

# Report of the 24th Session of the CLIVAR Scientific Steering Group

Consortium for Ocean Leadership  
Washington, DC, USA, 27-29 November 2018





## **Bibliographic information**

This report should be cited as:

*Bracco A., and W. Cai: 24th Session of the CLIVAR Scientific Steering Group. WCRP Publication 5/2019; World Climate Research Programme (WCRP): Geneva, Switzerland; 32 pp*

## **Contact information**

All enquiries regarding this report should be directed to [wcrp@wmo.int](mailto:wcrp@wmo.int) or:

World Climate Research Programme  
c/o World Meteorological Organization  
7 bis, Avenue de la Paix  
Case Postale 2300  
CH-1211 Geneva 2  
Switzerland

## **Cover image credit**

*24th Session of the CLIVAR Scientific Steering Group, by the WCRP CLIVAR Core Project*

## **Copyright notice**

This report is published by the World Climate Research Programme (WCRP) under a Creative Commons Attribution 3.0 IGO License (CC BY 3.0 IGO, [www.creativecommons.org/licenses/by/3.0/igo](http://www.creativecommons.org/licenses/by/3.0/igo)) and thereunder made available for reuse for any purpose, subject to the license's terms, including proper attribution.

## **Authorship and publisher's notice**

This report was authored by Annalisa Bracco (Georgia Institute of Technology) and Wenju Cai (Commonwealth Scientific and Industrial Research Organisation) with the contribution from the CLIVAR Scientific Steering Group and the staff from the International CLIVAR Project Office.

CLIVAR (Climate and Ocean: Variability, Predictability and Change) is one of the four core projects of the World Climate Research Program; its mission is to understand the dynamics, the interaction, and the predictability of the coupled ocean-atmosphere system. To this end it facilitates observations, analysis and predictions of changes in the Earth's climate system, enabling better understanding of climate variability and dynamics, predictability, and change, to the benefit of society and the environment in which we live.

WCRP is co-sponsored by the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO and the International Science Council (ISC), see [www.wmo.int](http://www.wmo.int) , [www.ioc-unesco.org](http://www.ioc-unesco.org) and [council.science](http://council.science).

## **Disclaimer**

The designations employed in WCRP publications and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of neither the World Climate Research Programme (WCRP) nor its Sponsor Organizations – the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO and the International Science Council (ISC) – concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The findings, interpretations and conclusions expressed in WCRP publications with named authors are those of the authors alone and do not necessarily reflect those of WCRP, of its Sponsor Organizations – the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO and the International Science Council (ISC) – or of their Members.

Recommendations of WCRP working groups and panels shall have no status within WCRP and its Sponsor Organizations until they have been approved by the Joint Scientific Committee (JSC) of WCRP. The recommendations must be concurred with by the Chair of the JSC before being submitted to the designated constituent body or bodies.

This document is not an official publication of the World Meteorological Organization (WMO) and has been issued without formal editing. The views expressed herein do not necessarily have the endorsement of WMO or its Members.

Any potential mention of specific companies or products does not imply that they are endorsed or recommended by WMO in preference to others of a similar nature which are not mentioned or advertised.

<b>EXECUTIVE SUMMARY .....</b>	<b>6</b>
<b>I SESSION WITH PROGRAM MANAGERS, REPRESENTATIVES FROM US INSTITUTIONS AND CLIVAR SSG MEMBERS.....</b>	<b>7</b>
<b>II SESSION FOR CLIVAR PANEL AND RESEARCH FOCI REPORTING</b>	<b>9</b>
<b>1 INTRODUCTORY SESSION .....</b>	<b>9</b>
1.1 Opening .....	9
1.2 WCRP Presentation.....	10
<b>2 PANEL REPORTS .....</b>	<b>10</b>
2.1 NORP .....	10
2.2 SORP .....	11
2.3 PRP .....	12
2.4 ARP .....	13
2.5 IORP .....	13
2.6 GSOP .....	14
2.7 Monsoons P .....	15
2.8 OMDP .....	16
2.9 CDP .....	16
<b>3 RESEARCH FOCI/GRAND CHALLENGE REPORTS .....</b>	<b>17</b>
3.1 Concept-Heat RF .....	17
3.2 DCVP RF .....	18
3.3 ENSO RF .....	19
3.4 EBUS RF .....	19
3.5 Sea Level GC .....	20
<b>4 ICPO REPORT .....</b>	<b>21</b>
4.1 ICPO.....	21
4.2 Summer School.....	21
4.3 ENSO Conference.....	22
4.4 WCRP.....	22
<b>5 INTERACTION WITH OTHER PROJECTS .....</b>	<b>22</b>
5.1 USCLIVAR .....	22
5.2 IOC .....	23
5.3 CliC .....	23
5.4 CORDEX .....	24
5.5 SPARC .....	24
5.6 GEWEX .....	25
5.7 OceanObs'19.....	25
5.8 IPCC.....	26
<b>6 SSG CLOSED MEETING .....</b>	<b>26</b>
<b>APPENDIX A: PARTICIPANTS .....</b>	<b>27</b>
<b>APPENDIX B: AGENDA .....</b>	<b>30</b>

## **EXECUTIVE SUMMARY**

The 24th Session of the CLIVAR Scientific Steering Group was held at the Consortium for Ocean Leadership in Washington, DC., USA from 27<sup>th</sup> to 29<sup>th</sup> November 2018. The meeting was hosted by US CLIVAR and brought together the members of the Scientific Steering Group (SSG), the WCRP Joint Scientific Committee (JSC), the Executive Committee of the US CLIVAR Scientific Steering Committee (SSC), US agency program leaders/managers, representatives from the US Global Change Research Program, co-chairs of the Panels, Research Foci, and other WCRP core projects, and invited speakers to review progress, identify opportunities for enhanced collaboration, and develop strategies to achieve CLIVAR's objectives. Over Fifty participants gathered (in DC or remotely) over three days of plenary, breakout presentations and discussion, and a closed business session of the SSG.

The first day of the meeting was a special session organized with the objective of discussing priorities among the CLIVAR SSG members, WCRP leadership, and US leaders of the SSC and federal agency programs in order to reflect on: The achievements and New Science plan of CLIVAR, the new WCRP Strategic plan and its future implementation, and opportunities for enhanced collaboration between US CLIVAR and International CLIVAR.

Starting the second day, a representative of each Panel and Research Foci presented highlights of the activities implemented during 2018, plans for the next year and proposals for membership changes. Comments and suggestions to panel/RF business were given by the SSG and will be sorted out and distributed to each panel/RF soon after the meeting by the International CLIVAR Project Office (ICPO).

Participants also heard about overall program direction, updated international program goals, and other agencies interests and opportunities. Further details on the meeting are available at the SSG meeting website (<http://clivar.org/events/24th-session-clivar-scientific-steering-group>).

The CLIVAR Scientific Steering Group met on the last day of the meeting to discuss the outcomes, make recommendations, and decide on next steps.

## **I SESSION WITH PROGRAM MANAGERS, REPRESENTATIVES FROM US INSTITUTIONS, AND CLIVAR SSG MEMBERS**

The purpose of this Session was to provide a forum for exchanges of ideas between WCRP-Joint Scientific Committee (JSC) lead, CLIVAR SSG members and US agency representatives on the following:

- Discuss CLIVAR success and progress;
- Review new CLIVAR Science Plan;
- Summarize new WCRP Strategic Plan;
- Discuss future WCRP directions with respect to CLIVAR science; and
- Brainstorm on possible implementation directions in light of CLIVAR science needs and US agency suggestions

The co-chairs of the CLIVAR SSG made a summary of the main achievements of CLIVAR which can be summarized as follows:

CLIVAR has contributed to many advances in the field of climate and ocean research and will continue to do so in the future. Its legacy includes:

- Major scientific findings in ocean and climate research;
- Coordination, implementation and development of major multinational observing networks in all ocean basins;
- Development of ocean and climate re-analyses, bridging observations and modeling through data assimilation;
- Development of ocean-climate models and initialized decadal climate predictions building on ocean and climate reanalyses; and
- Through ensemble climate simulations, contributed to separation of natural climate fluctuations from anthropogenic effects.

