



## Pan-CLIVAR Break-out sessions programmes

### **ENSO in a changing climate**

**Date:** Wednesday - 16th July

**Time:** 13:30hs

**Room:** Europe 1

**Conveners:** Eric Guilyardi, Wenju Cai

**Rapporteur:** Nico Caltabiano

The El Niño–Southern Oscillation (ENSO) phenomenon is a naturally occurring fluctuation that originates in the tropical Pacific region and affects ecosystems, agriculture, freshwater supplies, hurricanes and other severe weather events worldwide. Despite considerable progress in our understanding of the impact of climate change on many of the processes that contribute to ENSO variability, it is not yet possible to say whether ENSO activity will be enhanced or damped, or if the frequency or character of events will change in the next decades. Over the past few years, new promising methods have emerged, which can improve ENSO simulations, for example by bridging ENSO theoretical frameworks and CGCM modeling. Not only can these new methods and research areas help address the question of whether the characteristics of ENSO are changing in a changing climate, but potentially they can also improve reliability of decadal and centennial-scale climate projections and predictions on seasonal time scales.

### **Major research themes**

- Better understand processes that control ENSO characteristics in nature and in the models, namely diversity of El Niño events and decadal variations;
- Propose a standard ENSO evaluation protocol for CGCMs
- Understand how ENSO characteristics might be modified in the next decades, namely under the influence of anthropogenic climate change.

### **PROGRAMME:**

- Overview of the ENSO in a Changing Climate Research Focus (Eric Guilyardi)
- General Discussion

## **Dynamics of Regional Sea Level**

**Date:** Wednesday - 16th July

**Time:** 13:30hs

**Room:** Europe 2

**Conveners:** Detlef Stammer, Catia Domingues

**Rapporteur:** Han Lei

Global sea level rise is forecast to increase by more than 50 cm by 2100. This will have significant impacts for coastal cities, which currently are home to 60 % of the global population. Accurate predictions of regional sea level change on decadal to centennial time scales are therefore required for impact, adaptation and vulnerability assessments, especially for the coastal communities and ecosystems.

Observations are key to our understanding of sea-level changes in the past and present, but models are essential to obtain best projections of change in the future. Understanding these changes in terms of underlying physical and dynamical processes is essential for providing science-based information about the regional sea level change.

### **Major research themes**

- Contribution of wind-driven circulation change;
- Ocean – ice sheet interaction in Southern Ocean;
- Representation of gravitational attraction in climate models.



## **Decadal Variability and Prediction**

**Date:** Wednesday - 16th July

**Time:** 15:30hs

**Room:** Europe 1

**Conveners:** Yochanan Kushnir, Gokhan Danabasglu, George Boer

**Rapporteur:** Anna Pirani

There is a need to better understand decadal natural variability in the ocean and climate system and to explore the predictability of decadal changes and their interaction with the long-term climate change. This is increasingly important, as it is the timescale over which developed societies base significant decisions upon.

Better understanding of decadal variability and its potential predictability can be achieved through improved understanding of the driving mechanisms, monitoring, observation and modeling studies of ocean-climate system variability.

### **Introductory presentation**

[http://www.clivar.org/sites/default/files/documents/pan-clivar/pan\\_clivar\\_reports/Decadal\\_RF\\_Hague.pptx](http://www.clivar.org/sites/default/files/documents/pan-clivar/pan_clivar_reports/Decadal_RF_Hague.pptx)

NOTE: please copy and paste the link above to your browser



## **Attribution and Prediction of Extremes**

**Date:** Wednesday - 16th July

**Time:** 15:30hs

**Room:** Europe 2

**Conveners:** Lisa Alexander, Xuebin Zhang

**Rapporteur:** Valery Detemmerman, Rokkam Rao

In recent years, the occurrence of extreme events, and the associated damage caused to human and natural systems, has increased. Extreme events can be wide ranging in nature, from heat waves and droughts, to flooding and storm surges.

Natural climatic variations such as El Niño-Southern Oscillation and the North Atlantic Oscillation affect the frequency and intensity of extreme events on seasonal to interannual timescales. Furthermore, anthropogenic climate change has been related to changes in the frequency and intensity of extreme events.

