programme (WCRP), focuses on describing and understanding variability and change of the physical climate system on time scales from months to centuries and beyond. CLIVAR's goal is to assess predictability, and develop information systems and practical prediction capabilities.

The 1st International CLIVAR Science Conference will feature:

- **Invited overviews prepared by expert teams**
- **Stimulating invited presentations and discussion forums**
- **Contributed poster presentations (with special emphasis on young scientists' participation)**

Contributions are solicited on research topics that include, but are not limited to:

- **Advances in understanding elements of the climate system**
Seasonal-to-interannual variability, especially ENSO, monsoon systems, decadal (and longer) variability, and anthropogenic climate change
- **Looking into the past**
Analysis of paleoclimate records; reanalyses
- **New approaches to climate prediction**
Modeling, data assimilation, and validation
- **Improvements to the observing system**
- **Climate applications**
Who are our clients? What products and information do they need?

Organizing Committee

A committee of international scientists is organizing the conference. Leaders of this committee include:

- Lennart Bengtsson (Max-Planck-Institut, Hamburg) – Organizing Committee Chair
- Antonio Busalacchi (Univ Maryland) – CLIVAR Scientific Steering Group Co-Chair
- Jürgen Willebrand (IFM, Kiel) – CLIVAR Scientific Steering Group Co-Chair
- David Legler (US CLIVAR Office) – Local Organizing Committee Chair

Conference contact: info@clivar2004.org

www.clivar2004.org



Conference Statistics



- **650+ Attendees - the largest WCRP Conference ever!**
- **56 Countries**
- **650+ Posters**
- **35 Oral presentations**
- **9 Discussants**
- **4 Press briefings**
 - 17 panelists, 5 moderators
 - Several stories went to print...
- **80+ students, 16 poster awards**
- **14 Major sponsors**

