



Climate and Ocean: Variability, Predictability and Change (CLIVAR) Core Project

44th Session of the WCRP Joint Scientific Committee



Sonya Legg and Francois Englebrecht (co-chairs)

Jing Li (acting ICPO executive director)

May 2023, Climate Center, Brussels, Belgium



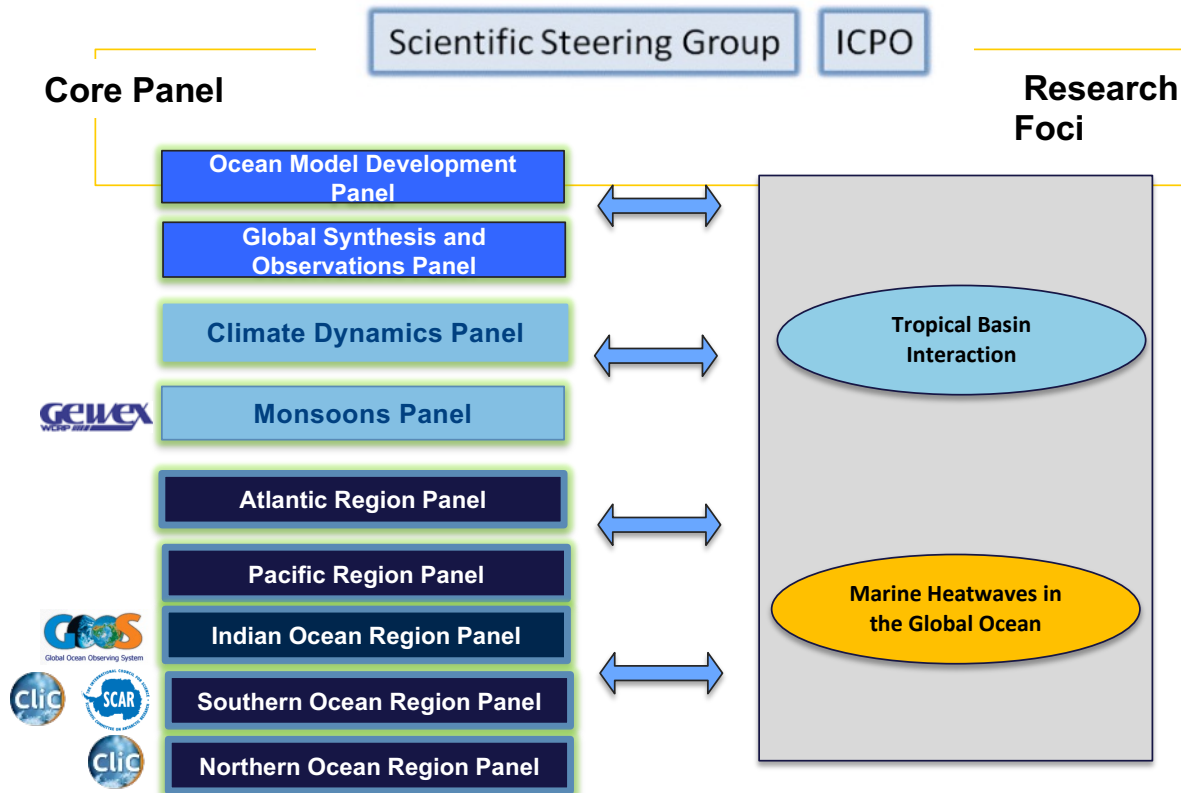
International
Science Council



WCRP
World Climate Research Programme

CLIVAR Organization Chart

CLIVAR Organization



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)

CLIVAR New Research Foci: Marine Heatwaves in the Global Ocean started activities in January 2023.

