2021 2030 United Nations Decade of Ocean Science for Sustainable Development

From Global to Coastal: Cultivating New Solutions and Partnerships for An Enhanced Ocean Observing System in A Decade of Accelerating Change

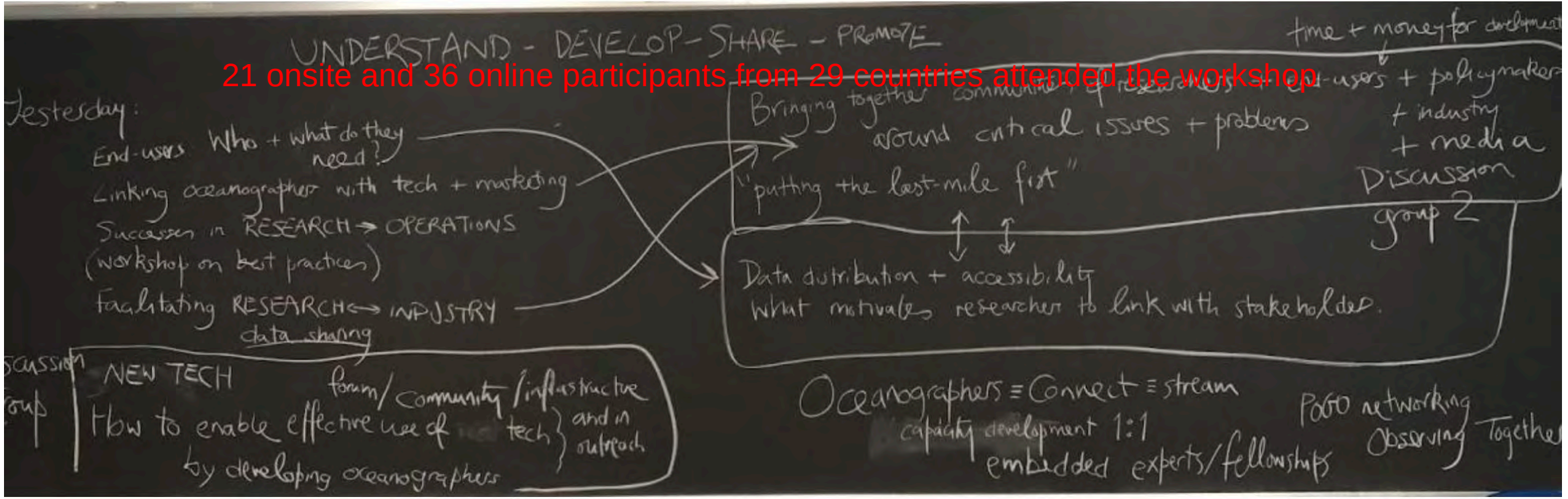
15th-17th August 2022
Trieste, Italy & Online

CLIVAR GOOS ICTP The Abdus Salam International Centre for Theoretical Physics WCRP World Climate Research Programme US CLIVAR

From Global to Coastal:
Cultivating New Solutions and Partnerships for an Enhanced Ocean Observing System in a Decade of Accelerating Change

ICTP

CLIVAR



21 onsite and 36 online participants from 29 countries attended the workshop

Workshop Agenda: https://www.clivar.org/clivar-goos-workshop-agenda

Day 1: *Ocean Observing Systems and the way forward*

09:00 - 09:25 ***Opening session:*** **Welcome from our sponsors and Aspirations for the Workshop** (Chair: Lisa Beal)

- **Vladimir Ryabinin** (IOC-UNESCO, virtual) (Recording)
- **Sonya Legg** (CLIVAR SSG Co-chairs, virtual) (Slides | Recording)
- **Welcome remarks from local host (Riccardo Farneti,** ICTP, in-person) and **organizing committee co-chairs (Edem Mahu/Weidong Yu**, virtual) (Recording)

