



# Climate and Ocean - Variability, Predictability, and Change

## 2022 PICES POC Meeting

*Jing Li*

28 September 2022

Online



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# CLIVAR Mission and Scientific Priorities

CLIVAR is one of the 6 Core Projects of the World Climate Research Programme (WCRP)

CLIVAR's **mission** is to understand the dynamics, interaction, and predictability of the climate system with emphasis on ocean-atmosphere interactions.



## Scientific priorities of CLIVAR:

1. 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;
2. Ocean processes that modulate climate variability and change for which open questions remain;
3. Climate predictability challenges over a broad range of space and time scales.

# CLIVAR Organization Chart

## CLIVAR Organization

Scientific Steering Group ICPO

Core Panel

Research Foci

- Ocean Model Development Panel
- Global Synthesis and Observations Panel
- Climate Dynamics Panel
- Monsoons Panel
- Atlantic Region Panel
- Pacific Region Panel
- Indian Ocean Region Panel
- Southern Ocean Region Panel
- Northern Ocean Region Panel

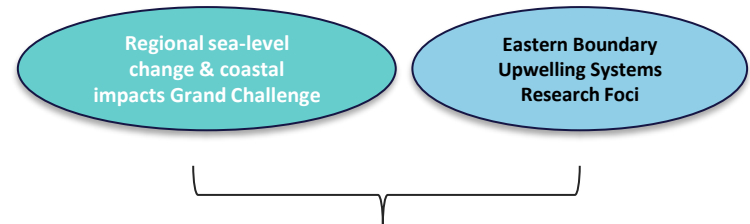
Tropical Basin Interaction  
(Mar.2020-Dec.2024)

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Calling for new Research Foci  
(Deadline: Oct.31)

The **CLIVAR SSG** provides overall guidance for CLIVAR activities, in concert with WCRP objectives, and establishes CLIVAR **Panels and Working Groups** and their term of reference.

**Research Foci** address urgent and actionable research challenges. RFs have a limited life-time (3-5 yrs)



WCRP Sea Level GC and CLIVAR EBUS RF sunset in 2022.



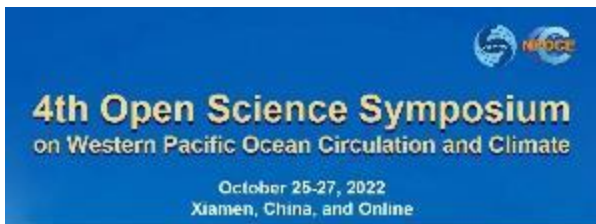
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# CLIVAR activities that are relevant to PICES

## Pacific Region Panel

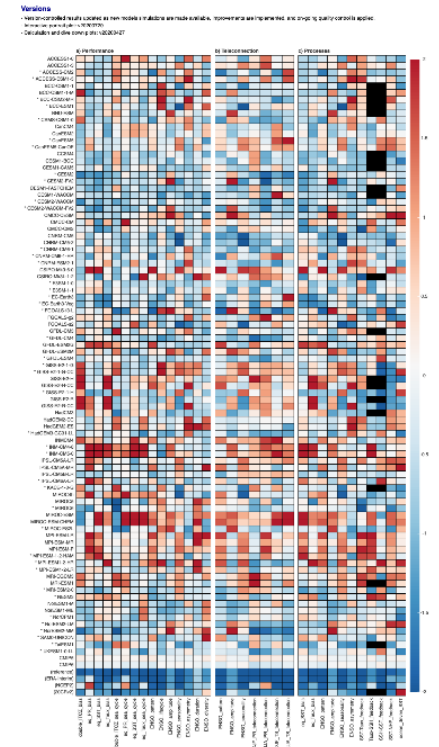
- WG: Tropical Pacific Decadal Variability (TPDV)
- WG: ENSO Conceptual Model
- ENSO Metrics



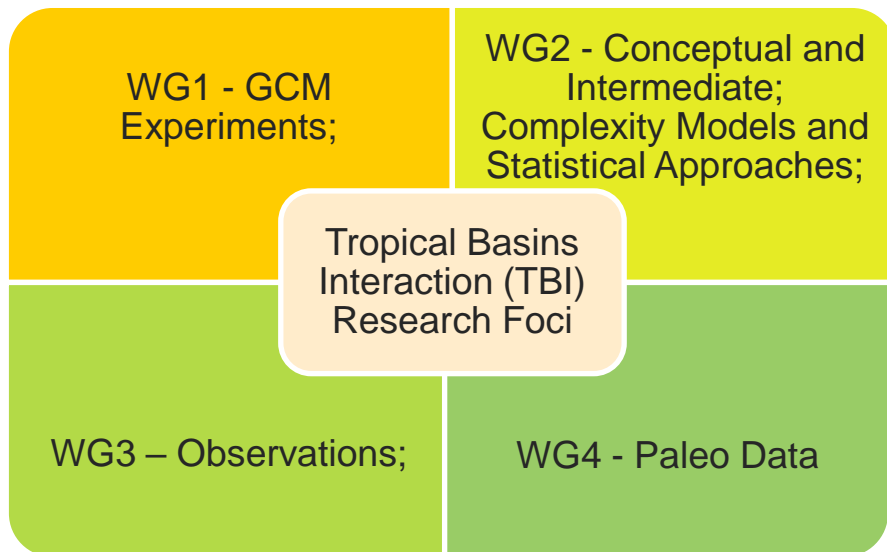
### Publications:

Decadal climate variability in the tropical Pacific: Characteristics, causes, predictability and prospects, *Science* (Power et al., 2021, Sci., <https://doi.org/10.1126/science.aay9165>)

ENSO CLIVAR 2020 Metrics in Collaboration with PCMDI IPSL/OCEAN AND NOAA



# CLIVAR activities that are relevant to PICES



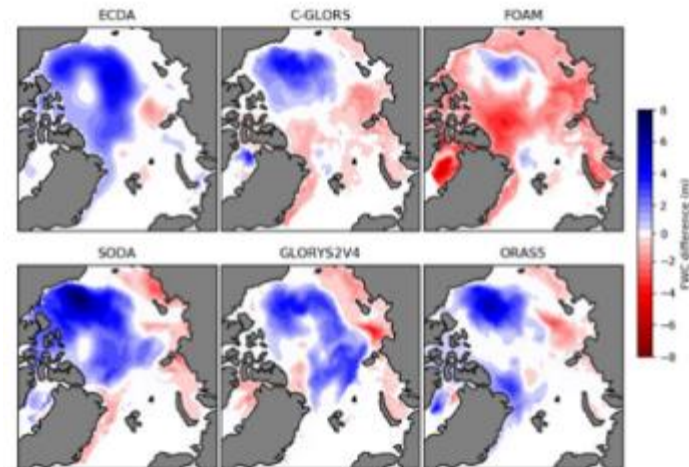
*The Tropical Basin Interaction (TBI) RF aims to create a consensus on the mechanisms underlying TBI and how these contribute to predictability, and to promote research on how these interactions are affected by low-frequency climate variability and long-term climate change.*

# CLIVAR activities that are relevant to PICES

## CLIVAR/CLiC Northern Oceans Region Panel

### Task Teams:

1. Improving Arctic Ocean reanalyses
2. The role of the Arctic Ocean in Arctic amplification
3. Understanding Arctic-midlatitude linkages
4. Quantifying the response to natural variability and external forcings
5. Model errors in Arctic projections
6. Greenland ice sheet – ocean interactions



*Freshwater content difference between 2010-2017 and 2000-2010 means in 6 ORAs.*



### Publication:

**Freshwater in the Arctic Ocean 2010–2019**  
(Solomon, et al., 2021, *Ocean Sci.*,  
<https://doi.org/10.5194/os-17-1081-2021>)



# Conference and Workshops in 2022

## Ongoing /Upcoming

**CLIVAR CLIMATE DYNAMICS PANEL (CDP)  
ANNUAL WORKSHOP: EXTERNAL VERSUS INTERNAL  
VARIABILITY ON DECADEAL AND LONGER TIME SCALES**

Online, 6 weekly 2-hour sessions  
September 12 - October 21, 2022






**Arctic Processes  
CMIP6 bootcamp**

Organised by the CLIVAR/CIC Northern Oceanic Region Panel  
11th to 21st October 2022 | Søminestationen  
Denmark

The Polar Prediction Project (PPP)













**SPARC 2022 • 7<sup>th</sup> General Assembly**  
24<sup>th</sup> to 28<sup>th</sup> October, at three locations  
Boulder, USA - Reading, UK - Qingdao, China

The 7<sup>th</sup> General Assembly of SPARC: Stratosphere-Troposphere Processes And their Role in Climate, a core project of the World Climate Research Programme, will bring together a large community of scientists from around the world. Its format will be different from General Assemblies run in the past, as it will be on a multi-hub basis with three locations and remote participation.