CLIVAR has finalized the development of a new Science plan in 2018, and has identified as scientific priorities:

- Mechanisms of climate variability and change that require further investigation with the ultimate goal of better constraining the fluxes of energy and carbon in the climate system;
- Ocean processes that modulate climate variability and change for which open questions remain; and
- Climate predictability challenges that exist over a broad range of space and time scales

The overarching goal of CLIVAR is to build a society resilient to environmental changes, by:

- Expanding on a climate risk concept (uncertainty);
- Providing regional climate information and seamless predictions across timescales; and
- Understanding mechanisms and consequences of climate variability and change, globally and regionally

During the discussion, the importance of data availability in coastal zones was emphasized, which may need political effort to push forward. Given that more connections from the deep ocean to the coast exist, the availability of coastal data is critical to future research. WCRP is aware of this issue, and is working towards finding a solution.

New WCRP Strategic Plan (presented by Amanda Lynch, vice chair of WCRP JSC):

The diversity of interests of CLIVAR has been bringing together information for climate research, relevant to both ocean and atmosphere, which is very important for WCRP. The former co-chair of CLIVAR SSG, Detlef Stammer, has left CLIVAR to become a member of JSC at WCRP; two SSG members have joined the JSC as well, and this will reinforce the connection between CLIVAR and WCRP.

WCRP is currently in a transition and at a critical point in its history. The transition involves difficulties, but also opportunities. WCRP has had a comprehensive review from a joint panel consisting of its three major donors, i.e. International Council for Science (ICS), World Meteorological Organization (WMO) and Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO). The review panel looked back at the WCRP's achievements, gave a full picture of WCRP, and made a number of recommendations. There are two major outcomes which need to be discussed. The first is the need to establish a formal Governing Board for WCRP to enable more effective engagement with the sponsors and enable them to fulfill their responsibilities for the program. However, there were some negative responses to this proposal as potentially conflicting with the JSC. The second review outcome is the suggestion of a complete reorganization of the WCRP program. The scientific objectives in the new WCRP strategic plan (Fundamental of understanding of the climate system; Prediction of the near-term evolution of the climate system; Future evolution of the climate system; Bridging climate science and society) should be highlighted. Furthermore, the critical infrastructure in the plan (Hierarchy of modeling tools; observations for process understanding; sustained observations; high-end computing and data management) should also be emphasized.

The WCRP implementation structure needs to evolve. However, we should not make the fundamental error of ignoring the existing communities (such as CLIVAR, SPARC, GEWEX, CliC), while recognizing that the core projects have not been working together as efficiently as they perhaps could. A more holistic approach should be taken, such as to bring people from different core projects together to address problems of interest to all the communities. Good examples of activities that have facilitated the cooperation among different programmes in recent years have been the Consistency between planetary energy balance and ocean heat storage" (CONCEPT-HEAT) CLIVAR-GEWEX Research Focus and the Regional Sea Level Change and Coastal Impacts Grand Challenge led by CLIVAR.

Guy Brasseur rotates off the JSC at the end of 2018 and the new JSC chair will be appointed at the next JSC meeting in April, 2019. The WCRP will enter a new era.

Some comments made during the discussion are:

- NOAA has benefited from WCRP's activities on modeling and observations in the past; one of the critical issues faced by almost all funding agencies might be to balance fundamental



research and application-driven research. WCRP should continue advocating the importance of fundamental science in the future.

- CLIVAR seems to have lost its focus on ocean, moving to broader climate research areas.
- WCRP was initially focusing on the physical science rather than the societal impacts and stakeholder involvement. However, WCRP found itself to be more and more important as a bridge for science to society, like what some funding agencies are doing now, e.g. NOAA. WCRP will not only bridge the people but also the resources in the future.
- What WCRP is doing now works well. Rather than compromising its research, WCRP should plan to add more elements on building capacity, engagement with more stakeholders.
- WCRP/CLIVAR should be an advisor to provide qualified opinion to agencies to guide their investment of funds.
- NASA has already provided great support to CLIVAR infrastructure. It would be expected for WCRP/CLIVAR to provide funding agencies with priorities for scientific research, related to ocean and climate observations, as well as cross-cutting issues. US CLIVAR is closer and more effective to address the agencies' needs than international CLIVAR; the latter is more focused on academic exercises.

## II Session for CLIVAR Panel and Research Foci Reporting

### 1. INTRODUCTORY SESSION

#### 1.1 Opening.

The CLIVAR Scientific Steering Group (SSG) co-chairs, Annalisa Bracco and Detlef Stammer, welcomed all participants (see Appendix A), presented the detailed agenda (included in Appendix B), and explained the meeting objectives:

- Review developments related to the WCRP review and the new WCRP strategic plan;
- Interact with US CLIVAR SSC and US Inter-Agency Group;
- Review progress, steer activities within panels and within RF;
- Planning of meetings, summer schools;
- Discuss implementation of new science plan;
- Budget requirements and distribution of resources; and
- Membership and other internal SSG business.

CLIVAR capabilities were highlighted, which are unique within WCRP. For instance, CLIVAR helped with the infrastructure, ocean and atmospheric modelling component of Earth System Models (ESM), data synthesis, observing system, and capacity building.

SSG members need to discuss SSG membership issues, since four members need to be replaced, and a new co-chair needs to be elected for 2020.

Regarding the ICPO, it is important that SSG members and panel/RF co-chairs provide input on the efficiency of the office and how things could be improved.

The CLIVAR report for the WCRP-JSC in 2018 was well received. JSC did not give any specific CLIVAR action or follow-up but for DCVP RF and membership renewals.

### **1.2 WCRP Presentation (Guy Brasseur).**

WCRP is a successful program, established around 40 years ago. Looking towards the future, fundamental research remains important for WCRP. Some issues to be considered include: predictability across scales, processes that determine the sensitivity of climate to external forcing, role of interactions and feedbacks, regional aspects and extremes.

WCRP is finalizing its 10-year new Strategic Plan, which focuses on fundamental scientific questions, whilst taking into account end-users/stakeholders' requirements; and an Implementation Plan which will indicate how WCRP will work to address and solve these questions. Many consultations have been made, involving sponsors (ICS, WMO, IOC), agencies (in different parts of the world), other programmes (like the World Weather Research Programme and Future Earth), service organizations (Climate and Met Services, Intergovernmental Panel on Climate Change, IPCC), and other groups (e.g., Young Earth System Scientists, YESS). Also, a Strengths, Weakness, Opportunities, and Threats (SWOT) exercise for WCRP has been initiated.

The strategic plan will have three overarching questions (which are the results of many discussions among JSC members, with inputs from members of the core projects) on: process, sensitivity and predictability, a few scientific emphases, and some imperatives.

## **2. PANEL REPORTS**

### **2.1 Northern Ocean Region Panel (NORP) (Amy Solomon)**

The NORP panel was proposed in 2016 and approved by the WCRP JSC in 2017, envisioned as an international forum for coordinating and strategizing activities on the role of the Arctic and surrounding oceans in the context of the global climate system from a coupled perspective. Also, NORP promotes progress in the development of tools and methods to monitor and assess climate variability and change, and evaluate climate predictability of the ocean-atmosphere-ice system in the Arctic and Subarctic Ocean. The panel was organized into 6 task teams before the Davos meeting. Another task team, 'The changing arctic ocean' has been added to the agenda following the meeting.