09:25 - 10:10 ***Plenary:*** **Global and Regional Ocean Observing Systems** (Chair: Riccardo Farneti - in person; Co-chair: Weidong Yu - Online)

Global and regional context

- Global Ocean Observing Co-design (**Sabrina Speich**, in-person) - 15 mins (Slides | Recording)
- Indian Ocean Observing System (**Juliet Hermes,** in-person) - 10 mins (Slides | Recording)
- TPOS Tropical Pacific Observing System (**Sophie Cravatte,** virtual) 10 mins (Slides | Recording)
- TAOS Tropical Atlantic Observing System (**Regina Rodrigues**, virtual) - 10 mins (Slides | Recording)

10:10 -10:30 **Coffee break** (10 mins)

10:30 - 12:00 ***Plenary:*** **Rim-Nation and Small Island State Perspectives (8 mins each + 2 mins questions * 8=80 mins)** (Chair: Kim Juniper; Co-chair: Weidong Yu)

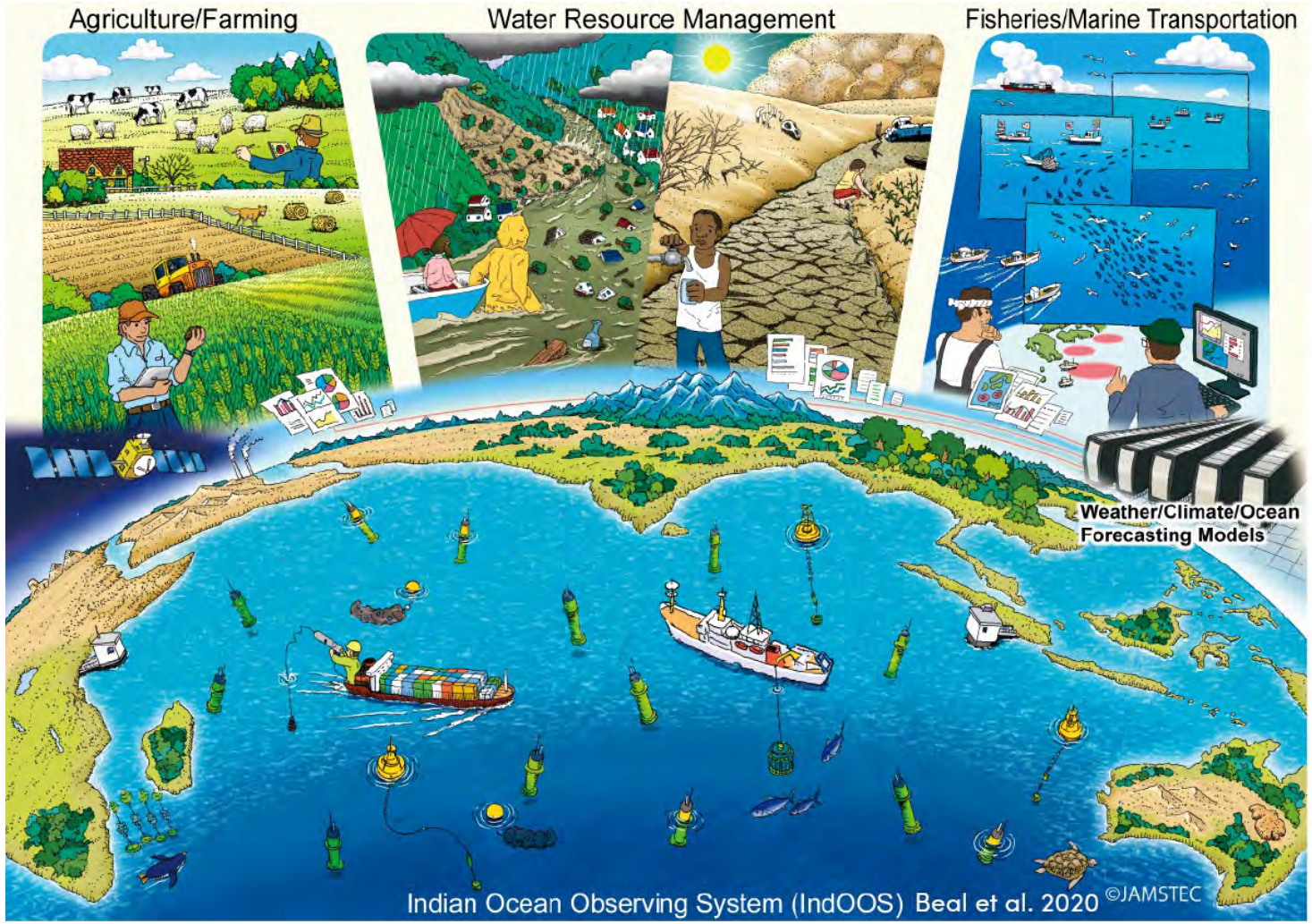
From Open Ocean to Coast

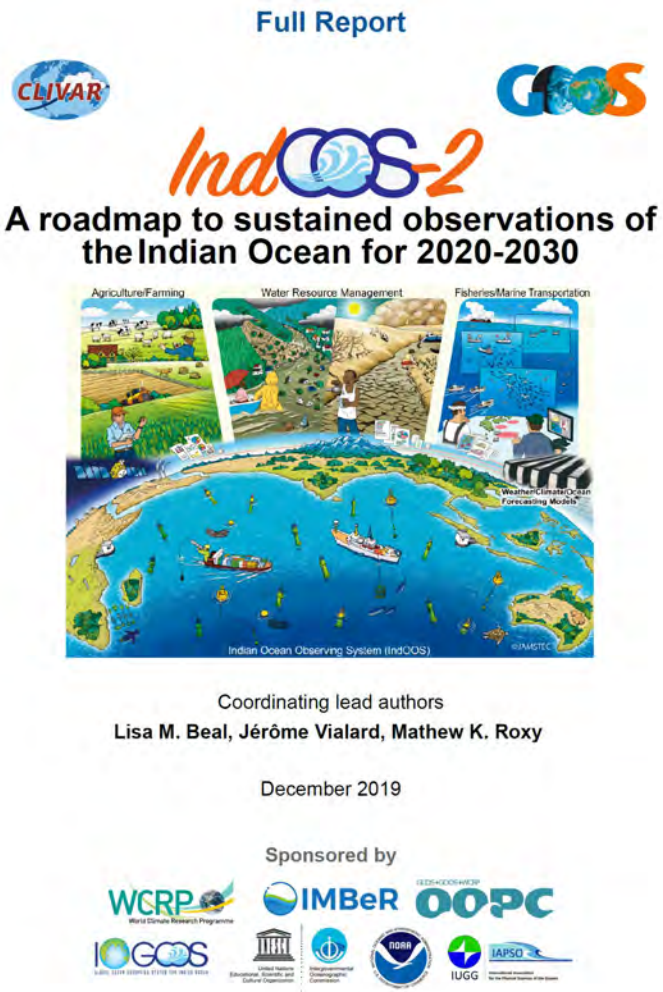
- Western Indian Ocean - **Mika Odido** (IOC coordinator Africa, in-person) (Slides | Recording)
- Eastern Indian Ocean - **Nelly Florida** (Indonesia, BMKG, in-person) (Slides | Recording)
- Northern Indian Ocean - **Ahmed Rasheed** (Maldives - Weather department, virtual) (Slides | Recording)
- Western Pacific Ocean - **Aileen Tan** (Malaysia, in-person) (Slides | Recording)
- Eastern Pacific Ocean - **Jonathan Cedeño** (ERFEN, virtual) (Slides | Recording)
- Eastern Atlantic Ocean - **Kwasi Appeaning Addo** (Ghana, virtual) (Slides | Recording)
- Southwestern Atlantic Ocean: **Leticia Cotrim Da Cunha** (Brazil, in-person) (Slides | Recording)
- SIDs-Pacific Island Country - **Zulfikar Begg** (Fiji, in-person) (Slides | Recording)
- Q & A session -10 mins

Group Discussion on thematical topics:

1. oceanographers' connection; 2. new technologies; 3. co-design stakeholders

Why do we monitor and forecast these changes?