## Completed

**WCRP SEA LEVEL CONFERENCE**  
12 - 16 July 2022 | Singapore









**FilaChange 2022**  
an international conference on ocean processes  
linking filaments and finescales (1-100 km) with climate change  
27 Aug - 2 Sep 2022



**NORP-SORP WORKSHOP ON POLAR FRESH WATER**  
Sources, Pathways and Impacts of Fresh Water in  
Northern and Southern Polar Oceans and Seas (SPICE UP)

ONLINE, 19-21 September, 2022  
**Register Now**











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# PICES and CLIVAR existing cooperation

CLIVAR and PICES have had demonstrated long-time successful interdisciplinary cooperation, mainly on:

- WG27: North Pacific Climate Variability and Change
- WG29: Regional Climate Models
- WG38: Mesoscale and Submesoscale Processes,
- WG40: Climate and Ecosystem Predictability



PRP-PICES WG40 Joint Workshop in Victory, Canada, 2019



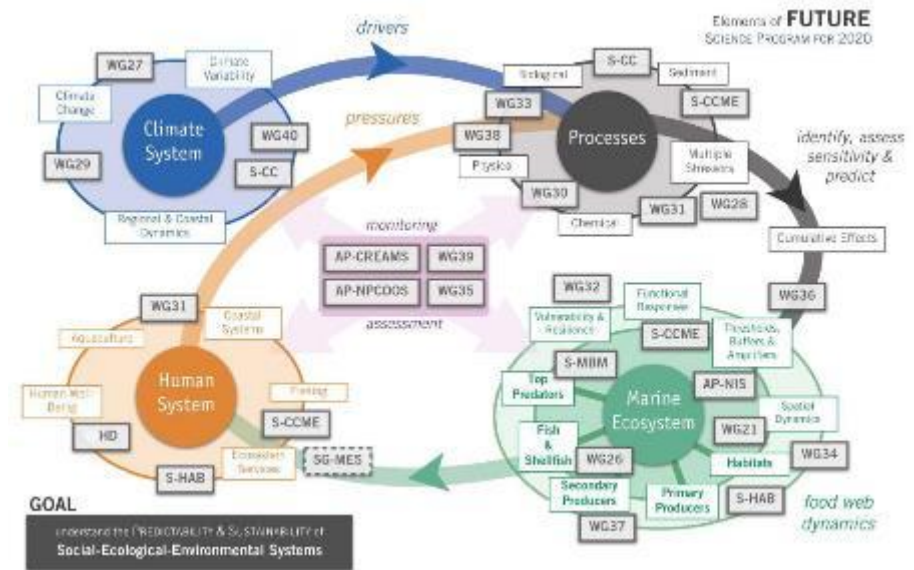
Shoshiro Minobe



Antonietta Capotondi



Ryan Rykaczewski



WG40 Workshop in Qingdao, China, 2019

# PICES-WCRP/CLIVAR Future

## Cooperation

### 1. Climate Extreme and Marine Heatwave

- Definition and characterization
- Mechanisms
- Model representation and simulation capacity
- Impacts
- .....

Some existing effort:

- ✓ PICES WG49: Climate Extremes and Coastal Impacts in the Pacific
- ✓ ICTP-CLIVAR Summer School on Marine Heatwaves: Global Phenomena with Regional Impacts (July 2023, Trieste, Italy)
- ✓ Possible CLIVAR Research Foci (Open call, deadline: Oct.31)
- ✓ Relevant WCRP and CLIVAR groups: PRP, CDP, OMDP, MCR LHA, EPESC LHA, etc.
- ✓ A session on ‘Marine Climate Extremes’ was co-conveyed by CLIVAR PRP and PICES during the 2022 Ocean Science Meeting.



# PICES-WCRP/CLIVAR Future

## 2. Early Career Scientists Capacity Building

- CLIVAR Summer school series (CLIVAR-FIO; ICTP-CLIVAR)
- WCRP Academy Lighthouse Activity (LHA)
- ESC to help with science communication (e.g. IO Ambassador)

## 3. Science-based solutions

- Meso and Submesoscale processes and their relevance for understanding and modeling ecosystem dynamics (OMDP)
- Region-focused ocean hub for My Climate Risk LHA
- WCRP new core project on Regional Information for Society (RiS)
- UN Ocean Decade (DITTO, OFS, ONCE, DCC-OCC, activities)



# CLIVAR Open Calls



The call for nominations to the CLIVAR panels and Scientific Steering Group (SSG) is now open, please submit the nominations online via the [nomination form](#) before **14 October 2022**. [Read more...](#)



## Open Call for new CLIVAR Research Foci

Applications are invited for groups within, or linked to CLIVAR communities across the globe to propose “Research Foci” (RF) Studies. Deadline: 31 October 2022. [Read more...](#)



# WCRP Open Science Conference



With the theme “**Advancing climate science for a sustainable future**”, the event will bring together diverse research communities, programs and partners to discuss the latest developments in climate science, with an emphasis on science-based information for decision making. WCRP is looking at innovative ways to bridge science and society and to foster future climate science leadership, through workshops, public exhibits, forums, and other associated events.

Open call for poster clusters and side events.

