



# Climate and Ocean - Variability, Predictability, and Change

41<sup>st</sup> Session of the WCRP Joint  
Scientific Committee

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# Progress and achievements

## Advancement in Science

### Publications:

1. Ten White Papers for OceanObs'19.
2. IndOOS-2: A roadmap to sustained observations of the Indian Ocean for 2020-2030 (CLIVAR IORP & GOOS jointly publication).
3. Framework for high-end estimates of sea-level rise for stakeholders application (SL GC)
4. Pantropical climate interactions, more vigorous than previously thought (PRP)
5. Sources and Sinks of Ocean Mesoscale Eddy Energy, A Joint US CLIVAR and CLIVAR Workshop (by US CLIVAR, OMDP)
6. Estimating the Freshwater Flux from the Greenland Ice Sheet Workshop Report (OMDP, NORP, and ISMIP6)
7. Evaluation of global ocean–sea-ice model simulations based on the experimental protocols of the Ocean Model Intercomparison Project phase 2 (OMIP-2) (by OMDP, and other ocean modelling communities)
8. AGU monograph: El Niño Southern Oscillation in a Changing Climate –edited by MCPPhaden, Santoso and Cai. (in progress)
9. A Review of Decadal Climate Variability in the Tropical Pacific: Characteristics, Causes, Predictability and Prospects. (Power et al., 2019. Submitted to Science, PRP).
10. IndOOS-2: A roadmap to better observations of the rapidly-warming Indian Ocean (Beal et al., Submitted to BAMS, by IORP)
11. Climate Impacts of El Niño Southern Oscillation in South America. Cai et al. Published in Nature Review.



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# Progress and achievements

## Advancement in Science

### *Ongoing:*

1. Tropical Atlantic Observing System (TAOS) Review (led by ARP)
2. Perspective paper on the important research questions of the current knowledge on EBUS and future - led by CLIVAR EBUS RF.
3. Perspective paper on the update of Arctic Freshwater Storage – led by CLIVAR NORP
4. Special issue on 'North Pacific Climate and Ecosystem Predictability on Seasonal to Decadal Timescales' in *Frontiers in Marine Science*. (Coordinated by CLIVAR and PICES)
5. Special issue on 'Climate Services for Adaptation to Sea-Level Rise' *Frontiers in Marine Science*. (Coordinated by SL GC)

# Progress and achievements

## Capacity Building

- First ICTP-CLIVAR Summer School on Oceanic Eastern Boundary Upwelling System. 37 students, 11 lecturers, 22 countries involved. (15 to 19 July 2019, Trieste, Italy).
- Advanced School and Workshop on American Monsoons: progress and future plans. (19-24 August, 2019) - led by the CLIVAR/GEWEX Monsoons Panel
- Sessions and Town hall in Ocean Sciences Meeting 2020 (on Feb. 17-21 2020 at San Diego, USA): WCRP town hall 'CLIVAR in WCRP: Present and Future of international collaboration in climate and ocean research', and the IndOOS-2 town hall.
- Links between physical oceanography and biogeochemical and biological sciences
  - First joint workshop with PICES-40 on Climate and Ecosystem Predictability (June, 2019, Qingdao, China)
  - Second joint workshop with PICES-40 on Climate and Ecosystem Predictability (Oct. 20, 2019, Victoria, Canada)
- Workshop on WCRP Grand Challenge and Climate Services (Nov., 2019, Orléans, France) – led by SL GC



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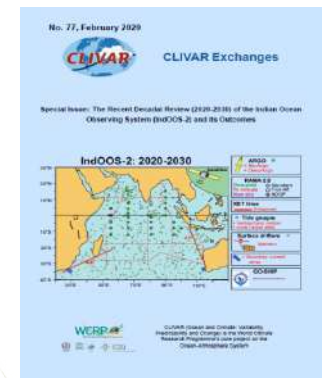
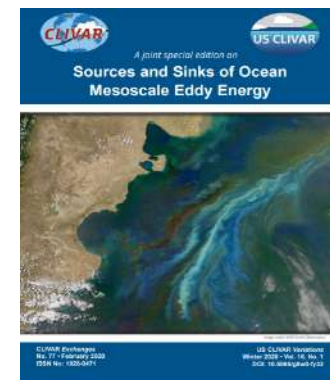
# Progress and achievements

## CLIVAR updates

- New approved CLIVAR Research Foci: Research Foci on Tropical Basin Interaction (TBI).
- New Agreement for hosting of the International CLIVAR Project Office (ICPO) was signed between the First Institute of Oceanography of the Ministry of Natural Resources, China (FIO, MNR) and the World Climate Research Programme (WCRP) on July 11, 2019.
- WCRP and the Indian Institute of Tropical Meteorology (IITM), Pune, India, have formally extended their agreement to host the International CLIVAR Monsoon Project Office (ICMPO) at IITM for one more year until February 2021 to enable consultations on future evolution of ICMPO.