The monthly telecons have been held regularly since the establishment of the panel. During 15-16 June 2018, NORP panel organized its first panel meeting at Congress Centre Davos, Switzerland. Since the 13<sup>th</sup> session of the CLIVAR/CliC/SCAR Southern Ocean Region Panel (SORP) also occurred in Davos on 14-15 June, a joint session from SORP and NORP was

convened on the afternoon of 15<sup>th</sup> June. Another achievement of the panel in 2018 was the organization of the pre-AGU workshop on Greenland Freshwater Fluxes. In addition, the panel has proposed a workshop entitled “Role of Freshwater in Polar Ocean Climate Change and Global Linkages” to the Aspen Global Change Institute (AGCI).

The SSG members made the following comments on the NORP report:

- The SSG congratulates the NORP community for the effort made in its first year. The identification of a couple of key challenges linked to Arctic Amplification is particularly useful and carefully planned. This is likely to be a productive approach that will build a long-term legacy for NORP and for CLIVAR. It is also seen very positively how NORP is linking its activities to the CLIVAR Science Plan and how is addressing regional - global challenges.
- The SSG suggests to include ARP in the Task Team No.1 on “The changing Arctic Ocean (including sea ice)”.
- The SSG recommended to highlight what is the unique contribution of NORP on Arctic research.
- The SSG recommends to enhance collaboration with US CLIVAR, specially on the observation network. One possibility could be to co-organize a workshop on ‘Physical observational needs in the Arctic Ocean and Subarctic Seas’ with the ‘Phenomena, Observations, and Synthesis (POS) Panel’ of US CLIVAR.
- It may be wise to engage the paleoclimate community and add a member to the panel from that community.
- The SSG recommends to enhance interactions with activities and scientists involved in the Year of Polar Prediction.

## **2.2 Southern Ocean Region Panel (SORP) (Ricardo Farneti)**

SORP is co-sponsored by CLIVAR, the Climate and Cryosphere (CliC), and the Scientific Committee on Antarctic Research (SCAR). The panel acts as a forum for the discussion and communication of scientific advances in the understanding of climate variability and change in the Southern Ocean (SO), and provides suggestion for its sponsors on progress, achievements, new opportunities, and impediments in internationally-coordinated SO research.

In 2018, the 13<sup>th</sup> session of SORP panel meeting was hold alongside the Polar2018 Conference. During SORP-13, a joint session from SORP and the NORP was organized to discuss future collaborations and common research goals.

SORP was represented by Riccardo Farneti at the Southern Ocean Observing System (SOOS) Scientific Steering Committee (SSC) in 2018; this should enhance the interactions with SOOS. Some of the SORP members have also contributed to the writing of the SOOS-led white paper for OceanObs 19.

The national representatives are considered to be the contact points and they should keep the panel and SO community apprised of their countries' activities (campaigns, modelling efforts, as well as information for observations) in the SO region. The national reports for 2017 have been collected from 10 countries. For a capability building, the early career scientists (ECS) have been recruited for the role of national representative for some countries since 2018.

The panel proposed to establish SORP task teams, and the SSG thought that it is a good strategy to engage members outside the regular panel meetings. Specific comments include:

- SORP has taken the approach of using their meeting as a kind of clearing house of what is being done by participants. This information sharing is important but does not exclude the need for a science challenge focus in relation to the contribution of the Panel to the global community and the CLIVAR science plan. There are plenty of major challenges in the SO and its impact on global climate projections. One of them - freshwater fluxes - was alluded to, but there are others related, for example, to the carbon and heat budgets. SSG would encourage SORP to increase their focus by identifying one or two key challenges that can be addressed in a 5-year time period;
- The Task team is a good strategy to engage members outside the regular panel meetings;
- The SSG would like to stress that a panel can also contribute to research, e.g. through peer reviews undertaken by team members;
- We recommend engaging more ECS/young scientists as national representatives;
- National representatives could help collect information on all activities in their country related to Southern Ocean, e.g. campaigns, modelling efforts, as well as synthesis and satellite observations;
- We recommend enhancing the interactions with SOOS.

### **2.3 Pacific Region Panel (PRP) (Xiaopei Lin)**

The PRP general objectives cover a vast range of topics, including the ENSO dynamics and teleconnections (in conjunction with the ENSO RF), decadal Pacific variability (in conjunction with the Climate Dynamics RF), ocean mass transports and properties, the regional impact of climate variability and change, western boundary current variability and the development of a sustainable tropical observing system (in conjunction with TPOS2020). Due to time constraints of all panel members and the wide range of topics to be tackled, the PRP decided to focus its activity during the next couple of years on an emerging new challenge that has to be urgently addressed given its societal importance: the decadal variations in the tropical Pacific.

Comments by the SSG are summarized below:

- PRP is strongly focused on ENSO, but it should cover other scientific issues in the Pacific Ocean. Stronger ties with NORP, SORP and CDP would help in this regard.
- It is strongly recommended to continue the dialogue with TPOS2020 in a constructive manner, e.g. to invite TPOS2020 people into PRP meetings, and/or to consider including a TPOS2020 representative in the PRP membership.
- In the feedback to TPOS2020 plans, it is mentioned that a sufficient overlap period is necessary to ensure the required multiple calibration. PRP may want to reach out to modelling groups that use mooring data for seasonal forecasts to strengthen their position.

- The SSG recommends to invite at least one member of the PICES working group to the PRP meetings and workshops.
- PRP or interested members of the ENSO RF may consider consulting or collaborating with US CLIVAR that is promoting activities on the major ENSO biases in models, as well as the ENSO variability and coastal El Nino impacts.
- PRP may wish to discuss the need(s) for creating a standalone sub-group within the panel on ENSO metrics to continue one of the RF activities.

#### **2.4 Atlantic Region Panel (ARP) (Sabrina Speich)**

The main activities and Achievements of the panel during 2018 include:

- Atlantic observations (Continues development of the AMOC observing system (OSNAP, Rapid-Mocha, SAMOC, ...); Tropical Atlantic Observing System (TAOS) Review; Development of a pan-Atlantic Ocean Observing System (AtlantOS, Galway & Bélem statements and actions – H2020 BG08 European proposals)
- Ocean Mesoscale Eddies and Air-Sea interactions (workshop in February 2018, ARP with OMDP & US CLIVAR), More Community work on mesoscale dynamics (1/10° – JRA55-do Ocean Global Simulations Intercomparison; Workshop on Sources and Sinks of Mesoscale Eddy energy in 2019);
- WCRP and CLIVAR endorsement of EUREC<sup>4</sup>A-OA/ATOMIC international initiative
- Community work on air-sea exchanges and impacts (HiRes CMIP coupled models analyses jointed conducted by ARP & CDP)

The CLIVAR SSG recommends:

- Increasing interaction with NORP on the Arctic Ocean observing system design;
- Increasing interaction with US CLIVAR on the issue of air-sea forcing in the Atlantic Ocean;
- To begin defining plans for Post AtlantOS;

The CLIVAR-FIO Summer School in 2020 on ‘Ocean Macroturbulence and Its Role in Earth’s Climate’ proposed by ARP in collaboration with CDP was approved.