<https://www.wcrp-climate.org/wcrp-osc23>



# Additional Slides



# Capacity Building



Regional Training Workshop on Observing the Coastal and Marginal Seas in the Western Indian Ocean (Maputo, Mozambique & online, 7-9 June 2022)



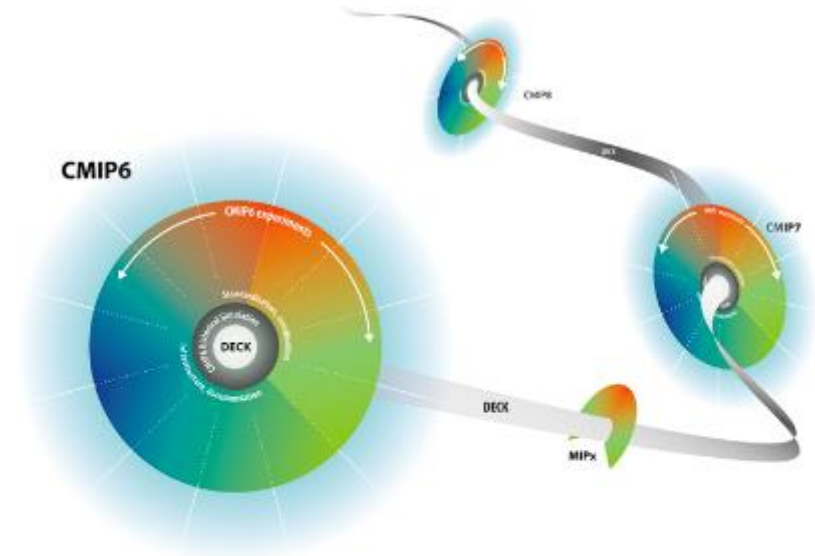
CLIVAR-FIO Summer School on 'Ocean Macroturbulence and Its Role in Earth's Climate' (Qingdao, China & online, 15-19 August 2022)



# Open Call for CMIP7 Task Teams

## CMIP7 Task Teams

- Climate Data Request
- Climate Model Benchmarking
- Climate Model Documentation
- Climate Data Citation
- Climate Forcings
- Strategic Ensemble Design



*CMIP continuity across different phases. [Eyring, Veronika, et al. "Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization." Geoscientific Model Development 9.5 (2016): 1937-1958].*

Application deadline of 2<sup>nd</sup> October 2022.

<https://www.wcrp-climate.org/wgcm-cmip/call-members-cmip7>



# CLIVAR and the UN Ocean Decade

- **Digital Twin of the Ocean (DITTO) Programme**
  - ✓ Assisted in the preparation of the 1<sup>st</sup> International Digital Twins of the Ocean Summit, and coordinate for virtual satellite activities
  - ✓ Registered as a partner for DITTO Programme
- **Ocean Observing Co-design Programme**
  - ✓ Attended Ocean Observing Co-design Programme meeting and workshop
  - ✓ To link the CLIVAR/GOOS Workshop more closely with the programme
  - ✓ To support the co-design for a testbed in the Indian Ocean
- Contributed to the Southern Ocean UN Decade
- CLIVAR-GOOS Workshop was endorsed as an UN Decade activity
- Participated in the development of UN Ocean Decade China's national strategy, actions and contribution:
  - ✓ Decade Collaborative Centre for Ocean-Climate Nexus and Coordination amongst Decade Implementing Partners in P.R. China (DCC-OCC)
  - ✓ Ocean Seamless Forecast (OSF Programme)
  - ✓ Ocean Negative Carbon Emission (ONCE Programme)



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# Progress and achievements

## Other CLIVAR panel activities

- **IORP:** RAMA-OMNI coordination, Indian Ocean Youth Ambassador, IndOOS-2 implementation progress report, WIO training workshop
- **SORP:** contributed to the SOOS Science Plan and SO UN Ocean Decade; special issue on 'SO and S Atlantic' in *Front. in Mar. Sci.*
- **PRP:** ENSO metrics, ENSO conceptual models WG, ENSO Summer School, CLIVAR-PICES Joint WG on Climate Extremes and Coastal Impacts in the Pacific
- **ARP:** 3 focal areas: AMOC, Tropical Atlantic, risks and extreme events.
- **NORP:** Arctic Processes CMIP6 Bootcamp; review papers on seasonality of Arctic freshwater and Arctic Ocean heat flux, NORP/SORP joint workshop
- **MP:** Regional working groups updated: Asian-Australian Monsoons (17 members), African Monsoons (19 members), American Monsoons (14 members)
- **GSOP:** Focus on 2 topics: The Deep Argo role in the observing system; and collaboration in SynObs (a Project under the UN Ocean Decade)
- **OMDP:** 1 new paper emanating from panel activities; three workshops within OMDP; SWOT-Adopt-a-Crossover calibration and validation experiments
- **CDP:** Arranged two workshops: on “towards providing more reliable regional climate change projections”; and “Multi-annual to Decadal Climate Predictability in the North Atlantic-Arctic Sector”, 3 sessions on big conferences