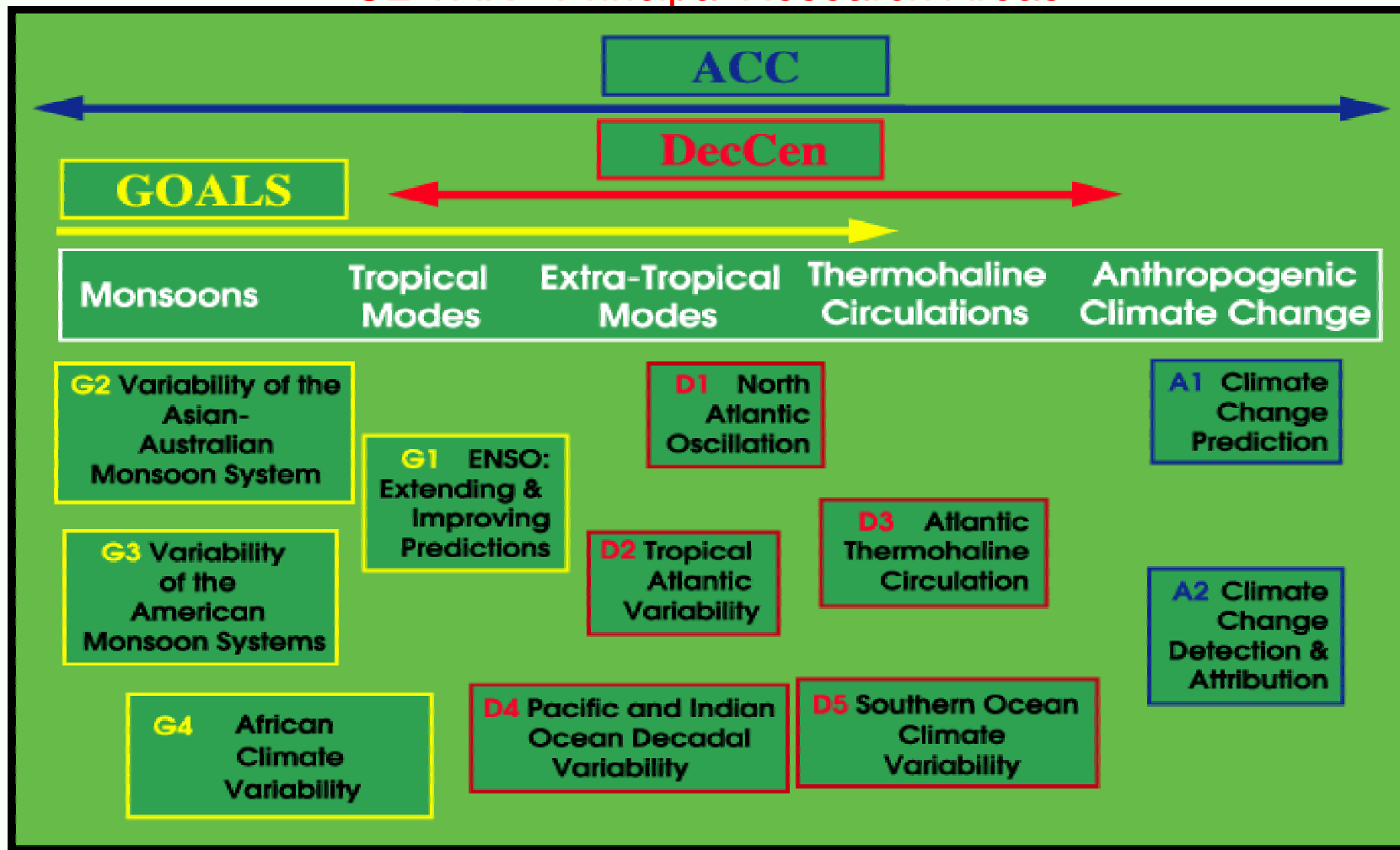


CLIVAR Assessment

- **Organised by:**
 - **CLIVAR streams (GOALS, DecCen, ACC) referenced to the Science & Implementation Plans and ToRs of Panels & WGs**
 - **Unifying streams of “Data” & “Modelling”**
 - **Overall programme structure & the ICPO**



CLIVAR - Principal Research Areas



CLIVAR Assessment

- **Organised by:**
 - **CLIVAR streams (GOALS, DecCen, ACC) referenced to the Science & Implementation Plans and ToRs of Panels & WGs**
 - **Unifying streams of “Data” & “Modelling”**
 - **Overall programme structure & the ICPO**
- **Team of 6 assessors and SSG liaisons**
- **Inputs**
 - **Panel & Working Group responses to questionnaire**
 - **CLIVAR web pages & documents**
 - **Reviewer/Panel & WG interactions**
 - **CLIVAR Conference**
- **Written & oral reports to CLIVAR SSG-13**
- **Subsequent analysis of outcomes**