#### **2.5 CLIVAR/IOC GOOS Indian Ocean Region Panel (IORP) (Lisa Beal)**

The Indian Ocean Observation System (IndOOS) Decadal Review remained the priority IORP task in 2018. It is led and coordinated by the IORP on behalf of the international community, with the assistance of Sustained Indian Ocean Biogeochemical and Ecological Research (SIBER). The goal of IndOOS is to provide sustained high-quality oceanographic and marine meteorological measurements to support knowledge-based decision making through improved scientific understanding, weather and climate forecasts, and environmental assessments.

In addition to the enormous task of the Review and the fundraising necessary to conduct it, many IORP members have been contributing to OceanObs'19 white papers during 2018, including a paper based on the IndOOS review led by Masumoto and Hermes, one on Western Boundary Currents with co-author Beal, one led by CLIVAR SSG with co-authors Beal and Roxy, and one on Go-SHIP co-authored by McDonagh.

Specific comments from SSG to the panel:

- The SSG recommends engaging more with the Second International Indian Ocean Expedition (IIOE-2) scientists in IORP activities.
- There are some important problems related to the Indian Ocean that need to be addressed and that may be stressed more by the panel, such as the expansion of the oxygen minimum zone in the Arabian Sea, the lack of observations in the Somali current, the lack of biogeochemical observations in the basin.
- The SSG recommends increasing the focus on the Western Indian Ocean and on observational needs in the subtropics.

## **2.6 Global Synthesis and Observation Panel (GSOP) (Steven Jayne)**

GSOP is responsible for the definition and promotion of CLIVAR's overall global needs for sustained ocean observations, and the evaluation of model-based synthesis of ocean observations. The topics of GSOP include:

- Metrics to evaluate ocean and coupled syntheses, to promote the utility of synthesis products for climate applications (forecast, model initialization);
- Requirement for globally sustained observations and promotion of the use of resulting data sets in global synthesis efforts (CLIVAR datasets);
- Develop, promote and seek to implement strategies for the synthesis of global ocean, atmosphere and coupled climate information

The primary accomplishment for this past year has been to revitalize the committee membership. Recommendations to the panel:

- To coordinate the efforts and initiate the discussion on identifying the strengths and weaknesses of ocean reanalysis in different regions.
- To consider looking into wind stress products.
- To initiate a discussion within the panel on best ways to improve reanalysis and data quality, also considering coupled assimilation.
- To emphasize the connection between land and ocean.
- To consider organizing, in collaboration with the Phenomena, Observations, and Synthesis Panel (POS) panel of US-CLIVAR, a joint session at OceanObs'19.

Jose Santos will replace Jing Li from ICPO to liaison with GSOP starting in January 2019.

## **2.7 Monsoons Panel (Andy Turner, by telecon)**

### **Asia-Australia Monsoon Working Group (AAMWG)**

- Attracted stakeholder engagement, e.g. a representative from Regional Integrated Multi-Hazard Early-warning System (RIMES) based in Thailand has joined the Asia-Australia WG.
- Is actively involved in the Regional Climate Outlook Fora (RCOFs).
- Will continue its work on analyzing systematic biases and determining the sources of error in Global Climate Models for monsoon in CMIP6.
- Encouraged the national meteorological office to implement automated tracking through the Diagnostic Package on Monsoon Lows and Depressions.
- Will continue exploitation of the subseasonal to seasonal (S2S) database or short time-scale prediction through the monsoon subprojects.

### **America WG**

- Continued exploitation of the S2S database for the South American monsoon, to assess possibility for subseasonal prediction.
- Will assess skill of S2S-participating models in simulating MJO impacts on the American monsoons, in particular on the precipitation anomalies & associated teleconnections.

### **Africa WG**

- Will develop S2S activities for Africa and in the context of the global monsoons.
- Is linking with Future Climate for Africa (FCFA), including CP4-Africa project and Atlas for end users.

### **Monsoons Panel**

- Is assembling a webpage on regional monsoons on CLIVAR website, to publish the information generated from regional working groups.
- Convened MP3 in conjunction with 8<sup>th</sup> GEWEX Open Science Conference in Canmore Alberta, Canada, and is maintaining regular communication via telecons.
- Interacts with WMO/WWRP by participating invited reviews for next volume of The Global Monsoons: Research & Forecast 5<sup>th</sup> Edition.
- Interacts with SPARC monsoon activities through:
  - Existing cooperative activity: Aerosol Composition & Asian Monsoon
  - CLIVAR MP interest: Monsoon teleconnection dynamics
  - SPARC interest: 1) Lower stratospheric QBO; 2) Impact of monsoon convection on UTLS composition; 3) Analysis in CMIP-6; and 4) Storm tracks in SE Asia
  - Suggest to set up task force to strengthen the cooperation; and
  - Possibility to work through exiting SPARC activities, e.g. DYNVAR which is currently revising its priorities.

- Is seeking to get good representation in IPCC AR6, mainly in Chapter 8: Water Cycle Changes.
  - Is interacting with GEWEX to develop common activities intercomparisons, dedicated diagnostics, observational campaigns to be organized under the GASS umbrella.
- Is contributing to the Indian Ocean Observation System (IndOOS) Review
- Is coordinating a funding request to WCRP to support the ICTP Workshop on *American Monsoons, Progress & Future Plans*.

## **2.8 Ocean Model Development Panel (OMDP) (Alistar Adcroft)**

The mission of OMDP in CLIVAR and WCRP is to: (i) collaborate with and to advise other CLIVAR panels and Research Foci Teams on issues related to ocean modelling; (ii) coordinate activities aimed at addressing modeling needs and (iii) address other issues impeding progress of CLIVAR.

OMDP has contributed a lot for the JRA55-do paper. The paper white for Oceanobs19: An Ocean of Opportunity, led by OMDP was submitted to Frontiers.

The panel will have its 5<sup>th</sup> session panel meeting jointing with the Sources and Sinks of Ocean Mesoscale Eddy Energy workshop in March 2019 at Florida State University, Tallahassee, Florida. The panel will discuss some issues on the ongoing coordinated comparison of ocean-sea ice models driven by the JRA55-do forcing datasets, the coupled simulations of CMIP6.

Key research foci for the next 3 years are: continue the JRA55-do low- and high-res intercomparisons, new process modeling and parameterization integration, supporting and participating IPCC SROCC, CMIP6 and AR6.

The SSG made the following comments to the report:

- It may be useful to focus in the near term on activities that may help improve understanding and model representation of mixing.
- Building upon CORE-II and the JRA-55 forcing, it could also be possible to investigate in depth the role of resolution (in the ocean models and in the forcing fields).

## **2.9 Climate Dynamics Panel (CDP) (Mat Collins)**

In 2018, CDP organized the Stormtracks 2018 workshop: Alternative perspectives on storm tracks in a changing climate during 27-31 August at Stockholm. The panel convened two AGU 2018 Sessions on Role of Ocean-Atmosphere Interaction in Regional Climate Variability and Change on 13- 14 December. Some members contributed the ICTP Summer School from 25 June-5 July. According to the recommendation of 2017, one panel member engaged with the NORP panel and attended the NORP panel meeting at Davos in 2018.

For the scientific capacity building, the panel submitted the large Horizon 2020 proposal on basic dynamics of storm tracks; Minobe was elected the chair of Japan CLIVAR sub-committee of Science Council of Japan and the member of US CLIVAR Large Ensemble working group;



Barreiro and Zolina have been selected to be the Lead Authors of IPCC WG1 AR6 and attended the first lead author meeting; Collins continued to lead a chapter in the IPCC Special Report on Oceans and Cryosphere in a Changing Climate.