Progress and achievements over the last year (1)

- CLIVAR Research Foci on Marine Heatwaves in the Global Ocean (**MHW RF**) was approved by SSG in December 2022.
- The Skill Development, Awareness, and Application (**SDA²**) framework for ECR capacity building was developed by IORP, and will be applied to the upcoming ICTP/CLIVAR MHW summer school.
- **Coordinated experiments:**
 - ✓ Southern Ocean Freshwater release model experiments Initiative (SOFIA) was officially launched, to reconcile the growing number of Southern Ocean model studies on meltwater impacts. The SOFIA experiment protocol paper has been submitted to GMD, and 2 experiments will be started soon (SORP).
 - ✓ Several test runs for the TBI coordinated experiments (CoEx) have been completed, and two critical aspects of the experiment design (i.e., the SST restoring time scale and the latitudinal width of the restoring region) were reached in a consensus. The full-scale experiments will start in the second half of 2023 (TBI RF).
- Support for **global/regional ocean observing system** design and implementation: CLIVAR/GOOS workshop | WIO Workshop | 7th Argo Workshop | CLIVAR Exchanges on TAOS | Review paper on COVID impacts on IndOOS | WG3 (Observation) of TBI RF
- 3 **regional monsoons WGs** (Asian-Australian, WG-AAM; African, WG-AFM; and American, WG-AMM) of MP to enhance understanding of the monsoons in those regions through various process studies with an emphasis on improving prediction skills in those respective areas.



International
Science Council



Progress and achievements over the last year (2)

- The **Atlantic Ocean Blog (AOB)** was launched in Feb. 2023 with ~ monthly update (ARP).
- A review paper on Tropical Pacific Decadal Variability (**TPDV**) has been submitted in March 2023 to *Nature Review Earth & Environment* as a major outcome of TPDV WG (PRP)
- A review paper on ‘**ENSO Recharge Oscillator (RO) Conceptual Model: past achievements, future prospects**’ will be submitted to *Reviews of Geophysics* in Summer of 2023 as a major outcome of ENSO Conceptual Model WG (PRP).
- A cloud-based model comparison was published and dataset was established, as results of the **FilaChange Workshop** co-organized by SWOT-AdAC and OMDP.
- A meeting summary paper “Polar Fresh Water in a Changing Global Climate: Linking Arctic and Southern Ocean Processes” has been under preprint in *BAMS*, as a legacy of **SPICE UP Workshop**, jointly organized by NORP and SORP.

Progress and achievements over the last year (3)

- Key topics of **Climate Dynamics Panel (CDP)**:
 - ✓ weather-climate interaction across different spatio-temporal scales;
 - ✓ ocean basin to ocean basin and tropical-extratropical teleconnections;
 - ✓ development of predictive theories of climate dynamics, involving non-linear interactions between the dynamics and physics of the atmosphere and ocean.
- **Southern Ocean Region Panel (SORP)** is closely tied to other panels/groups via its members (e.g., NORP, SCAR, SOOS, FRISP, UN Ocean Decade and etc.). The key topics covered by SORP are:
 - ✓ to constrain the role of the Southern Ocean in the planet's heat and freshwater balance issues;
 - ✓ to constrain the Southern Ocean's role in global carbon cycling.
- The ongoing activities of **Global Synthesis and Observations Panel (GSOP)** focus on two questions:
 - ✓ How does data assimilation of observations impact dynamical balance of models?
 - ✓ What metrics are most suitable for assessing data assimilating systems?

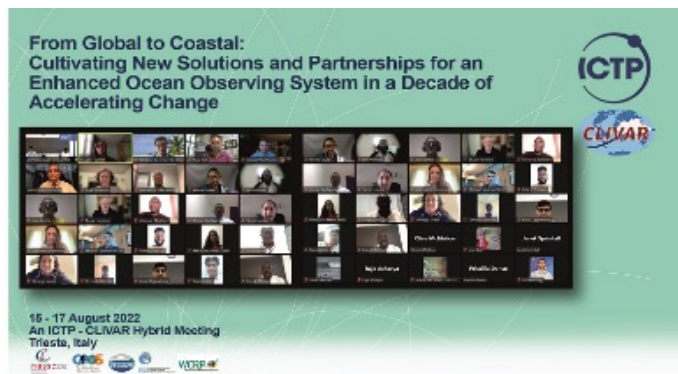
Capacity building activities in 2022



7th – 9th June, Maputo, Mozambique & online



2nd CLIVAR-FIO Summer School (15-19), August, hybrid, Qingdao, China.