### **CLIVAR contribution to WCRP GC on climate extremes**

- Data and indices development including coastal marine climate extreme indices
- Role of external forcings and internal variability for changes in intensity and frequency of climate extremes
- Factors contributing to the risks of particular extreme events
- Causes of drought changes in past and future
- Predictability of frequency/intensity of extremes at seasonal to decadal time scales
- Large scale phenomena for past and future changes in extremes

## **Planetary Heat Balance and Ocean Heat Storage**

**Date:** Thursday - 17th July

**Time:** 11:00hs

**Room:** Europe 1

**Conveners:** Karina von Schuckmann, Carol Anne Clayson

**Rapporteur:** Nico Caltabiano, Han Lei

Improving the accuracy of our estimates of Earth's climate state and variability is critical for advancing our understanding and prediction of the evolution of our climate. Determining exact values for energy flows in the Earth system is an area of ongoing climate research. There are independent measurement approaches based on remote sensing and in situ measurements and each approach has problems. While deriving budgets of the Earth's Climate, errors involved in deriving the single components can accumulate and have major impacts on the accuracy of climate indicators, leading to large imbalances in estimates of global Earth's climate budgets. There is merit in pursuing all methods, because confidence in the result will become high only when they agree or at least the reasons that they differ are understood. Reconciling the different approaches remains a challenge. Energy balance can also be estimated from climate models, which in turn require validation to provide confidence in their results. Only by using conservation and physical principles can we infer the likely resolution.

### **Major research themes**

- Earth Observation Measurement Constraints on Ocean Heat Budget;
- In situ observations of ocean heat content changes;
- Ocean reanalysis for atmosphere-ocean heat exchange and ocean heat content estimate.

### **PROGRAMME:**

- General overview and objectives of the research focus (Karina von Schuckmann)
- Earth Observation Measurement Constraints on Ocean Heat Budget (Lead: Carol-Anne Clayson with contributions from Pierre-Philippe Mathieu, Sergey Gulev, Martin Wild, Norman Loeb, Kevin Trenberth, Simon Josey, Karina von Schuckmann)
- In situ observations of ocean heat content changes (Lead: Karina von Schuckmann with contributions from Catia Domingues, Matt Palmer, Kevin Trenberth, Martin Wild, Norman Loeb, Martin Visbeck)
- Ocean reanalysis for atmosphere-ocean heat exchange and ocean heat content estimate (Lead: Keith Haines, with contributions from Anne-Marie Treguier, Bernard Barnier, Kevin Trenberth, Martin Visbeck, Maria Valdivieso)



## **Scoping for a CLIVAR Climate Dynamics Panel**

**Date:** Thursday - 17th July

**Time:** 11:00hs

**Room:** Europe 2

**Conveners:** Matt Collins, Shoshiro Minobe

**Rapporteur:** Anna Pirani

CLIVAR is a WCRP project focused on the ocean and climate. Its mission is “To improve understanding and prediction of the ocean-atmosphere system and its influence on climate variability and change, to the benefit of society and the environment.” CLIVAR is organized around Panels and Research Foci, through which the core CLIVAR capabilities are facilitated. Jointly, the Panels and Research Foci provide a mechanism for the project to address long-standing challenges and at the same time remain flexible and responsive to new ideas and opportunities. “Research Foci” usually relate to topics requiring cross-panel/project interactions, while the Panels at the same time ensure that core CLIVAR science topics continue to be addressed.

During the 34th WCRP JSC meeting, when all core projects presented their plans, it became apparent that a gap in the WCRP structure exists with regards to the domain of atmospheric/climate dynamics research. CLIVAR responded by proposing a possible way forward by creating a new Climate Dynamics Panel to be finally discussed and decided at JSC 35.

This new panel would focus on the large-scale dynamics of climate variability and change over seasonal, interannual, multidecadal to centennial timescales, for example, addressing annular modes, storm track dynamics, teleconnections, and mid-latitude air-sea interactions. It is envisioned that this panel would have linkages with several other CLIVAR panels, and within WCRP with SPARC DYVAR, GEWEX (GASS), CliC, WGNE, WGCM, WGSIP, WGOMD, and the Monsoons Panel.

A team of experts was asked to scope brief details on the rationale, potential activities and anticipated impacts of the panel, as well as a proposed panel composition.

## **Variability and Predictability of Monsoon Systems**

**Date:** Thursday - 17th July

**Time:** 13:30hs

**Room:** Europe 1

**Conveners:** Andy Turner, Dave Gochis

**Rapporteur:** Carlos Ereño, Rokkam Rao

Monsoon systems are a major mode of seasonal climate variability driven by variations in temperature between the land and the ocean, determining the wet and dry seasons for much of the tropics. Ocean atmosphere coupling (e.g. El Niño / La Niña events) and associated variations in sea surface temperature affects the occurrence of monsoon systems. Monsoonal variability, from complete failure, to greater than average rainfall, over seasonal and inter-annual timescales, can have profound impacts on food security, water supplies and national economics. Consequently, it is important to accurately simulate and predict monsoonal system dynamics.

### **Major research themes**

- Better constraint of modelled monsoon variability and change based on observation-informed process studies;
- Improving models to better represent the key processes involved in monsoon intraseasonal and inter-annual variability, including El Niño-Southern Oscillation and the Indian Ocean Dipole;
- Extending efforts to improve predictions of monsoon variability and change using land surface modelling and incorporation of land surface initialisation;
- Improving the physical understanding of monsoon decadal variability in the context of natural variations and anthropogenic change.