The paper planned in 2017 was published in Nature Climate Change. A paper on “The benefits of global high-resolution for climate simulation: process understanding and the enabling of stakeholder decisions at the regional scale” was also published in BAMS (Minobe is co-author). Barreiro was the co-author for the book chapter on "South and North American Monsoons: characteristics, life cycle, variability, modelling and prediction" in book “The Multi-Scale Global Monsoon System” in 2019. The panel members also led the review of inter-basin teleconnections.

One problem that should be noted is that the majority of panel members, including the two co-chairs, will conclude their terms in 2019. Membership replacements should be carefully considered.

The panel is concerned about the future of Decadal Climate Variability and Predictability (DCVP) research foci. The SSG recommended that DCVP RF should sunset as planned, and “handover” its tasks to the CDP during 2019. Co-chairs of CDP should coordinate with the DCVP co-chairs on how to best continue ongoing activities on predictability studies within the Panel.

The SSG feedbacks included:

- To collaborate with the US CLIVAR Large Ensemble Working Group and co-organize a joint workshop. The WG will hold a workshop on changing patterns of climate: Understanding Uncertainties, in July 2019. Dr Minobe could interact with the WG co-chairs and the CDP panel may try to contribute to the workshop organization.
- To coordinate with CMIP6 how to best contribute to address common problems faced by different CMIP6 groups related to climate dynamic issues, focusing on the HighResMIP.
- To think about developing a ‘standard’ hierarchy of models that could be used to benchmark CMIP6-like coupled models and for process understanding.
- The group should coordinate with the co-chairs of the DCVP RF how to best continue ongoing activities on predictability studies. The RF may consider proposing one or at most two members for CDP to consider for 2019.

### **3. RESEARCH FOCI/GRAND CHALLENGE REPORTS**

#### **3.1 CONCEPT-HEAT RF (Karina von Schukmann, by telecon)**

The main objective of CONCEPT-HEAT is to address the world energy imbalance, and some interdisciplinary topics, by taking different approaches to estimate the world energy imbalance.

As a result of the Earth's Energy Imbalance and its implications (EEI) workshop, a proposed framing of activities under 3 pillars have been identified: 1) EEI absolute value (quantification and uncertainty assessment), 2) inventory of EEI and 3) implications of EEI.

Next steps:

- Workshop report, which includes a proposal/recommendation to WCRP on how the CLIVAR/GEWEX CONCEPT-HEAT RF should evolve into a WCRP wide activity for maintenance and re-enforcement of community synergy on the Earth Energy Imbalance.
- Organization of special issue on the Earth Energy Imbalance (submission before Dec. 2019 to meet IPCC AR6 requirements).

The SSG provided the following comments to the report:

- CONCEPT-HEAT RF should sunset as planned by the end of 2018, and eventually become a WCRP-wide initiative if so decided at the WCRP level.
- The earth energy balance is an important issue that goes beyond the RF and CLIVAR, and it is important that this topic continues in some way within CLIVAR for the ocean contribution.
- We congratulate the RF on their achievements and successful culmination of their activities.

### **3.2 Decadal climate variability and predictability (DCVP) Research Foci (Yochanan Kushnir, by telecon)**

DCVP RF started in the fall of 2014. In 2017 the group laid out the following plan for 2018-2019:

1. Complete DCVP contribution to CLIVAR Science Plan.
2. Participate in analysis of Decadal Climate Prediction Project (DCPP) experiments, particularly the results from component C and contribute to publications of the results.
3. Continue participation in the planning of the WCRP international workshop on Subseasonal to Decadal variability planned for September 2018 and represent DCVP work in that meeting.
4. Present DCVP science in the 2019 Ocean Observations Conference.
5. Plan and execute a final DCVP Science Symposium and Summer School and publish outcome.

DCVP has achieved goal 1 and 3. Goal 2 is in progress as a result of delays in the entire CMIP6 endeavor. A survey of WG member activities following a teleconference reveals that DCVP members from modeling centers have all been involved in modeling activities that meet the DCPP protocols and more, as described below.

The SSG made the following recommendations to DCVP:

- DCVP RF should sunset as planned, and “handover” of the subject of decadal variability to the Climate Dynamics Panel by March 2019<sup>1</sup>.
- The group should coordinate with the co-chairs of CDP how to best continue ongoing activities on predictability studies within the Panel. They may consider proposing one or at most two members to CDP to this end.
- The CLIVAR SSG is looking forward to continuous and successful activities of DCVP during the first three months of 2019.

### **3.3 ENSO in a changing climate Research Foci (ENSO RF) (Wenju Cai)**

ENSO in a Changing Climate Research Foci started from 2015. During the past 3 years, the group has fulfilled most of its goals, which include:

- 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 promote 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: Understanding how ENSO may change in the coming decades, due to anthropogenic forcing as well as intrinsically-generated variability.

The SSG recommends:

- The ENSO RF should sunset, as planned, by the end of 2018, with its remaining activities to be absorbed by PRP.
- PRP or interested members of the RF may consider consulting or collaborating with US CLIVAR that is promoting activities on the major ENSO biases in models, as well as the ENSO variability and coastal El Nino impacts.
- PRP may wish to discuss the need(s) for creating a standalone sub-group within the panel on ENSO metrics to continue one of the RF activities.

SSG congratulates the RF on their achievements and successful culmination of their activities.

### **3.4 Eastern boundary upwelling systems Research Foci (EBUS RF) (Ryan Rykaczewski)**

The EBUS RF began in October 2015 with a scoping workshop in Ankara, Turkey and the submission of an original EBUS RF prospectus in April of 2016. However, concern for the potential overlap with activities of other groups in the research community and changes to the

---

<sup>1</sup> Amended to October 2019 in January 2019, following a request from DCVP and CDP leadership.

leadership and membership of the group necessitated shifts in the focus of the efforts. A plan for revisions to the group to address these concerns was submitted to the SSG in November of 2017, and following the SSG recommendations, the RF group membership was revised, and a new prospectus has been submitted in June of 2018.

The activities of the group are on schedule. A first meeting of the reconfigured RF group is scheduled for December 9, 2018, prior to the annual assembly of the AGU in Washington, DC. The main item on the agenda for this meeting is the preparation of a syllabus and teaching schedule for a summer school on EBUS to be held in collaboration with ICTP in July 2019 in Trieste, Italy. The school is intended as a scientific educational, networking, and capacity-building activity for the benefit of students and early-career scientists from countries that have a stake in EBUS.

In addition to capacity building, the current goals of the RF group are two-fold: to develop research recommendations for synergistic activities between the modeling and observational communities, and to improve the quantification of potential impacts of climate change on the marine ecosystem and the potential consequences on their dependent societies.

The SSG made the following recommendations to the EBUS RF:

- Consider to continue the comparison between ocean model and reanalysis to in situ observations, particularly in relation to winds.
- Consider the possibility to link with the ‘US West Coast: Ecological forecasting’ activity under the ‘Phenomena, Observations, and Synthesis (POS) Panel’ of US CLIVAR.
- In terms of the evaluation of the JRA-55 forcing dataset, there is space for performing more comparisons with atmospheric in-situ observations, if the RF decides to go in this direction.
- Frame clearly resources and activities, considering the spread of the members, both in terms of their research interests and their geography.

### **3.5 Sea Level GC (Detlef Stammer)**

The Sea Level GC has six parallel, but interconnected, working groups:

1. An integrated approach to paleo time scale sea level estimates
2. Quantifying the contribution of land ice to near-future sea level rise
3. Causes for contemporary regional sea level variability and change
4. Predictability of regional sea level
5. Sea level science for coastal zone management
6. Global sea level budgets

In addition, the GC group intends to provide regular assessments of the state of affairs of sea level research and will use the resulting information to recommendations for international sea

level research efforts. The GC team will write summaries on data and modeling issues, bringing together information and recommendations from all working groups.

