

# CLIVAR REPORT

Climate and Ocean: Variability, Predictability, and Change



Meeting report

## **1<sup>st</sup> Session of the CLIVAR Research Focus on "ENSO in a Changing Climate"**

15<sup>th</sup> October, 2017, Busan, Rep of Korea

November 2017

CLIVAR Report No. 06/2017

# CLIVAR REPORT

Climate and Ocean: Variability, Predictability, and Change

## **ACTION ITEMS**

**ACTION:** The RF members were divided into three teams on the ENSO metrics and will meet regularly by telecon as the metrics project moves forward.

**ACTION:** To release the first version of the evaluation tools on ENSO metrics in 2018.

**ACTION:** Work with CLIVAR Pacific Region Panel to respond to the mooring decommissioning in TPOS2020 recommendations.

**ACTION:** Meet next time alongside with the CLIVAR ENSO conference in Ecuador in October, 2018.

**ACTION:** Take part in planning an ENSO summer school in Urbino, Italy during July 2019.

# CLIVAR REPORT

Climate and Ocean: Variability, Predictability, and Change

The 1st session of the CLIVAR Research Focus (RF) on “ENSO in a Changing Climate” (ENSO RF hereafter) was held on 15 October 2017 at the BISTEP Conference Room, Centum Science Park, Busan, Rep. of Korea. This session was held one day prior to the ENSO Complexity Workshop organized by the ICCP (IBS Climate Center for Climate Physics) at Pusan National University. This session was attended by 5 members of the ENSO RF and 3 invited guests.

The ENSO RF is a three-year effort focusing primarily on a community-wide synthesis of methods to evaluate the behavior, dynamics, and sensitivities of ENSO in coupled GCMs. The co-chairs gave an overview of the RF goals and strategy:

- **Goal 1:** improve understanding of the processes in nature and in models that control ENSO’s behavior (decadal, diversity, climate change).
- **Goal 2:** Synthesize existing ENSO evaluation methods in CGCMs, promote best practices, and propose a standard ENSO evaluation protocol as a resource for model developers, impacts studies, and coordinated analysis of CMIP models.
- **Goal 3:** Identify new observations needed to better constrain ENSO processes, both for the current climate and for past climates. This includes helping to guide the redesign of the tropical Pacific observing system (TPOS).
- **Goal 4:** Understand how ENSO may change in the coming decades, due to anthropogenic forcings as well as intrinsically-generated variability.

The group then reviewed the achievements for 2015-2017 of the RF, which are in line with the implementation strategy:

- *Goals 1 & 4, Process understanding:*  
"4th CLIVAR ENSO workshop on the evaluation of ENSO in climate models: ENSO in a changing climate" in Paris, France, July 8-10 2015, alongside “Our Common Future” COP21 conference (Guilyardi et al. BAMS 2015).  
Publication of Cai et al. (2015) and Capotondi et al. (2015) reviews.  
Organization of numerous ENSO sessions at international conferences (AGU, EGU, etc.), inspired by the 2015-16 extreme El Niño.
- *Goal 2, ENSO metrics:*  
Publication of Eyring et al. (2016) and Chen et al. (2016).  
Multi-model evaluation to document ENSO performance in CMIP, within the WGCM Metrics Panel.  
Subset of the Bellenger et al. (2014) metrics is being integrated into 3 evaluations systems: ESMVal (IS-ENES2 effort), metrics packages at PCMDI and CLIMAF (French community effort).  
A comparison of these implementations will help to identify a standard way of providing these ENSO metrics that can be governed at the community level by a CLIVAR group, such as the ENSO RF.
- *Goal 3, Identify new observations:*  
Publication of Simmons et al. (2016), Cravatte et al. (2016).  
The ENSO RF co-chairs are contributing to the TPOS effort in several ways, in particular the Backbone Task Team (coauthoring its 174-page report, Cravatte et al. 2016), and Model and Data Assimilation Task Team (set up this year).  
Specific action to understand sources of differences between satellite-based wind stress products.

# CLIVAR REPORT

Climate and Ocean: Variability, Predictability, and Change

The plan for 2017 and beyond was then presented and discussed, also in line with the implementation strategy:

- *Goals 1 & 4, Process understanding*  
Update on ENSO in a changing climate, namely following the 2015-16 extreme El Niño.  
Co-organise the ENSO Complexity Workshop in 2017 (Busan, Korea).  
Organise an ENSO summer school in July 2019 (Urbino, Italy).
- *Goal 2, ENSO metrics:*  
Comparison of ENSO metrics implementations, to devise technical standards and community governance – in time for CMIP6 evaluation.
- *Goal 3, Identify new observations:*  
RF group to provide input to TPOS, with respect to modelling needs.  
Identify ocean modellers to contribute to TPOS redesign.

Andrew Wittenberg then reported on the TPOS 2020 (Tropical Pacific Observation System) Project. The first report has been published after two rounds of review and revision. Specific recommendations on the reconfiguration of the mooring array in the tropical Pacific were discussed and a feedback proposed, together with the Pacific Panel.