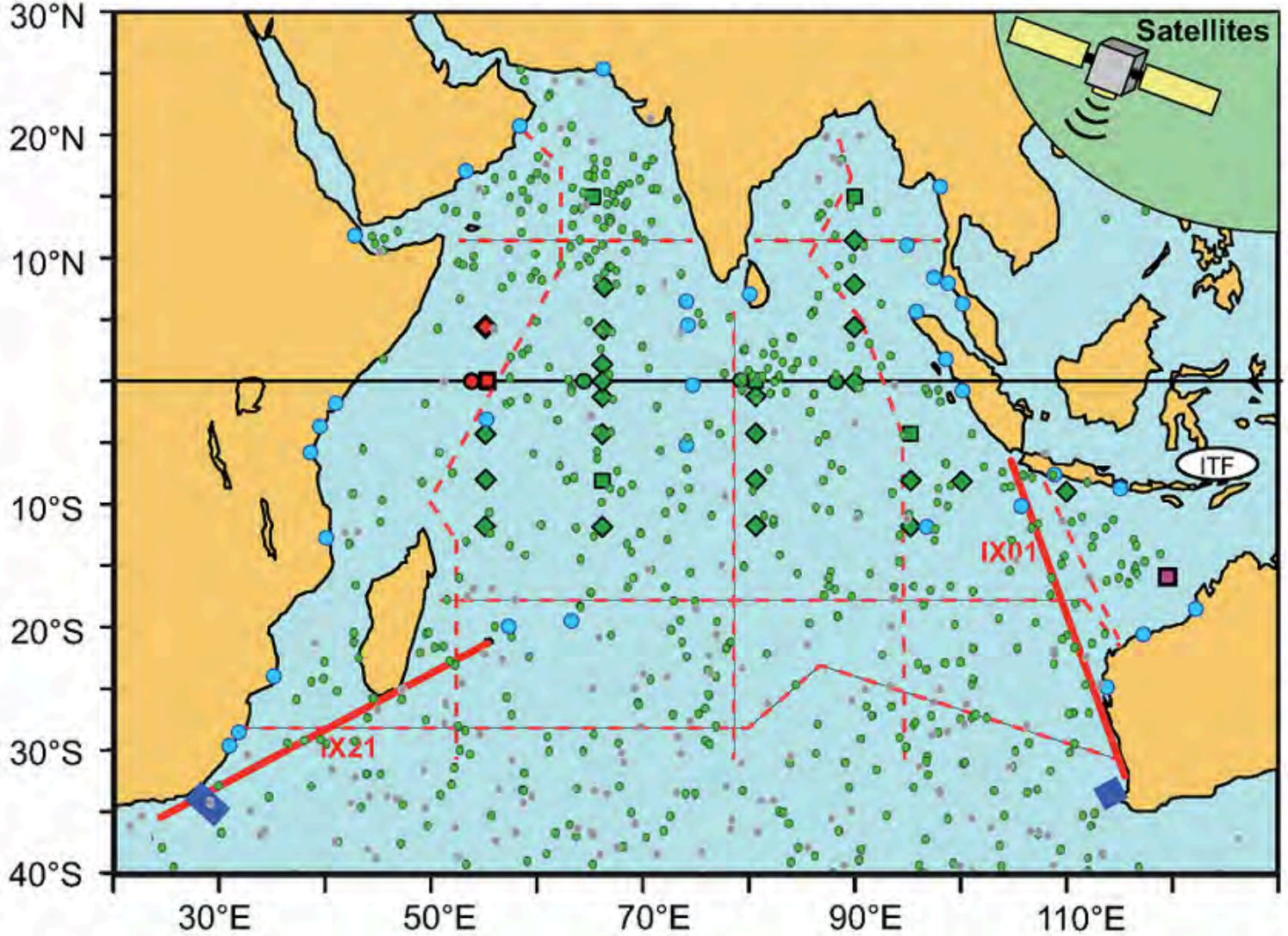


What counts in life is not the mere fact that we have lived. It is what difference we have made to the lives of others that will determine the significance of the life we lead, Mandela