Key outcomes of CLIVAR to date

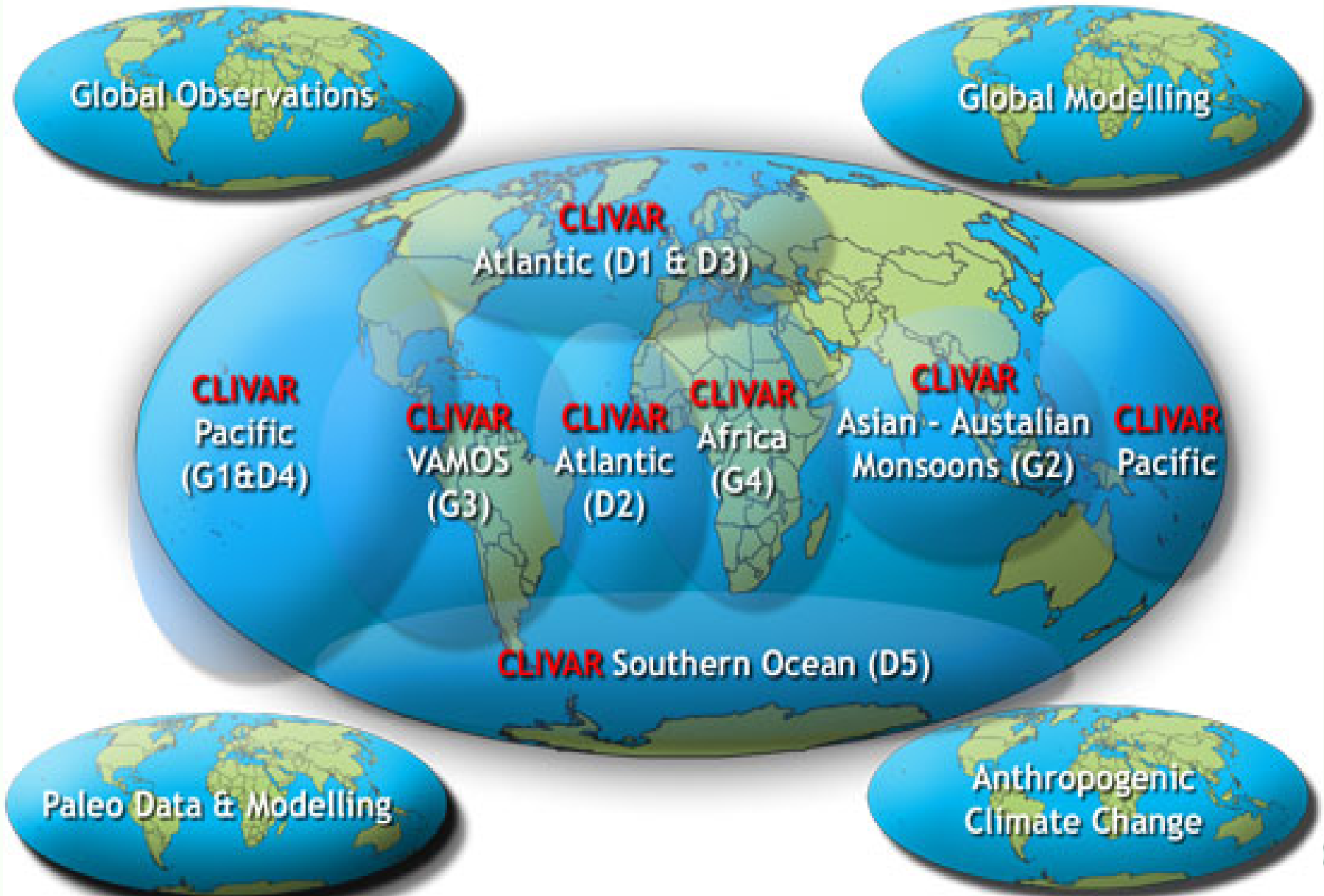
- Creation of a sustained demand for global ocean and atmospheric climate observations, in situ & remotely-sensed
- Global change model scenarios underpinning IPCC
- St Raphael Conference (Oceanobs'99) and definition of the approach to global ocean observations, e.g.,
 - Extension of buoy arrays into the Atlantic Ocean
 - Developing Indian Ocean climate observing system
 - New focus on ocean climate re-analysis
 - Global ARGO deployment
- Stimulated climate model development, e.g., CPT
- Routine operational seasonal forecasts, forecast system intercomparisons and development of ensemble prediction methods
- Experimental decadal prediction
- Focus on American monsoon systems and processes (VAMOS NAME & MESA)

Key issues of the CLIVAR Conference and Assessment: Science Foci

- **Regional analysis of global model outputs and feedback**
- **Regional/global synthesis & observation links**
- **Strengthen CLIVAR activity in ACC**
- **Links between process studies & model improvement**
- **Cross CLIVAR effort on climate indices**
- **Ocean observing strategy including hydrography & carbon links**
- **Ocean reanalysis activity & related data management issues**
- **Pan WCRP monsoon activity (with GEWEX)**
- **Applications of CLIVAR science**



CLIVAR - global view



Key outcomes of the CLIVAR Conference & Assessment Structure

“Think globally, act regionally”

Global observations, synthesis & modelling
GSOP - WGSIP/WGCM/WGOMD - CCD

Key CLIVAR foci
ENSO - Monsoons - THC/decadal - Anthropogenic climate change
Applications