The group has maintained successful collaborations with US CLIVAR and NASA Sea level rise team, IOC/GLOSS, but there is space for enhancing this. Some highlights during 2018 include:

- Sea level terminology paper submitted.
- Sea level obs paper for OceanObs'19 submitted.
- Coastal Sea Level science paper in preparation.
- High-end sea level paper soon to be submitted.
- CMIP6 Sea Level Analysis: Production of “recipe book” for dealing with ISMIP6 results.
- New Reports: (Sea level Observing Requirements; Model improvement requirements for sea level)
- There are discussions for planning a 2023 Sea Level Conference

## 4. ICPO REPORT

### 4.1 ICPO (J. Santos)

In terms of the ICPO in Qingdao, there has been a transition period after Han Lei decided to leave his post as staff scientist. An international Intern was appointed.

New Coordination of groups at ICGPO:

Jing Li: ARP, EBUS, IORP, PRP, SL

Liping Yin: OMDP, SORP, NORP, CDP

Jose Santos: GSOP, DCVP, CH

The office has started to coordinate regular telecons with other IPOs and JPS.

J. Santos's initial commitment was until early 2019, and He is willing to stay at least 2 more years, but several factors need to be considered; most importantly, the financial support from FIO/SOA for the Qingdao office is secured for 2019, and WCRP needs to renew the agreement with FIO by June in 2019.

The SSG recommends that Jose Santos replaces Jing Li from ICPO to liaison with GSOP starting January 2019.

### 4.2 Summer schools (A. Bracco)

For the CLIVAR-FIO Summer School to be held in June 2020 in Qingdao, the ICPO made a call to all CLIVAR groups to present proposals; a proposal presented by the Atlantic Region Panel (with CDP interested in being partner) was received, with the topic: Ocean Macroturbulence and Its Role in Earth's Climate

The short description of the proposed course is: Ocean macroturbulence comprises fronts, eddies, and currents on the ocean meso- and sub-meso-scales (1 -300 km). These features are ubiquitous in the world ocean, as revealed by observations and models now available at ever greater spatial resolutions. At the same time, there is mounting evidence that motions on these scales play fundamental roles in Earth's climate system: by transporting heat, momentum, and nutrients within the ocean, by influencing air-sea fluxes of heat, fresh water, and carbon, and by shaping marine ecosystems.

The SSG approves this topic for the CLIVAR Summer School in 2020.

#### **4.3 ENSO Conference (J. Santos)**

The ENSO Conference was proposed by the ICPO as a means for enhancing the visibility of CLIVAR in Latin America, by looking for regional partners (in this case The International Research Center on ENSO, CIIFEN) to organize events; this approach was one of the recommendations made by the JSC-WCRP during its meeting in Paris. The Office was able to mobilize funds for around US\$40K from different donors for the event.

ICPO was in charge of the logistical aspects of the organization of the conference, in cooperation with the local partners CIIFEN and Escuela Superior Politecnica del Litoral (ESPOL). PRP and ENSO RF took the lead on the scientific coordination of the meeting, to assure this, 5 members of PRP and 5 members of ENSO RF were part of the Scientific Organizing Committee of the Conference.

#### **4.4 WCRP (M. Sparrow)**

For the core projects: at the moment of the meeting, 70K was provisionally set aside for each core project. Besides the regular allocation to the core projects, WCRP JPS will try to help mobilize additional funding from WMO and other funding sources to support the signature activities that fulfill the strategy of WCRP. Moreover, WCRP will foresee to share the resources from WMO with WWRP and other programmes through joint activities in the future.

Given the staff change and shortage in WCRP JPS, Mike called on the support from each project office to remind people being funded by WCRP to respond within the deadline.

### **5. INTERACTION WITH OTHER PROJECTS**

#### **5.1 US CLIVAR (Dan Vimont)**

US CLIVAR does not intend to reproduce the efforts of CLIVAR internationally, but rather hosts and organizes activities in the US that advance CLIVAR, where it intersects with the interests of the US funding agencies. The US CLIVAR working groups are currently on (i) Arctic-midlatitude interactions and (ii) the expanding tropical belt – they both include international members. More generally, all US CLIVAR workshops are open to the international community. Furthermore, US CLIVAR continues to support travel for US members of CLIVAR panels and research foci teams to attend their quasi-annual meetings, helping to further strengthen the communication between the US and international science planning and implementation. There is a possibility to link the CONCETP-HEAT RF's work with the newly proposed US CLIVAR Working group on Water Isotopes. There might be a potential

opportunity to strengthen the cooperation between international CLIVAR and US CLIVAR during the next round of open calls for CLIVAR Research Foci.

### **5.2 IOC (Salvatore Arico by written statement)**

IOC is a proud co-sponsor of the World Climate Research Programme (WCRP). As the draft Strategic Plan for WCRP indicates, regional and global climate predictability and predictions on a range of time and spatial scales hold great promise and can help delivering meaningful climate services. In this regard, cooperation of IOC with CLIVAR will be important in the future. It is useful therefore to establish a dialogue involving the ocean and climate science communities while finalizing the Strategic Plan for WCRP.

IOC also believes that the United Nations Decade of Ocean Science for Sustainable Development may be of substantial interest for CLIVAR as a means to promote a leapfrog effect of science on the understanding of climate and ocean variability, predictability and change and of related implications and applications of such knowledge for policy and society. The relationship between CLIVAR/WCRP and UN Decade of Ocean Science for Sustainable Development should be planned carefully.

In light of the above, IOC is looking forward to continuously close communication and cooperation between IOC and CLIVAR. IOC would be pleased to learn about the results of the discussions and deliberations of the CLIVAR SSC at its twenty-fourth session, with a view to see how potential areas of interaction between relevant IOC programmes and CLIVAR could further reinforce the cooperation that will be needed to realize the vision, mission and strategic objectives of WCRP as framed in its new Strategic Plan.

Carbon is also an important issue that CLIVAR needs to consider. Participants noted that a WG on integrated ocean carbon research is being established within IOC. CLIVAR will be involved. A meeting is scheduled in January 2019 in China to further discuss.

### **5.3 CliC (Mike Sparrow)**

The Climate and Cryosphere (CliC) project is one of the core projects of WCRP, serving as the focal point for climate science related to the cryosphere, its variability and change, and interaction with the broader climate systems. According to the new science plan (2017-2021) of CliC, there are four general science themes to be covered: Observing the Cryosphere; Physical Processes and Dynamical Understanding; Modelling the Cryosphere and Global and Regional Prediction and Predictability. CliC enhanced its linkage with the biogeochemical communities through the Biogeochemical Exchange Processes at sea ice Interface (BEPSII) project. CliC is also working on the Cryosphere Modelling in CMIP6, e.g. ESM-SnowMIP, SIMIP, ISMIP6 and GlacierMIP, under the WCRP Grand Challenge on Melting Ice.

The current host office of CliC, Tromsø, would finish its support at the end of 2019. CliC would have a new host for the office in 2019, the most likely place is the University of Massachusetts in the US, but still depending on the funding on the grant application. Gwenaëlle Hamon would be the consultant executive officer on an interim basis beginning the early spring of 2019.

CliC made its new Science Plane for 2017-2021, with the four general science themes (Observing, process, modelling, prediction and predictability).

There are many cross-cutting activities in CliC: CliC communicated with SCOR and SOLAS on the biogeochemical process and sea ice interfaces through the BEPSII working group. There was also possibility for the cooperation between the US CLIVAR ice prediction group and the CliC Arctic Sea Ice Working Group, CliC has a long history of working with AMAP. A special issue was published in JGR Biogeosciences contributed by some input from CliC. CliC also cooperated with the Grand Challenge on Melting Ice (ESM-SnowMIP, SIMIP, ISMIP6, GlacierMIP).