doi.org/10.36071/clivar.rp.4.2019

Beal et al. *BAMS* 2020; Hermes et al. *Frontiers in Marine Science* 2019

IndOOS-2: 2020-2030



ARGO
+ Bio-Argo
+ Deep-Argo

RAMA 2.0

Occupied	Standard
To occupy	Flux ref.
New site	ADCP

XBT lines
Enhanced

Tide gauges
+ Vertical land motion
+ more Island sites

Surface drifters
+ surface pressure

+ Boundary current array

GO-SHIP
+ leadership for line I1

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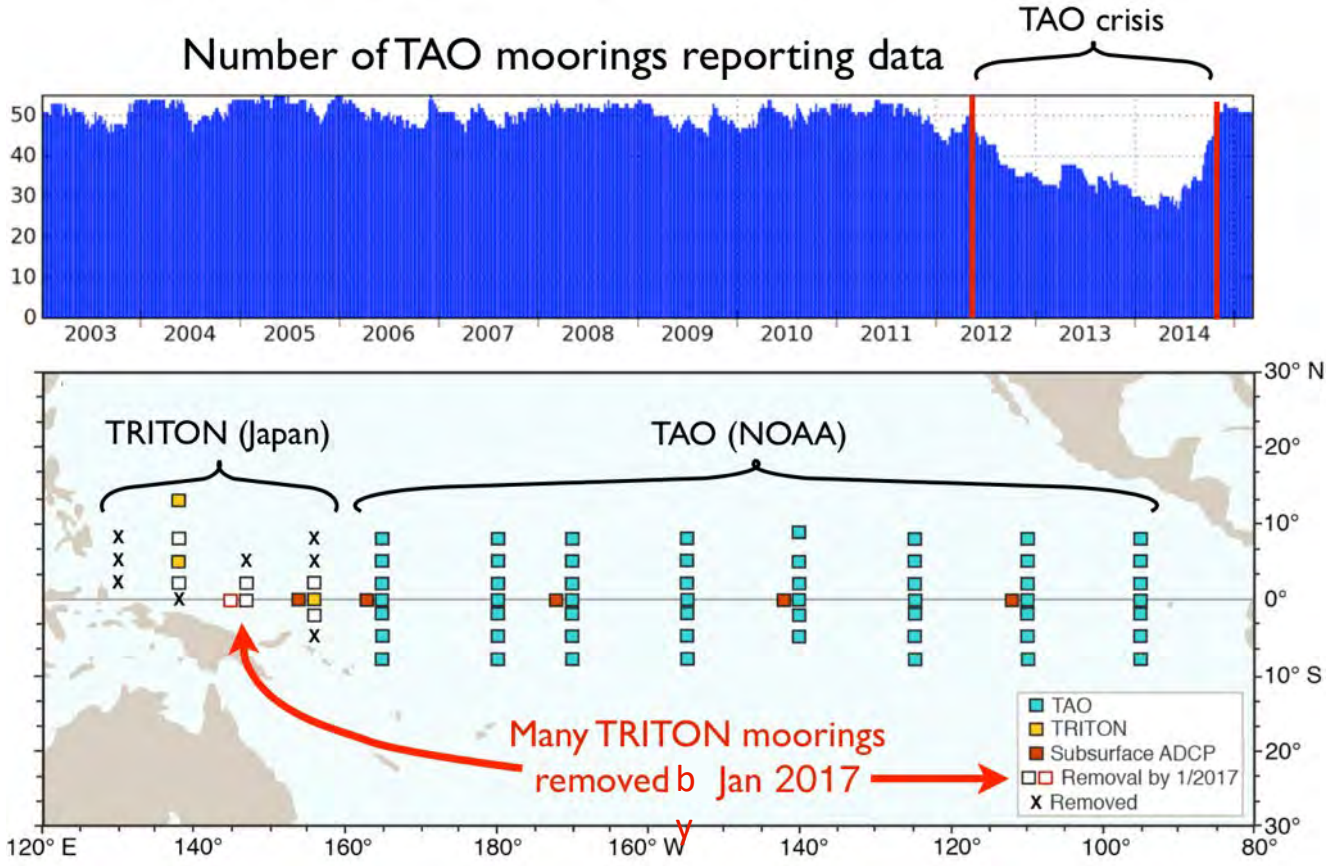
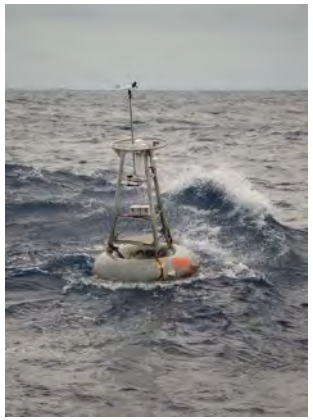
TROPICAL PACIFIC OBSERVING SYSTEM