Monsoon Panels
VAMOS - VACS - AAMP

Ocean Panels
Atlantic - Pacific - Indian - Southern Ocean



Key issues of the CLIVAR Conference and Assessment: Summary Response

- **On an annual basis CLIVAR progress will be assessed against four major global themes: ENSO, Monsoons, THC/Decadal and ACC. Each year a topical workshop will be held for one of the four themes.**
- **ACC representation to be increased on SSG**
- **Global perspective/framework to be provided by GSOP, WGSIP, WGCM, WGOMD, and CCD**
- **Global to regional perspective provided by Monsoon Panels for VAMOS, VACS, and AAMP and Ocean Basin Panels for Atlantic, Pacific, Indian, and Southern Oceans**



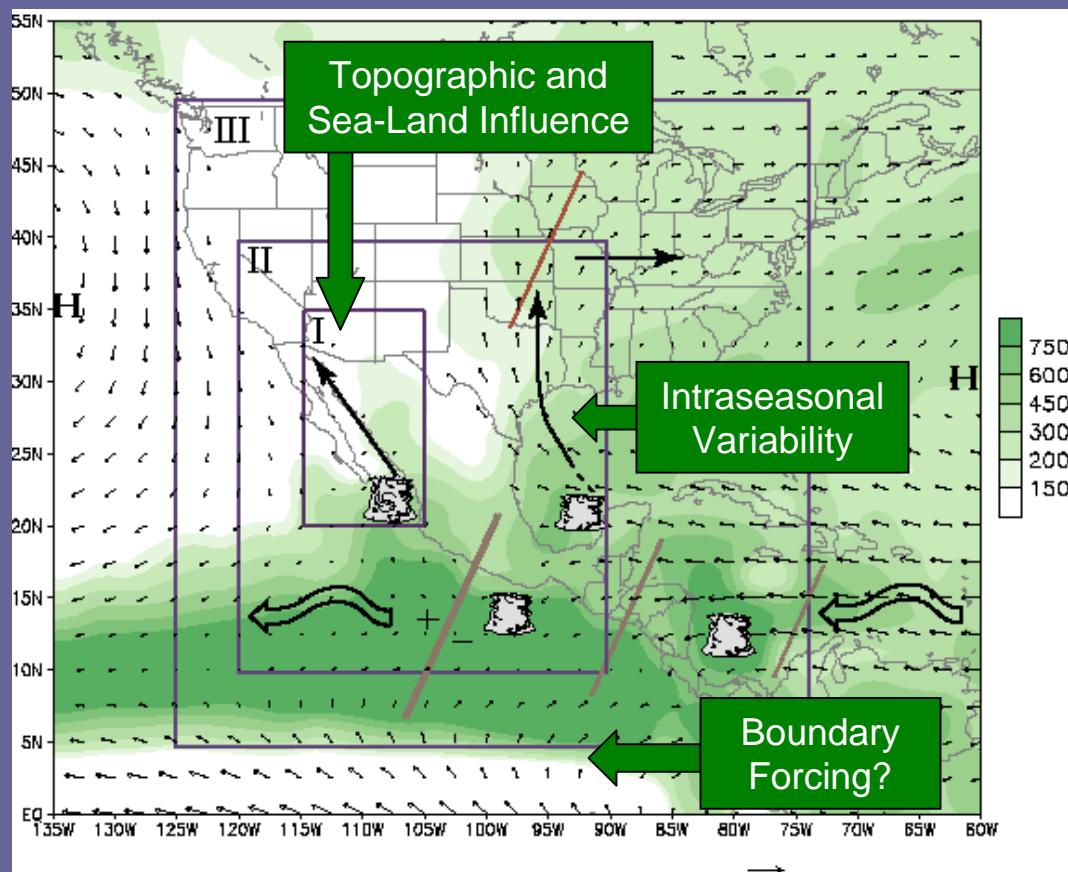
CLIVAR-CEOP Interactions and Comments on the CEOP Phase II Implementation Plan

- Given the first two CEOP key scientific objective *“to use enhanced observations to diagnose, simulate and predict water and energy fluxes and reservoirs over land on diurnal to annual temporal scales as well as apply these predictions for water resource applications”* and *“to document the seasonal march of the monsoon systems, assess their driving mechanisms, and investigate their possible physical connection”*

the greatest CEOP synergy with CLIVAR will be via its Variability of the American Monsoon System (VAMOS), Variability of the African Climate System (VACS) and Asian-Australian Monsoon Panels (AAMP).