In 2018, CliC organized 17 workshops, contributed 5 conference presentations, held more than 80 online project meetings. In addition, CliC disseminate itself through facebook and twitter, with 1900 likes and 2800 followers. As the widely distribution of the group members, the gotomeeting is always focusing on a small group of people.

#### **5.4 CORDEX (Christopher Lennard)**

CORDEX attended the CLIVAR SSG for the first time. The goal of CORDEX is to advance and coordinate the science and application of regional climate downscaling through global partnerships. CORDEX comprised of 14 domains with 2 points of contacts for each domain, international project office for CORDEX (IPOC), and science advisory team (SAT).

Several workshops and sessions were organized in CORDEX domains in the past two year. The Flagship Pilot Studies (FPS) are used to expand the 'research portfolio' in addition to the existing scientific challenges. Potential connections with CLIVAR panels (NORP, CDP, Moonsoon) and Research Foci (EBUS, ENSO) will be established through FPS. CORDEX will hold the International Conference on Regional Climate-CORDEX 2019 (ICRC-CORDEX 2019) during 14th-18th October 2019 in Beijing, China.

The goal of the second phase of CORDEX is to advance the science and application of regional climate downscaling, for improved regional climate information.

The participants think that there should be a two-way communication to do the down scaling needed for boundary conditions, but should also provide information on the processes that are missed and to improve the global model up scales. They also think that the modelling improvement CORDEX products are mostly used by the user community and not necessary by the research community.

#### **5.5 SPARC (Donald Wuebbles)**

SPARC covers three different major themes: Atmospheric dynamics and predictability, connection between chemistry and climate, long-term records for climate understanding, with 18 specific activities organized under the three themes. New work on the short-term climate forcing has been proposed. Science highlights in 2018 are productive. The interim report of S-RIP will be published as a journal publication.



SPARC held its General Assembly in October 1-5, 2018 in Kyoto, Japan. In 2019, SPARC planned to organize several workshops and meeting, 2 summer schools, and draft 7 overview papers. The 2019 SPARC SSG meeting hasn't been fixed.

Collaboration with CLIVAR Monsoons panel was proposed by the SPARC SSG, hoping to set up a SPARC-side task group. Decadal climate prediction is a good theme for the cooperation with CLIVAR, Participants suggested that SPARC can find some cooperation with the CLIVAR CDP panel.

### **5.6 GEWEX (Peter Van Oevelen)**

GEWEX is responsible for the WCRP grand challenges in Water for Food Baskets and Weather & Climate Extremes. Among the GEWEX approach, process studies are the most important. In addition to the GCs' big science questions, the GEWEX science questions for the next 5 to 10 years will focus on 1) Precipitation, 2) global water resource systems, 3) changes in extremes and 4) water and energy cycles and processes.

GEWEX recognizes, in agreement with CLIVAR, that interactions between different core projects are not always well coordinated and could be done better. Further discussion for better cooperation between WCRP core projects should be implemented. In terms of collaborations with CLIVAR, GEWEX hopes to exploit new possible ventures: joint process evaluation studies; partnerships in activities emerging from the new strategy plan. Also, they hope to continue the activities under the Concept Heat and Monsoon panel umbrellas to improve the cooperation with CLIVAR.

GEWEX will hold the 31th SSG at the end of February.

### **5.7 OceanObs'19**

OceanObs takes place every decade. It aims to provide an opportunity for the communities working on ocean related science to come together to refresh the status of observing system in the last decade, provide the vision for the observations in the coming decade, and enhance and optimize ocean observing towards a fit-for-purpose observing system.

It started in 1999, with about 300 people attending that meeting and the goal of promoting and enhancing an international coordinated observing system for the physical ocean. OceanObs'09 expanded the range of communities working together to undertake more comprehensive and sustained ocean observations and led to the Framework for Ocean Observing.

The objective of the conference in this year is to develop effective strategies for a sustained, multidisciplinary, and integrated ocean observing system that better connects user communities and observers. The overarching themes will include the observing system governance, data and information systems, observing technologies and networks. The Societal themes will include ocean discovery, ecosystem health and biodiversity, climate variability and change, water, food and energy security, pollution and human health, hazards and maritime safety, blue economy.

### **5.8 Intergovernmental Panel on Climate Change (IPCC)**

Nathan Bindoff briefly introduced goal and objective of IPCC and the schedule and milestones for its sixth Assessment Report (AR6). The participants suggested to strengthen the communication to better explain to the public why 1.5°C is better than 2 °C. Also, it will be important to engage more people from CLIVAR community in the review process of IPCC report.

### **6. SSG CLOSED MEETING.**

During this closed meeting the SSG discussed the budget allocated by WCRP for 2019, the activities proposed by panels and RF, and plans for new SSG membership.

The co-chairs closed the meeting, thanking all SSG members for their participation, and the local hosts for all the logistics arrangements.

## APENDIX A. Participants

Group	Name	Organization
CLIVAR SSG	Krishna AchutaRao	Indian Institute of Technology. India
CLIVAR SSG	Annalisa Bracco	Georgia Institute of Technology. USA
CLIVAR SSG	Nathan Bindoff	University of Tasmania. Australia
CLIVAR SSG	Pascale Braconnot	National Center for Scientific Research. France
CLIVAR SSG	Wenju Cai	Commonwealth Scientific and Industrial Research Organization. Australia
CLIVAR SSG	Dake Chen	Second Institute of Oceanography. China
CLIVAR SSG	Boris Dewitte	Laboratoire d'Etudes en Géophysique et Océanographie Spatiales. France
CLIVAR SSG	Stephen Griffies	NOAA Geophysical Fluid Dynamics Lab. USA
CLIVAR SSG	Mauricio Mata	Universidade Federal do Rio Grande. Brazil
CLIVAR SSG	Detlef Stammer	CEN, Universität Hamburg. Germany
GSOP	Steven Jayne	Woods Hole Oceanographic Institution. USA
OMDP	Alistair Adcroft	NOAA Geophysical Fluid Dynamics Lab. USA
CDP	Mat Collins	University of Exeter. UK
ARP	Sabrina Speich	Ecole Normale Supérieure de Paris. France
PRP	Xiaopei Lin	Ocean University of China. China
IORP	Lisa Beal	University of Miami. USA
SORP	Riccardo Farneti	International Centre for Theoretical Physics. Italy
NORP	Amy Solomon	NOAA Earth System Research Laboratory. USA
EBUS	Ryan Rykaczewski	University of South Carolina. USA
US CLIVAR SSC	Daniel Vimont	University of Wisconsin. USA
US CLIVAR SSC	Tony Lee	NASA Jet Propulsion Laboratory
US CLIVAR SSC	Carol Anne Clayson	Woods Hole Oceanographic Institution
US CLIVAR Project Office	Mike Patterson	University Corporation for Atmospheric Research
US CLIVAR Project Office	Jeff Becker	University Corporation for Atmospheric Research
US Agency Representatives	Jack Kaye	NASA Science Mission Directorate
US Agency Representatives	Eric Lindstrom	NASA Physical Oceanography Program
US Agency Representatives	Nadya Vinogradova-Shiffer	NASA Physical Oceanography Program
US Agency Representatives	Jin Huang	NOAA Earth System Science and Modelling Division
US Agency Representatives	Sandy Lucas	NOAA Climate Variability & Predictability Program