**Exchanges #77:** CLIVAR Exchanges/US CLIVAR Variations :  
A joint special edition on Sources and Sinks of Ocean Mesoscale Eddy Energy

**Exchanges #78:** The Recent Decadal Review (2020-2030) of the Indian Ocean Observing System (IndOOS-2) and its Outcomes



# Future plans

1. Extend to pan-WCRP focus on Monsoons modeling and prediction – MP
2. AMOC Task Team in ARP
3. ENSO Conceptual Model WG within PRP
4. Task Team for IndOOS-2 Recommendation Tracking (IORP & IRF)
5. Coastal Climate Services and SLR (SL GC)
6. Biophysical Interactions – Ecosystem Prediction, Marine Heat Wave, OMZ in Indian Ocean
7. Contribute to UN Decade Implementation



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# Future Plan

## *Upcoming Events*

**2020:** 2<sup>nd</sup> CLIVAR-FIO Summer School on Ocean Macroturbulence and Its Role in Earth's Climate (**postponed to 2021**) – led by CLIVAR ARP.

**2020:** 3<sup>rd</sup> Summer School on Theory, Mechanisms and Hierarchical Modeling of Climate Dynamics: Tropical Oceans, ENSO and their Teleconnections (**postponed to 2021**, Trieste, Italy) – led by CLIVAR PRP.

**2020:** Workshop on Ocean Heat and Freshwater Storage and Transports in Observations and Climate Models (**possible online**, 26 - 30 October 2020, Exeter, UK) – Met Office, OOPC and CLIVAR-NORP

**2021:** CLIVAR multi-region panel workshop: 'From global to coastal: Cultivating new solutions and partnerships for an enhanced Ocean Observing System in a decade of accelerating change' (3-5 May 2021, Trieste, Italy) – Led by IORP.

**2022:** 2nd Sea Level Conference (July 2022, Singapore)



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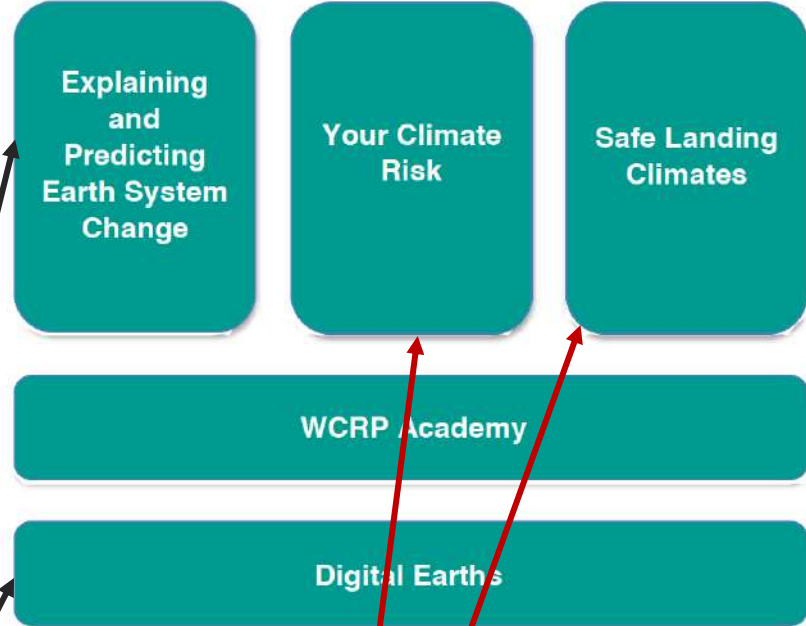


# Links to the WCRP Strategic and Implementation Plans

## WCRP Strategic plan

- 1** *Fundamental understanding of the climate system*
- 2** *Prediction of the near-term evolution of the climate system*
- 3** *Long-term response of the climate system*
- 4** *Bridging climate science and society*

## WCRP Implementation lighthouse activities (proposed)



Integrated ocean observations, models, assimilation, and prediction systems needed to achieve these goals/activities.

Connect with stakeholders to improve accessibility of ocean climate information

Greater emphasis on downscaling to local impacts, e.g. sea-level rise, marine heatwaves, needed to achieve these goals/activities



# Emerging issues

1. Impact and Opportunity of **COVID-19**
2. New arrangement for **ICMPO**
3. Contribution to the **UN Decade**: Promoting ECS | disseminating knowledge and connecting stakeholders | capacity building | Ocean observation and modelling
4. Evolving emphasis on:
  - **Integrating** modelling and observation, data science and machine learning;
  - **Interdisciplinary** research, e.g. role of biophysical interactions in carbon uptake;
  - Connecting understanding to improved prediction of impacts **relevant to society**
4. Funding constraints:
  - **Funding for CLIVAR**: fewer in person meetings/workshops | less participation from developing countries
  - **Funding from government & intergovernmental agencies for science**: observation | young generation | predictability capacity

# Additional Slides



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## 1. How you work with other WCRP activities?

1. Joint panels with other WCRP project/ activity
2. Cooperation in activities (CMIP6, OOPC, ...)
3. Future actions:
  - a. Detailed and sustained communication
  - b. co-organise joint activities

## 2. How you work with partners outside WCRP?

- US CLIVAR:** Joint workshops & publication; AMOC Science Team
- SCOR:** SCOR 2020 Annual Meeting, SIBER/IORP
- POGO:** POGO-21
- PICES:** WG-40 on Ecosystem Prediction, MHW, PICES 2020 Annual Meeting
- IOC-UNESCO:** UN Decade, GOOS, EBUS, SL...

## 3. Linking to WCRP Flagship Projects

1. Third Pole Environment (TPE): MP | IORP | OMDP
2. ANDEX: MP | PRP | OMDP
3. Greenland project: NOPR | ARP | OMDP

# Future plans

- Enhance links between CLIVAR groups and WCRP flagship projects