NORTH AMERICAN MONSOON EXPERIMENT (NAME)



HYPOTHESIS:

The NAMS provides a physical basis for determining the degree of predictability of warm season precipitation over the region.

OBJECTIVES:

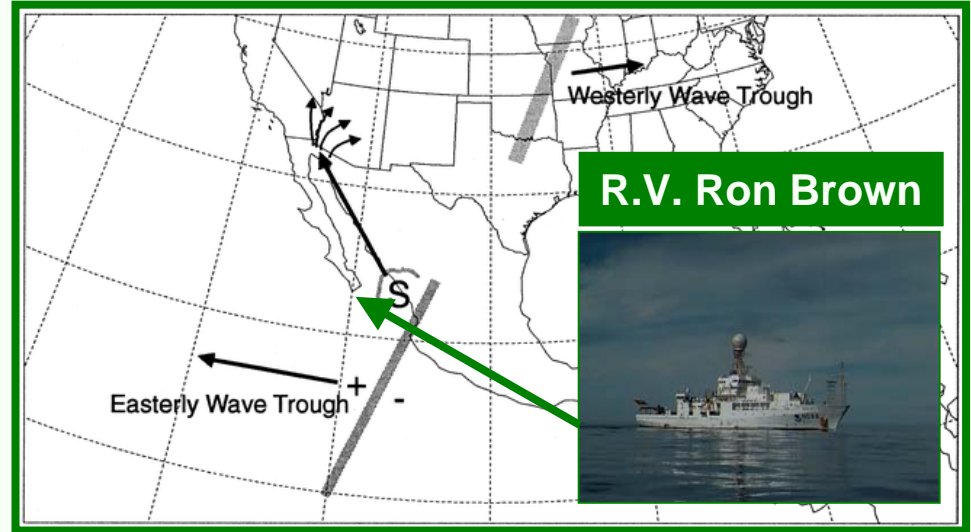
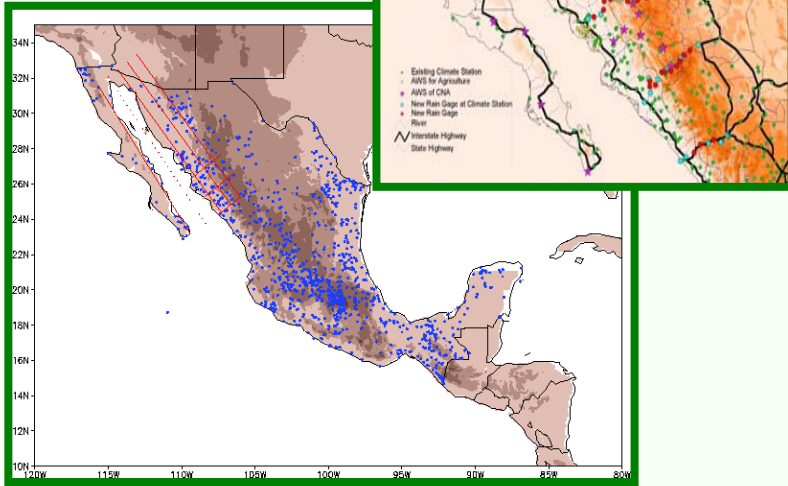
Better understanding and simulation of:

- warm season convective processes in complex terrain (TIER I);
- intraseasonal variability of the monsoon (TIER II);
- response to oceanic and continental boundary conditions (TIER III);
- monsoon evolution and variability (TIER I, II, III).