US Agency Representatives	Annarita Mariotti	NOAA Modeling, Analysis, Predictions & Projections
US Agency Representatives	James Todd	NOAA Ocean Observing & Monitoring Division
US Agency Representatives	Shelby Brunner	NOAA Ocean Observing & Monitoring Division
US Agency Representatives	Anjuli S. Bamzai	NSF Atmospheric Sciences Section
US Agency Representatives	Baris M Uz	NSF Physical Oceanography Program
US Agency Representatives	Xujing Jia Davis	NSF Physical Oceanography Program
US Agency Representatives	Gerald Geernaert	US DOE Climate & Environmental Sciences Division
US Agency Representatives	Renu Joseph	US DOE Climate & Earth System Modeling
US Agency Representatives	Dorothy Koch	US DOE Climate & Earth System Modeling
US Program Representatives	Michael Kuperberg	US Global Change Research Program
US Program Representatives	Jennifer Saleem Arrigo	US Global Change Research Program
US Program Representatives	Apurva Dave	US Global Change Research Program
US Program Representatives	Julie Morris	US Global Change Research Program
US Program Representatives	Jon White	Consortium for Oceanleadership
WCRP JSC	Guy Brasseur	Max Planck Institute for Meteorology. Germany
WCRP JSC	Amanda Lynch	Brown University. USA
WCRP	Mike Sparrow	World Meteorological Organization. Switzerland
Partner Projects and Observers	Peter Van Oevelen	International GEWEX Project Office; Universities Space Research Association. USA
Partner Projects and Observers	Donald Wuebbles	SPARC SSG; University of Illinois. USA
Partner Projects and Observers	Christopher Lennard	CORDEX Science Advisory Team; University of Cape Town. South Africa
ICPO	Jose Santos	Executive Director ICPO. First Institute of Oceanography. China
ICPO	Jing Li	Staff Scientist ICPO. First Institute of Oceanography. China
ICPO	Liping Yin	Staff Scientist ICPO. First Institute of Oceanography. China
ICPO	M.M. Ali	Indian Institute of Tropical Meteorology. India

### Remote Participants

Group	Name	Organization
Monsoon Panel	Andy Turner	University of Reading. UK
DCVP	Yochanan Kushnir	Columbia University. USA
Concept Heat RF	Karina von Schuckmann	Mercator Ocean. France
Partner Projects and Observers	Jessica Snowden	US IOOS Program Office; NOAA. USA

## APENDIX B. Agenda

**Agenda:** 24<sup>th</sup> Session of the CLIVAR Scientific Steering Group  
27-29 November 2018. Consortium for Ocean Leadership. Washington, DC.

Participants: Invited Program Managers and Representatives from US Institutions and CLIVAR SSG members					
Tuesday 27/11			Session	Presenter/Discussion lead	Time
09:00			Opening of the first day and charge to the 24 <sup>th</sup> CLIVAR SSG Meeting	Annalisa Bracco, Detlef Stammer, CLIVAR SSG with JSC chairs and PM	30
09:30			Summary of CLIVAR results, discussion of the new CLIVAR Science Plan.	D. Stammer and A. Bracco	60
10:30			<b>Break</b>		
11:00			Discussion on WCRP Strategic Plan and its future implementation	Guy Brasseur, Amanda Lynch	90
12:30			<b>Lunch</b>		
13:30			Feedback to WCRP Strategic Plan and its implementation requirements from point of view of audience	SSG Members, Agency Representatives	100
15:10			<b>Break</b>		
15:30			<i>Summary of the day</i>	D. Stammer and A. Bracco, G. Brasseur, A. Lynch	30
16:00			<b>Adjourn for day</b>		
17:00			<b>Reception hosted by UC CLIVAR</b>		120

Participants: CLIVAR SS members, CLIVAR Panel/RF representatives, Observers					
Wed. 28/11			Session	Presenter/Discussion lead	Time
	1		Opening		
09:00		1.1	Welcome	Mike Patterson	10
09:10		1.2	Welcome and meeting objectives	D. Stammer/A. Bracco	30
09:40		1.3	WCRP	G. Brasseur	30
10:10			Break		20
	2		Panel Reports		
10:30		2.1	CLIVAR/CliC Northern Ocean Region P.	Amy Solomon	25
10:55		2.2	CLIVAR/CliC/SCAR Southern Ocean R. P.	Riccardo Farneti	25
11:20		2.3	Pacific Region Panel	Xiaopei Lin	25
11:45		2.4	Atlantic Region Panel	Sabrina Speich	25
12:10		2.5	CLIVAR/IOC-GOOS Indian Ocean Region P.	Lisa Beal	25
12:35			Lunch		60
13:35		2.6	Monsoons Panel	Andy Turner (telecon)	25
14:00		2.7	Global Synthesis & Observations P.	Steven Jayne	25
14:25		2.8	Ocean Model Development Panel	Alistair Adcroft	25
14:50		2.9	Climate Dynamics Panel	Mat Collins	25
15:15			Break		25
	3		Research Foci Reports		
15:40		3.1	Consistency between planetary energy	Karina von Schuckman	25

			balance & ocean heat storage	(telecon)	
16:05		3.2	Decadal Climate Variability and Predictability	Yochanan Kushnir (telecon)	25
16:30		3.3	ENSO in a changing climate	Wenju Cai	25
16:55		3.4	Eastern Boundary Upwelling Systems	Ryan Rykaczewski	25
17:20		3.5	Regional Sea Level Change and Coastal Impacts Grand Challenge	Detlef Stammer	25
17:45		3.6	Discussion on budget/meetings	D. Stammer/ A. Bracco	15
<b>18:00</b>			<b>Adjourn for day</b>		
<b>Thurs. 29/11</b>			<b>Session</b>	<b>Presenter / Discussion lead</b>	<b>Time</b>
	<b>4</b>		<b>ICPO/WCRP report</b>		
09:00		4.1	ICPO report	J. Santos	15
		4.2	WCRP report	M. Sparrow	15
	<b>5</b>		<b>CLIVAR activities</b>		
09:30		5.1	CLIVAR Summer Schools	D. Stammer/A. Bracco	20
09:50			Report on IPCC	Nathan Bindoff	10
<b>10:00</b>			<b>Break</b>		<b>20</b>
	<b>6</b>		<b>Interactions with Other Projects</b>		
10:20		6.1	US CLIVAR	Dan Vimont	20
10:40		6.2	IOC	Salvatore Arico (written statement)	20
11:00		6.3	Clic	Mike Sparrow	10
11:10		6.4	CORDEX	Christopher Lennard	20
11:30		6.5	SPARC	Donald Wuebbles	20
11:50		6.5	GEWEX	Peter Van Oevelen	20
12:10		6.7	Discussion, review of action items. Closing of public part of SSG	D. Stammer/ A. Bracco	20
<b>12:30</b>			<b>Lunch</b>		<b>60</b>
			<b>In camera – SSG and ICPO only</b>		
13:30	<b>7</b>		<b>Review of 2019 Meeting proposals and budget</b>	ICPO staff/SSG	45
14:15	<b>8</b>		<b>Membership issues</b>	SSG	45
		8.1	Life cycle of RF	D. Stammer/A. Bracco	
		8.2	Discussion on every panel	D. Stammer/A. Bracco	
<b>15:00</b>			<b>Break</b>		
15:30	<b>9</b>		<b>Preparations for next JSC</b>	D. Stammer/A. Bracco	60
16:30	<b>10</b>		<b>Any Other Business/Next SSG</b>	D. Stammer/A. Bracco	30
<b>17:00</b>			<b>End of meeting</b>		

**The  
World Climate  
Research Programme  
(WCRP)**

*facilitates analysis and  
prediction of Earth system change  
for use in a range of practical  
applications of direct relevance,  
benefit and value to society.*