International Science Council



CLIVAR workshops/conferences in 2022-2023

Organized by CLIVAR panels

**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

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

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

29 Aug-2 Sep 2022

**2023 CLIVAR joint workshop on the tropical Pacific
and its interbasin interactions**
13- 17 February 2023, Melbourne, Australia & Online

MONASH University | CLIVAR | WCRP | US CLIVAR

Supported by CLIVAR

WCRP SEA LEVEL CONFERENCE
12 - 16 July 2022 | Singapore

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

The 7th 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.

7th Argo Science Workshop
October 11-13th 2022, Brussels, Belgium
OneArgo for a changing ocean

Argo | EuroSea | CLIVAR

CLIVAR Exchanges

Published in 2022

No. 82, November 2022
DOI: 10.36071/clivar.82.2022

CLIVAR Exchanges

Special Issue: Tropical Atlantic Ocean Observing System (TAOS)

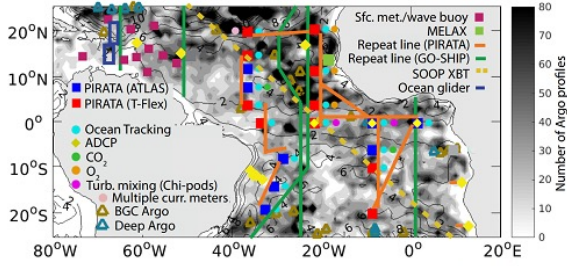



Figure provided by G. Falz

WCRP
World Climate Research Programme

CLIVAR (Climate and Ocean: Variability, Predictability and Change) is the World Climate Research Programme's core project on the Ocean-Atmosphere System



Upcoming issue in 2023

Open call: a CLIVAR Exchanges issue on highlighting Ocean Research, Data and Networks of Antarctic Programs

The CLIVAR/CLIC/SCAR Southern Ocean Region Panel is seeking contributions on

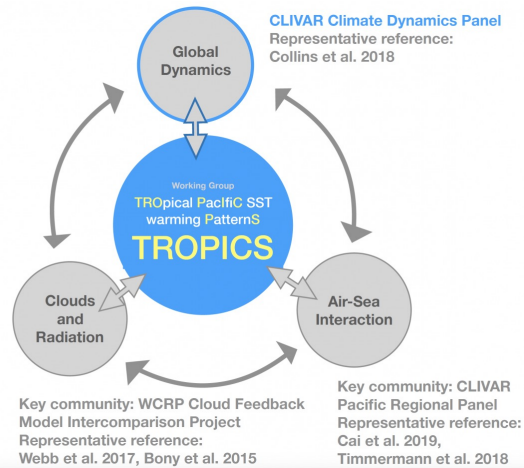
- latest research highlights in physical or biogeochemical oceanography
- networking and educational efforts on international level
- sharing experiences and challenges in expanding Southern Ocean programs

We particularly invite contributions from developing as well as newly emerging programs and those based in southern hemisphere countries.

Visit <https://www.wix.cn/vi/wov36w5.aspx> for more information and a brief questionnaire to sign up by **March 10, 2022**



Future plans



1. A CLIVAR/CFMIP Joint Working Group on TROPical Pacific SST warming PatternS (**TROPICS**) launched in March 2023.



2. CLIVAR Southern Ocean Freshwater release model experiments Initiative (**SOFIA**) task team

3. Ocean modeling development:

- OMDP will continue its active role in contributing to **CMIP7**, particularly through **OMIP**, but also connecting to coupled **CMIP**.
 - A **new ocean forcing dataset based on ERA-5** is planned to be developed by OMDP, to replace the soon to be discontinued JRA-55-do forcing dataset.
 - **Machine Learning** in ocean models will be further explored.
4. **National representatives of NORP** will be reactivated to secure support for Arctic ocean-sea ice state estimates and Northern Ocean Observing System (NOOS).
 5. Proposals for the next **CLIVAR Research Foci** will be invited at the end of 2023.