YEAR (2000+)	00	01	02	03	04	05	06	07	08
Planning	-----								
Preparations			-----						
Data Collection			-----						
Principal Research				-----					
Data Management					-----				

NAME 2004 FIELD CAMPAIGN

Enhanced Precipitation Gauge Network

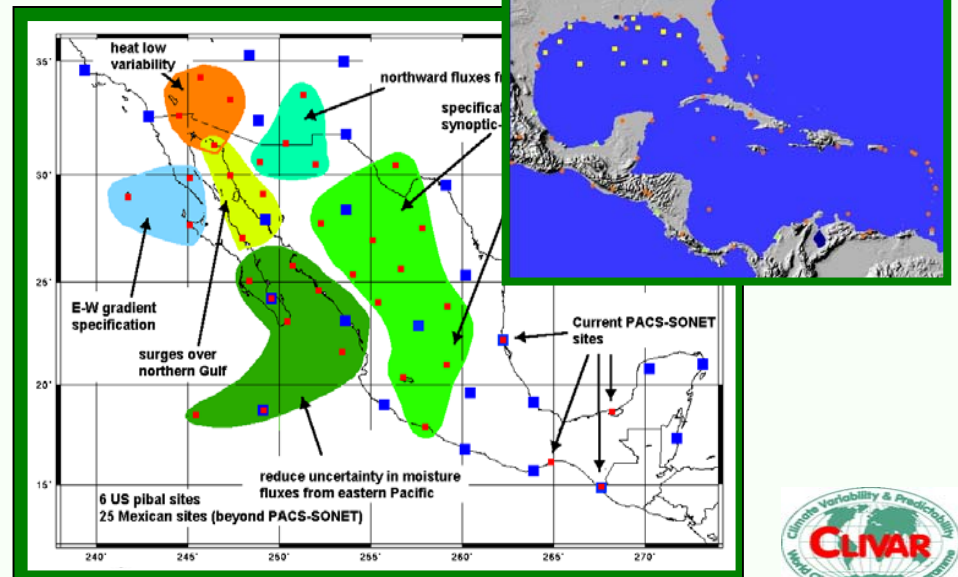


R.V. Ron Brown

Radar/Profiling/Radiosondes

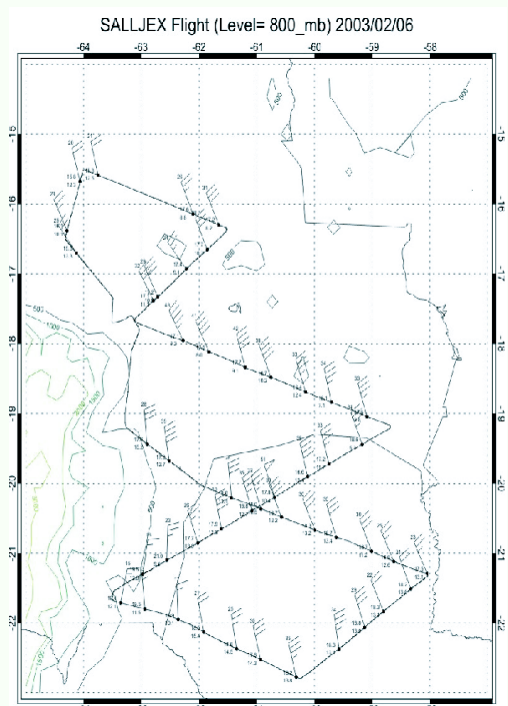
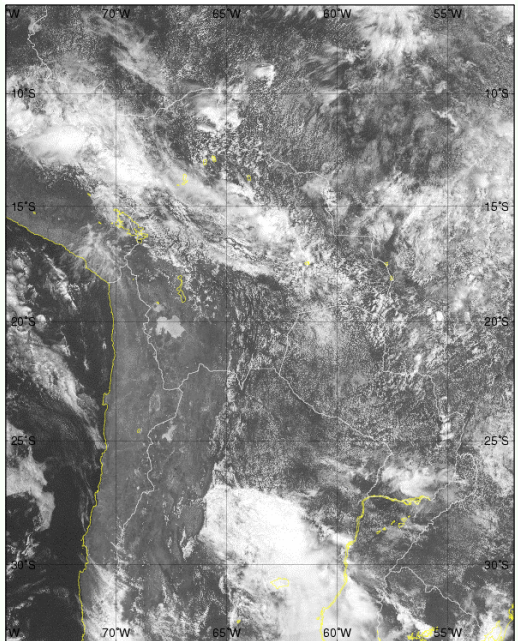
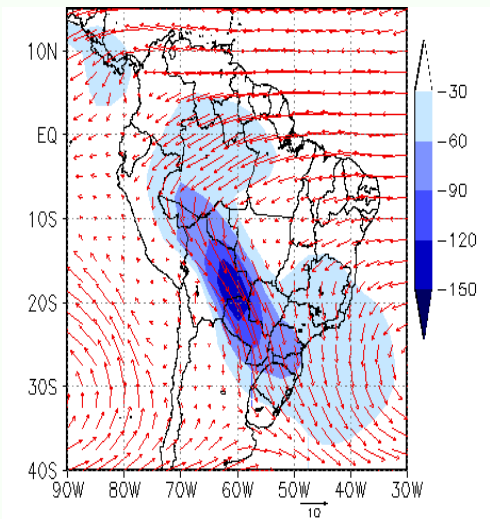


