

## **CLIVAR Report**

### **1. Highlights for JSC**

The CLIVAR Open Science Conference (OSC) was held in Qingdao, China, in September 2016. The event was titled “Charting the course for climate and ocean research”, was hosted by the Qingdao National Laboratory for Marine Science and Technology (QNLN), and gathered more than 600 scientists from 47 countries. Over five days scientists argued for a continued international CLIVAR coordination to improve our observational records (including paleo), models and process understanding, and our ability to communicate scientific discoveries. It was emphasized that further improvements in the understanding of climate processes are required covering scales from centimetres to global and from hours to decades and longer. Throughout the conference the value of cross-disciplinary integration and international cooperation was emphasized. Critical issues addressed included the interplay between the El Niño Southern Oscillation and global warming on multiple time-scales; the respective contributions of thermal expansion and melting ice to sea-level rise, with novel estimates of potential regional impacts; the connections between the ocean and the global water and energy cycles, including potential seasonal precipitation forecasting skill provided by sea surface salinity in key regions; the changes taking place deep in the ocean with small scale abyssal mixing being a key player; and the consequences of excess carbon on sea life. In addition, CLIVAR successfully helped early career participants organizing their three-day long Early Career Scientists Symposium (ECSS), hosted by China’s First Institute of Oceanography (SOA/FIO). More than 120 students and ECS participated in the symposium where they enjoyed an informal atmosphere while discussing key research challenges facing climate science. They also highlighted the need for international science collaboration and discussed how to best engage potential stakeholders with their scientific information and suggested their vision for the future of CLIVAR.

### **2. Primary science issues**

- Identify, measure and improve modelling of ocean and coupled **climate processes** that are critical for global and regional climate variability and change
- Identify temporal and spatial scales of **climate predictability**
- Quantify constraints on **climate sensitivity**, air-sea exchange and Earth’s energy budget / ocean heat content
- Quantify **regional impacts** of climate change in **sea level, cryosphere and water cycle**
- Quantify past/present/future **ocean role in heat and CO<sub>2</sub> uptake** and links between **climate and ocean ecosystems**

### **3. Issues and challenges**

The main challenge for 2017 has been the limited funding for CLIVAR activities, with a reduction of around 70% of the original allocated budget. Facing this drastic reduction, it has

been decided that all activities and meetings planned for 2017 will not receive any support from the core budget. The only plan is for the CLIVAR Scientific Steering Group (SSG) to meet to finalise the Science Plan and strategically think about the future of the core project in view of the current financial scenario.

CLIVAR has many panels and activities jointly organised with other core projects (e.g., CLIVAR/GEWEX Monsoons Panel, the CLIVAR/GEWEX Research Focus 'CONCEPT-HEAT', the CLIVAR/CliC/SCAR Southern Ocean Region Panel and the new CLIVAR/CliC Northern Ocean Region Panel). Some of these activities have worked well in partnership, but we recognise that in some cases discussion among partners needs to strengthen for a more effective collaboration. We continue to find challenging the communication by the WCRP leadership to interested parties whenever decisions are taken on activities in which CLIVAR plays or should play an important role as identified by the scientific community.

CLIVAR leads the Sea Level Grand Challenge, and the ICPO is playing a key role in the organisation of the WCRP/IOC Sea Level Conference to be held in New York City, USA, in July 2017. CLIVAR also has good engagement with the "Near-term climate prediction" GC through the CLIVAR Decadal Climate Variability and Predictability (DCVP) Research Focus. Not much engagement has taken place with the other GCs. CLIVAR is willing to contribute more if asked, and could/should play a more active role in the new established carbon one for its ocean component.

Modelling efforts in CLIVAR are led by the Ocean Model Development Panel (OMDP), in particular through the Coordinated Ocean-ice Reference Experiments (CORE), now part of CMIP6 as the Ocean Model Intercomparison Project (OMIP). Such comparison projects offer invaluable opportunities to the climate scientific community that is presented with high-end simulations to scrutinize and analyse. Further work with coordinated fine resolution process studies and global integrations will provide the means to cooperatively interrogate elements of the cascade hypothesis, including the important role of boundary layers, via a hierarchy of simulations resolving a growing portion of the energy spectrum. Such efforts, however, require support for meetings that cannot be easily organized in the current funding environment.

CLIVAR regional panels and the Global Synthesis and Observations Panel (GSOP) have provided input to the Ocean Observations Panel for Climate (OOPC) in relation to EOVs and ECVs. One member from each of those panels are ex-officio members of OOPC and funding their attendance to OOPC annual meetings has become a challenge recently. As an example of the importance of this interaction, the CLIVAR/IOC-GOOS Indian Ocean Region Panel is leading the review of the Indian Ocean Observing System (IndOOS) and has received the endorsement of the international community via OOPC.

In terms of use of ocean observations, GSOP leads the ocean reanalysis intercomparison project (ORA-IP), in collaboration with the Global Ocean Data Assimilation Experiment (GODAE) OceanView community, and promotes the International Quality Controlled Ocean Database (IQuOD) initiative, which aims to produce the definitive historical subsurface database to support climate science and services.

CLIVAR initiated short-term Research Foci (RFs) on topics identified by the community as important and likely to achieve major breakthroughs in a 3-5-year timeframe through international/interdisciplinary cooperation. All those activities but one will not receive any fund in 2017, disrupting scientific progress and posing the serious threat of disengagement of people who have volunteer their time from the core project.