Upcoming Events

1. **Workshop on Meeting AMOC Observation Needs in a Changing Climate** (18 – 20 July 2023, Hamburg, Germany and online) and pre-workshop webinar series.
2. **ICTP/CLIVAR Summer School on Marine Heatwaves: Global Phenomena with Regional Impacts** (24-29 July 2023, Trieste, Italy and online)
3. **4th Summer School and workshop on Theory, Mechanisms and Hierarchical Modeling of Climate Dynamics: Atlantic Variability and Tropical Basin Interactions at Interannual to Multi-decadal Timescales** (31 July – 11 August 2023, Trieste, Italy, and online)
4. **28th Session of CLIVAR Scientific Steering Group (SSG-28 Part II)** (22 & 27 October 2023, Kigali, Rwanda and online)
5. **Panel/RF meetings: SORP-NORP Joint meeting** (10-11 July 2023, Germany); **ARP** (17 July 2023, Germany); **MHW RF** (23 July 2023, Italy); **CDP** (11 August 2023, Italy); **MP** (October 2023, Rwanda); **GSOP** (TBD). (Note: IORP-19, PRP-15, and TBI RF were completed in early 2023).

Upcoming capacity building activities

*** Special thanks to US CLIVAR in providing tremendous support for CLIVAR activities**

ICTP/CLIVAR Summer School on Marine Heatwaves:
Global Phenomena with Regional Impacts

Registration now open!
24-29 July 2023, Trieste, Italy

Sponsors

WCRP World Climate Research Programme
US CLIVAR Climate Variability & Predictability
NASA
NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE
NSF

WCRP CLIVAR US CLIVAR

4th Summer School on Theory,
Mechanisms and Hierarchical
Modeling of Climate Dynamics:
Atlantic Variability and Tropical
Basin Interactions at Interannual to
Multi-Decadal Time Scales

ICTP

31 July - 11 August 2023
An ICTP hybrid meeting
Trieste, Italy

NASA NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE NSF

Further information:
<https://indico.ictp.it/sf3864>

- SORP-NORP Joint Summer School on polar fresh water is being tentatively scheduled for 2024.
- Call for proposals for 2024 CLIVAR/FIO, CLIVAR/ICTP summer school will be open in summer 2023.

SDA² Framework for Capacity Building

SDA² Framework

Methodological Roadmap for farming ECRs



- Hackathons
 - Concept of OceanHackWeek etc.
 - Introductory sessions on Python/Data analysis etc.
- Graduate Student Seminars
- Paper Writing Workshops
- Groups of new+old+mentor



- Webinars/interactive sessions with leading scientists & subject experts
- Short 1-2 day sessions on emerging topics
- Job opportunities
- Twitter/Slack channels

Concept taken from Sanskrit shloka "**Vidya Viniyoga vikasa**". It means development through the application of knowledge

Implementation of SDA² Framework

First implementation in Summer School on Marine Heatwaves in July 2023



- **Hackathons – Pre-school exercise** (eg : to develop a code)
- **Graduate Student Seminars** - Lightning session/online+in-person Poster session/creative sessions
- **Hands-on training**
- **Working groups** (ECRs + mentor)



- **Working Groups discussion.**
- **Webinars/interactive sessions** (with leading scientists & subject matter experts w.r.t. to the WGs)



- **Community Paper**
 - Timeline based community research paper as a quantified output for the Summer school.
 - Clivar Exchanges/Journal Article
- **Product Development**

