WCRP CLIVAR and Ocean Observations

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The overall mission of CLIVAR, the Climate Variability and Predictability Project of the World Climate Research Programme (WCRP) is to observe, simulate and predict the Earth's climate system, with a focus on ocean-atmosphere interactions. CLIVAR is a long-term, 15 year programme which began its implementation phase in 1998. Its role is to provide international coordination in areas of science that progress our understanding of climate variability and change and climate prediction.

The CLIVAR Scientific Steering Group (SSG) has overall responsibility for the implementation of CLIVAR and reports to the Joint Scientific Committee (JSC) of WCRP. The International CLIVAR Project Office acts as the executive arm of the CLIVAR SSG and is responsible for the day to day co-ordination of the scientific as well as administrative aspects of the CLIVAR programme.

The specific objectives of CLIVAR are:

- To describe and understand the physical processes responsible for climate variability and predictability on seasonal, interannual, decadal, and centennial time-scales.
- To extend the record of climate variability over the time-scales of interest through the assembly of quality-controlled paleoclimatic and instrumental data sets.
- To extend the range and accuracy of seasonal to interannual climate prediction and explore decadal predictabilty through the development of global coupled predictive models.
- To 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 is both global and regional in scope (see Fig. 1). Implementation of CLIVAR is carried out through the activities of its regional panels (one for each of the ocean basins, and one each for the American, African and Asian-Australian monsoon systems) and through its global modelling, observational and synthesis groups (see Fig. 2). Modelling activities within CLIVAR are focussed on coupled numerical model experiments on seasonal, decadal and centennial timescales, including prediction of the response to both natural and anthropogenic forcing. Special attention is given to assessing and improving predictions and facilitating their applications to society. A key question is how anthropogenic climate change will be influenced by, and modulate, climate variability and what the implications are for prediction out to decades and longer.

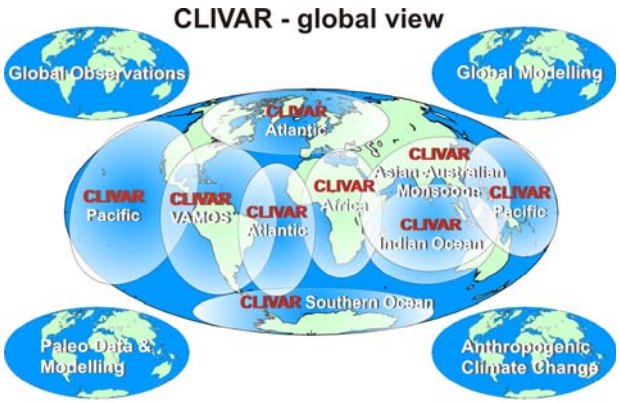

Fig. 1: The schematic diagram above summarizes CLIVAR's regional and global activities.

The CLIVAR SSG has recently reviewed the imperatives for CLIVAR research and agreed those to be as follows:

I - Anthropogenic climate change - Topics: Natural variability versus forced change; climate sensitivity and feedbacks; regional phenomena; extremes.
II – Decadal variability, predictability and prediction - Topics: Determine predictability; mechanisms of variability; role of the oceans including the impact of ocean variations on land, temperature, precipitation, etc; adequacy of the observing system; initialization; prediction uncertainty; drought.

III – Intraseasonal and seasonal predictability and prediction - Topics: Monsoons; El Niño-Southern Oscillation; tropical Atlantic variability; Madden-Julian Oscillation and Intraseasonal variability; prediction uncertainty.
IV – Improved atmosphere and ocean components of Earth System Models - Topics: Analysis and evaluation; climate process teams (process studies).
V – Data synthesis, analysis, reanalysis and uncertainty - Topics: Ocean; coupled data assimilation systems.
VI – Ocean observing system - Topics: Advocacy for sustained observations; development, implementation and system design.
VII – Capacity building - Topics: Contemporary workshops, summer schools, expert training.

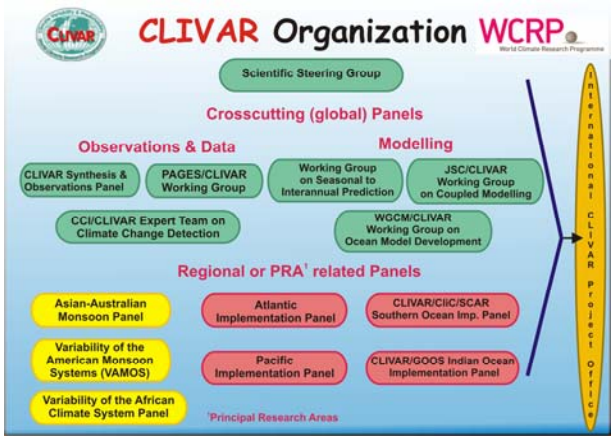

Fig. 2: The schematic diagram above summarizes the current structure of CLIVAR.

CLIVAR has overall responsibility for the role of the oceans in climate within WCRP. Sustained ocean observations (as well as ocean process studies) provide key inputs to CLIVAR activities and CLIVAR seeks to stimulate the continued development of the Ocean Observing System, in collaboration with the Global Ocean Observing System, the Ocean Observations Panel for Climate, the Global Climate Observing System and the Scientific Committee on Antarctic Research. It does this through the activities of its Atlantic, Pacific, Indian and Southern Ocean Basin Panels and its Global Synthesis and Observation Panel (GSOP). CLIVAR was an early co-sponsor (with the Global Ocean Data Assimilation Experiment) of the Argo profiling float array (Argo reached its target deployment of 3000 floats in October 2007) and is, for example, co-sponsor of OceanSITES, the Prediction and Research Moored Array in the Atlantic and the developing Indian Ocean sustained ocean observing network. In addition, following the World Ocean Circulation Experiment, CLIVAR established a set of recommended repeat hydrography lines. CLIVAR co-sponsors and participates in the Global Ocean Ship-based Hydrographic Investigations Panel development of a strategy for ship-based repeat hydrographic observations post CLIVAR.

Ocean modelling is a key component of CLIVAR's coupled modelling and seasonal prediction working groups for which ocean observations are needed for model development, initialization and validation. A key activity encouraged by CLIVAR, is the coordinated application of data assimilation systems to provide the integrated ocean syntheses and GSOP's programme to intercompare these. Ocean syntheses products have the potential to provide initial conditions for climate predictions on seasonal to decadal timescales, coordinated by CLIVAR's seasonal and coupled modelling working groups, and for validation and comparison of coordinated ocean-ice reference experiments by CLIVAR's Working Group on Ocean Model Development. Ocean observations also have a role in CLIVAR's wider activities in monsoon and African climate prediction.

Through GSOP and its ocean basin panels, CLIVAR works with the wider community to define the needs for global ocean observations. CLIVAR recognises that the need for ocean observations for climate services (and for society more widely) can only be met by the development and long term maintenance of the overall global ocean surface and subsurface observing networks.

Global sustained ocean observations both at the ocean surface and at depth are thus a key need for CLIVAR research and are essential for progressing its science, including:

- Monitoring, understanding and attributing climate variability and change.
- Diagnosing the ocean state - including changes in sea level rise, heat uptake and its redistribution by the ocean and changes in freshwater and mass transports.
- Understanding the interactions between oceans and atmosphere and the ocean's role in climate change.
- Provision of ocean initial conditions for seasonal to interannual prediction and decadal predictability studies.
- Model development and evaluation.

Further information on CLIVAR, its global panels, regional panels and working groups can be found at: http://www.clivar.org