Based on the introductory talks by both co-chairs, the meeting discussions focused on the following points:

- 1) The latest results and opportunities pertaining to ENSO in a changing climate, along with ways to quantify and reduce the remaining uncertainties. A key uncertainty identified by the panel was future changes in the zonal and meridional SST gradients of the equatorial Pacific, which strongly influence future changes in ENSO behavior and teleconnections. A key concern is the apparent inability of most existing climate simulations to capture the magnitude of the recently observed decadal cooling of the equatorial Pacific, associated with the so-called warming hiatus. The panel agreed that further attention to reconstructing these past decadal changes, and simulating them in climate models, are important for building confidence in future projections of tropical Pacific climate and ENSO.
- 2) Robust methods for evaluating ENSO simulations, and for interpreting model projections of the future. The panel has produced a prototype software framework for gathering and displaying ENSO metrics, with the aim of eventual insertion into existing community model evaluation tools like the PCMDI Metrics Package and ESMValTool. The goal is to release a first version in 2018, focusing on three key areas:
  - a) ENSO performance in historical simulations (background climatology, ENSO space/time structure and diversity, decadal modulation) ;
  - b) ENSO teleconnections in historical simulations ; and
  - c) ENSO dynamics and processes.The RF members were divided into three teams, which will meet by telecon as the metrics project moves forward.

# CLIVAR REPORT

Climate and Ocean: Variability, Predictability, and Change

- 3) Response to TPOS2020 recommendations: The panel was supportive of TPOS2020's recommendations to enhance observations over the tropical Pacific region – in particular extending several mooring lines poleward into the ITCZ and SPCZ regions. However, some members voiced concerns about TPOS2020's proposed removal of off-equatorial moorings along several of the meridional ribs of the Tropical Moored Array (TMA). These in-situ mooring measurements were viewed as crucial for constraining the surface heat and momentum fluxes in reanalyses, for maintaining continuity across satellite missions, and for providing long-term fixed-point records of tropical Pacific climate and ENSO. The CLIVAR Pacific Region Panel and the ENSO RF have drafted a letter on this issue, which will be presented to the international CLIVAR SSG next month for its endorsement before forwarding to the TPOS2020 SSG.
- 4) ENSO summer school. The ENSO RF has begun planning an ENSO summer school, for graduate students and early postdocs, to occur in Urbino, Italy during July 2019. This will be the first summer school to emphasize ENSO since the highly successful International WCRP/PAGES summer school on ENSO Dynamics and Predictability, held on the Big Island of Hawaii during June 2008. Antonietta Capotondi has taken the lead in coordinating with the University of Urbino, to host the summer school in conjunction with a paleo summer school that is regularly held at the same venue. M. McPhaden, K. Cobb, and A. Wittenberg are also assisting with the organization.

Acknowledgments: The venue for the ENSO RF meeting was coordinated by the ICCP, to which the organizers express their sincere thanks. A. Wittenberg and M. McPhaden also wish to thank U.S. CLIVAR and NOAA CPO for supporting their attendance at the meeting.

# CLIVAR REPORT

Climate and Ocean: Variability, Predictability, and Change

## Meeting agenda:

1. Discuss the latest results and opportunities pertaining to ENSO in a changing climate, along with ways to quantify and reduce the remaining uncertainties.
2. Synthesize and disseminate robust methods for evaluating ENSO simulations, and for interpreting model projections of the future. Discuss governance.
3. Enhance coordination among researchers in the field, and with other CLIVAR working groups. Review upcoming ENSO-related workshops and meetings.
4. Identify and facilitate future opportunities for research on ENSO.
5. Foster the next generation of researchers in the field. Propose the next ENSO summer school

## Participant list of ENSO-1

Name	Affiliation, Country	Role
<b>Eric Guilyardi</b>	IPSL, France & NCAS-Climate, UK	Co-chair
<b>Andrew Wittenberg</b>	NOAA GFDL, USA	Co-chair
<b>Wenju Cai</b>	CSIRO, Australia	member
<b>Mike McPhaden</b>	NOAA PMEL, USA	member
<b>Soon-Il An</b>	Yonsei Uni. Korea	member
<b>Lei Han</b>	International CLIVAR Project Office, FIO, China	CLIVAR ENSO RF staff
<b>Scott Power</b>	Bureau of Meteorology, Australia	Invited
<b>Antonietta Capotondi</b>	University of Colorado, USA	Invited
<b>Yann Planon</b>	IPSL/LOCEAN, France	Invited

# CLIVAR REPORT

Climate and Ocean: Variability, Predictability, and Change

## Group photo of ENSO-1 participants



*Left to right: Eric Guilyardi, Andrew Wittenberg, Soon-Il An, Antonietta Capotondi, Michael McPhaden, Wenju Cai, Yann Planton, Scott Power, Lei Han.*