Linkages with Core Projects & LHAs

- **OMDP** has close connections to the **ESMO** project, via long-term communication with **DAO**, **WGNE**. OMDP is collaborating with WGNE and DAO on how to initialize OMIP and coupled forecast systems. OMDP members (Fox-Kemper, Danabasoglu, Marsland) have been participants in the ESMO Transition team.
- CLIVAR collaborated in the development of the **Ocean Risk Hub**, which is under **My Climate Risk LHA**: Risks from ocean extremes for coastal communities in Indian Ocean (Roxy Koll, IITM) and Atlantic Ocean (Jenifer Veitch, SAEON), Pacific Ocean (Pending). Cross panels/Cross LHAs.
- ICPO supported the organisation of the WCRP 2022 Sea Level Conference and the 7th SPARC General Assembly Asia Hub in Qingdao, China.
- CLIVAR SSG will be held alongside **2023 WCRP OSC**, and several poster clusters are coordinating by CLIVAR Community e.g., *PC12: Changing in Sea Surface temperature patterns in the Tropics*; *PC14: Ocean Mixing and climate*; *PC16: Marine Heatwave in the world oceans*, and etc.
- Monsoons Panel coordinates the formation and function of regional working groups and collaborates with the **WCRP/WWRP** and **GEWEX**.
- CLIVAR's interaction with **CLiC** is coordinated via NORP and SORP.
- CLIVAR representation in the **WCRP GPEX Science Team** (Charlotte Demott).

Request for WCRP Academy

- WCRP Academy may help **advertise** the CLIVAR capacity building activities through their network, and include the archived training materials into the WCRP training repository. Organizers of CLIVAR capacity building activities are encouraged to coordinate with WCRP academy before and after events.
- WCRP Academy can help **recommend lecturers** through the WCRP expertise pool.
- One big issue the training activities are facing is **funding sources**. It would be great if WCRP can support such activities both in-kind or financially.

Partnerships with entities outside of WCRP

OOPC: CLIVAR-OOPC joint discussion organized in Oct 2022 and Mar 2023, with specific topics identified on: Marine heatwave, pan-tropical ocean observations; water-carbon-energy cycles and budgets, and connection to the UN Ocean Decade endorsed programmes implemented by GOOS.

- CLIVAR attendance to OOPC-26
- NOOS and boundary current observation (IO)
- A formal representative from CLIVAR in OOPC to be identified.

PICES: Interdisciplinary cooperation. CLIVAR-PICES Joint WG on Ocean Extremes and coastal impacts in the North Pacific (WG49) (Antonietta as co-chair and ex-officio representing CLIVAR). Potential linkage on MHW.

SOLAS: Integrated ocean carbon research (IOC-R) | Indian Ocean research | Capacity building.

Dr Lisan Yu – new SOLAS SSC member, representing CLIVAR and WCRP.

US CLIVAR: Financial support to CLIVAR activities | topics of common interests (e.g., AMOC)

UN Ocean Decade:

- DITTO Programme and DITTO Summit
- China UN Decade Actions: DCC | OSF | ONCE
- Several CLIVAR activities were endorsed by the Decade, e.g., CLIVAR-GOOS Workshop | FilaChange Workshop

Emerging issues

- To strengthen **internal communication within WCRP**.
- With increasing demands from society for climate information, CLIVAR is anticipated to provide information of strong societal relevance and to have more interaction with other communities (e.g., the BGC community) to better understand the ocean's role in the earth's climate system.
- There is no **integrated Arctic Observation System** and no NOOS (Northern Ocean Observing System), because of complex geopolitics of the Arctic. NORP is making efforts on this, but the process could be promoted if WCRP can support it.
- CLIVAR wishes to renew connections to other groups within/outside WCRP, which leads to an **increasing demand for travel funds** for CLIVAR representatives to attend other meetings. Meetings with hybrid access to observers may help alleviate the pressure on funds.
- The **ICPO is in transition** now, with 3 out of 4 staff left. Strong support and coordination from WCRP Secretariat is needed.