Radiosondes/PIBALS

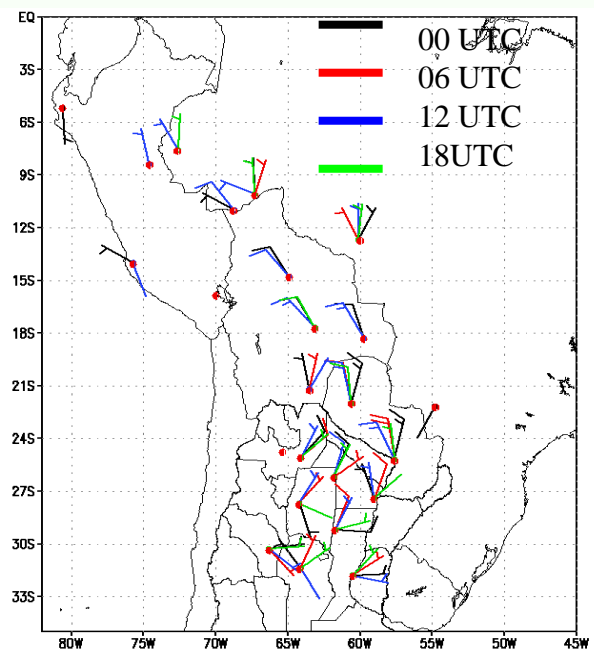


The South American Low-Level Jet

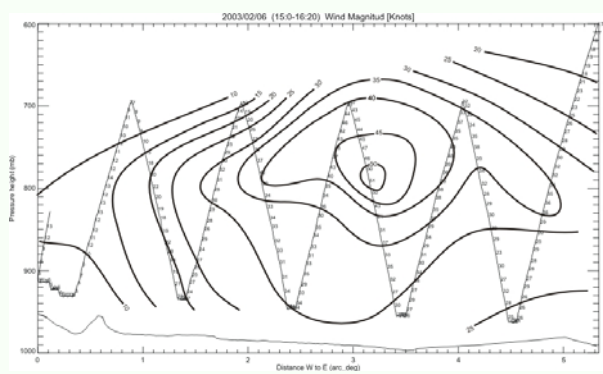
LLJ Composites NDJF,



SALLJ spatial structure depicted by NOAA/P-3 missions in SALLJEX



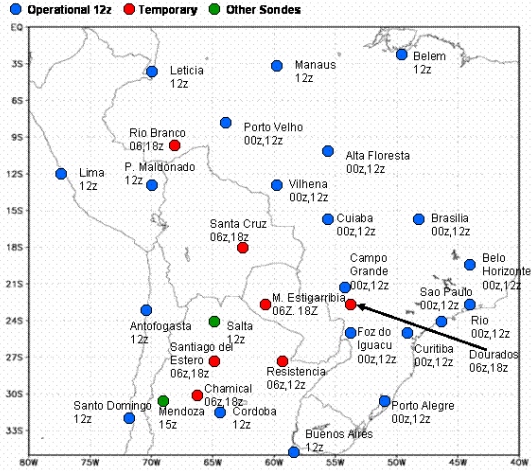
SALLJ diurnal cycle at 700 as depicted by SALLJEX observations