## **Biophysical Interactions and Dynamics of Upwelling Systems**

**Date:** Thursday - 17th July

**Time:** 13:30hs

**Room:** Europe 2

**Conveners:** Ken Drinkwater, Enrique Curchitser

**Rapporteur:** Nico Caltabiano

Upwelling systems bring nutrient rich waters from the deep ocean to the surface. Areas of upwelling are often associated with highly productive oceanic regions, offering great economic value in terms of fisheries. Regions of upwelling are located in equatorial (Inter Tropical Convergence Zone, ITCZ) and coastal (west coast Pacific and Atlantic) regions of the ocean.

Upwelling is driven by ocean surface winds. Consequently climatic events, causing shifts in prevailing winds (e.g. El Niño and Tropical Atlantic Variability) can cause variations and reduction in the strength of upwelling systems. Present models of upwelling systems show large biases, with implications for climate simulations.

### **Major research themes**

- Identifying the key physical processes that are responsible for upwelling and improving their representation in models;
- Coupled interactions between the physical, biogeochemical and marine ecological systems;
- Identifying the cause of tropical bias in climate models;
- Understanding how upwelling systems will change in the future, including changes in the biology and biogeochemistry associated with upwelling.





## **Sustained Ocean Observations**

**Date:** Thursday - 17th July

**Time:** 15:30hs

**Room:** Europe 1

**Conveners:** Martin Visbeck, Katy Hill

**Rapporteur:** Nico Caltabiano, Han Lei

### **PROGRAMME:**

15.30: Introduction (Martin Visbeck)

15.40: Atlantic Basin (Peter Brandt)

15.55: Indian Ocean Basin (M. Ravichandran)

16.10: Pacific Basin (Alex Ganachaud)

16.25: Southern Ocean Basin (Lynne Talley)

16.40: Discussion.



## **Ocean Model Improvements and Process Studies**

**Date:** Thursday - 17th July

**Time:** 15:30hs

**Room:** Europe 2

**Conveners:** Gokhan Danabasoglu, Steve Griffies

**Rapporteur:** Anna Pirani

### **PROGRAMME:**

- Some capabilities that OMDP can offer:
  - Brief review of ocean / climate models
  - CORE frameworks for CLIVAR science
  - CVMix (Community ocean Vertical Mixing) framework
  - CPT (Climate Process Team) concept
- Addressing ocean modeling needs of CLIVAR panels and research foci; addressing biases that can benefit from coordinated activities. Topics include:
  - Southern Ocean biases,
  - North Atlantic biases, i.e., Gulf Stream and North Atlantic Current paths,
  - Warm biases off the west coasts of continents (upwelling)
  - Ocean physics and BGC interactions, e.g., Oxygen minimum zones
  - Impacts of tropical cyclones,
  - Additional topics that will emerge during Monday and Tuesday.



## **Climate Information and Regional Engagement**

**Date:** Thursday - 17th July

**Time:** 15:30hs

**Room:** Asia

**Conveners:** Clare Goodess, Bruce Hewitson, Francisco Doblas-Reyes, Lisa Goddard

**Rapporteur:** Valery Detemmerman, Roberta Boscolo

This session provides an opportunity for the CLIVAR community with the help of GEWEX to help frame and move towards implementation of the WCRP Regional Climate Information Grand Challenge (RCIGC). Please see the Powerpoint presentation (link below) for background information.

([http://www.clivar.org/sites/default/files/documents/pan-clivar/pan\\_clivar\\_reports/Regional\\_GC\\_Hague.pptx](http://www.clivar.org/sites/default/files/documents/pan-clivar/pan_clivar_reports/Regional_GC_Hague.pptx))

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In particular, the convenors seek participants' input in identifying a limited number of specific and tractable research initiatives within this GC (which might be expressed as scientific questions). The emphasis is on advances and innovation in climate information (which is not the same as climate data) on regional to local spatial scales.

We also seek your help in finalising the criteria by which we define and select these initiatives. The currently proposed criteria are that initiatives should:

- Address the first three research Frontiers proposed in the original White Paper through the 'lens' of Frontier 4 (see PPT for explanation)
- Focus on issues which can be addressed from a cross-regional and cross-timescale (i.e., cross-Frontier) perspective
- Address fundamental knowledge issues which
  - Are holding back our scientific understanding and/or
  - Would maximise the value content of regional climate information for decision makers

We encourage all participants to think about these issues in advance of the break out session. If you have a specific idea for a research initiative that you would like to send the convenors in advance and might be prepared to present briefly during the session, please email Clare Goodess ([c.goodess@uea.ac.uk](mailto:c.goodess@uea.ac.uk)) by first thing Wednesday 16 July.

This is primarily a CLIVAR session, so we don't expect to finalize the initiatives through this session, but we hope that this discussion will be a solid starting point and that we can find some common ground with the other WCRP projects and working groups.