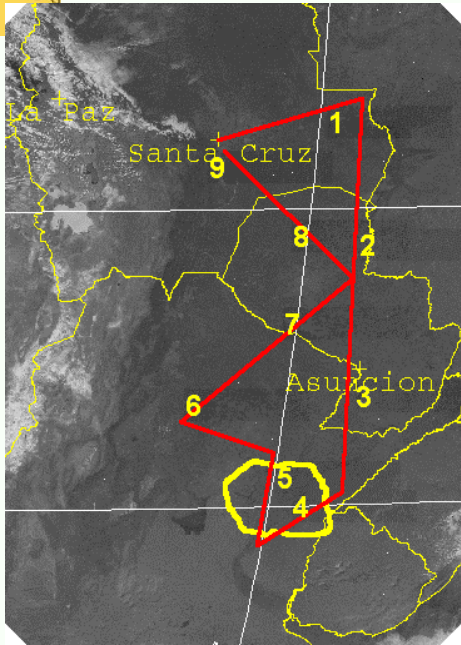
PIBALS



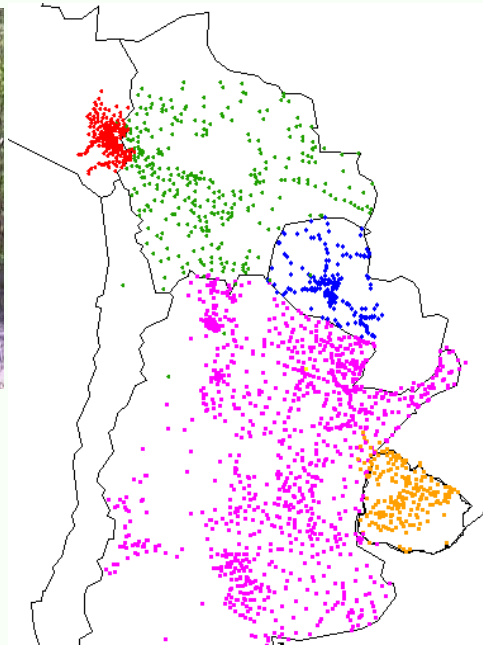
Radiosondes



NOAA/P-3 Missions



Enhanced precipitation gauge network



CLIVAR-CEOP Interactions and Comments on the CEOP Phase II Implementation Plan

- The CEOP Phase II unifying scientific theme focused on the diurnal cycle has the potential of bringing in some ocean aspects of CLIVAR especially as it pertains to land-atm-ocn interactions.
- However, the diurnal cycle as a unifying theme is not very evident in the context of this Implementation Plan.
- With respect to the Worldwide Integrated Study of Extremes (WISE) it is unclear how progress on “*factors that led to, sustained, and ended extremes*” can be determined without regard to the role of the ocean, as the first order cause of sustained large-scale drought is global SST anomalies.
- Within the context of WCRP/COPES a present shortcoming of CEOP would appear to be little acknowledgement or emphasis on the Indian Monsoon.



CLIVAR-CEOP Interactions and Comments on the CEOP Phase II Implementation Plan

- CEOP Data Management strategy has the potential to be the “backbone” data management approach for the whole of the WCRP.
- In order for CEOP to establish “an international framework for operating a sustained observational scheme of the **global** water cycle” it can never be truly global until the oceanic hydrological cycle is incorporated.



In conjunction with enhanced observations
 (note that the observations alone aren't sufficient – the analysis is required as well)

Global Water Cycle Satellite Constellation