Institut de Recherche pour le Développement FRANCE
French National Research Institute for Sustainable Development

Sophie Cravatte
IRD, New Caledonia

TPOS2020 began in a crisis (2014)





The crisis showed the risk to ENSO prediction.

TPOS2020 started:

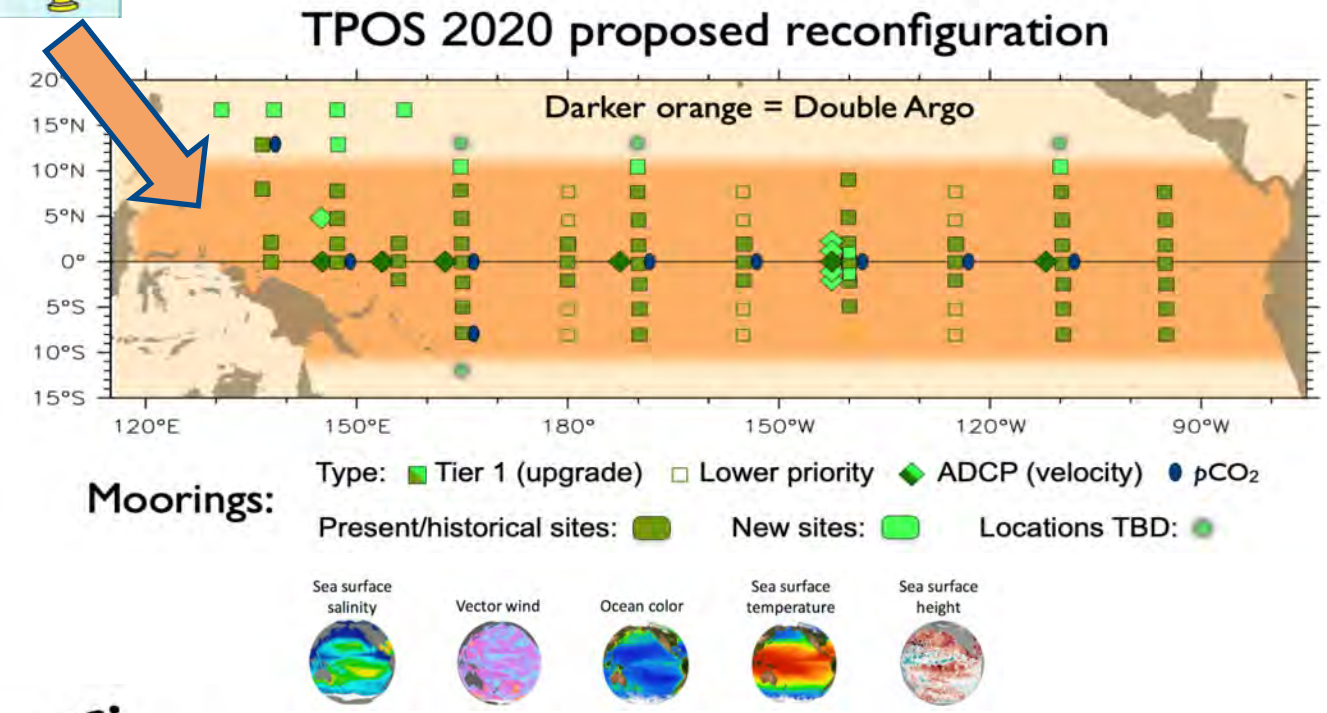
to build a more modern, robust and resilient system, meeting the needs of research and forecasting systems, considering:

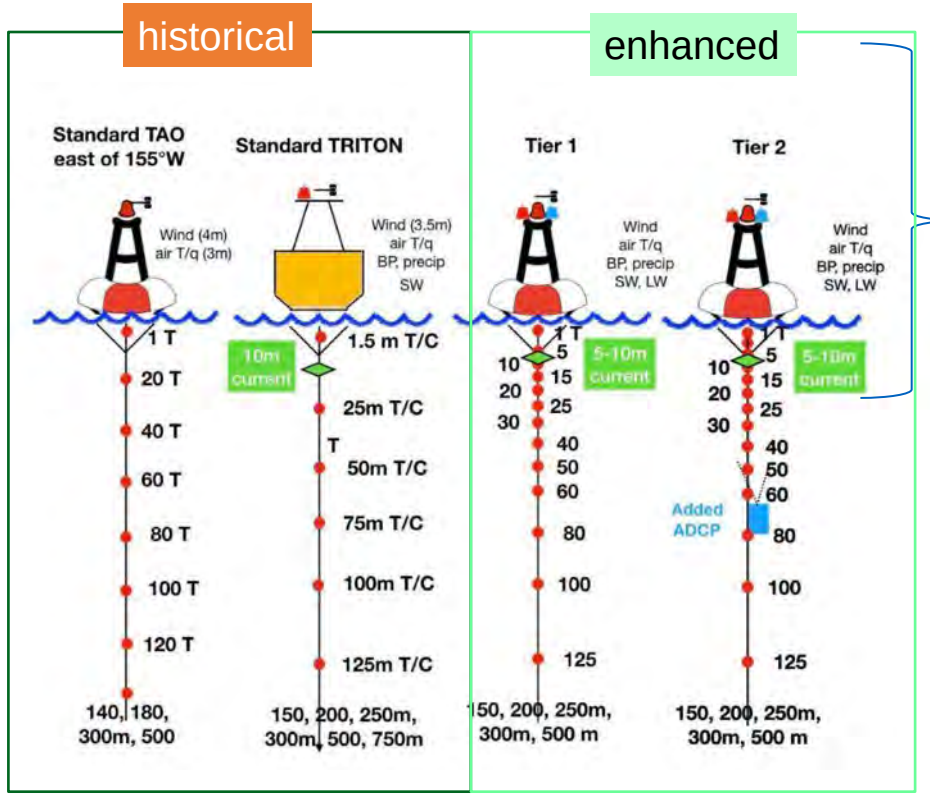
- New technical possibilities
- New scientific issues
- New model and DA developments

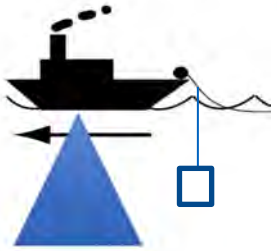
TPOS2020 recommendations for the Backbone

We provided plans for an **integrated** system responding to multiple needs

DOUBLING ARGO
Including
124 BGC floats







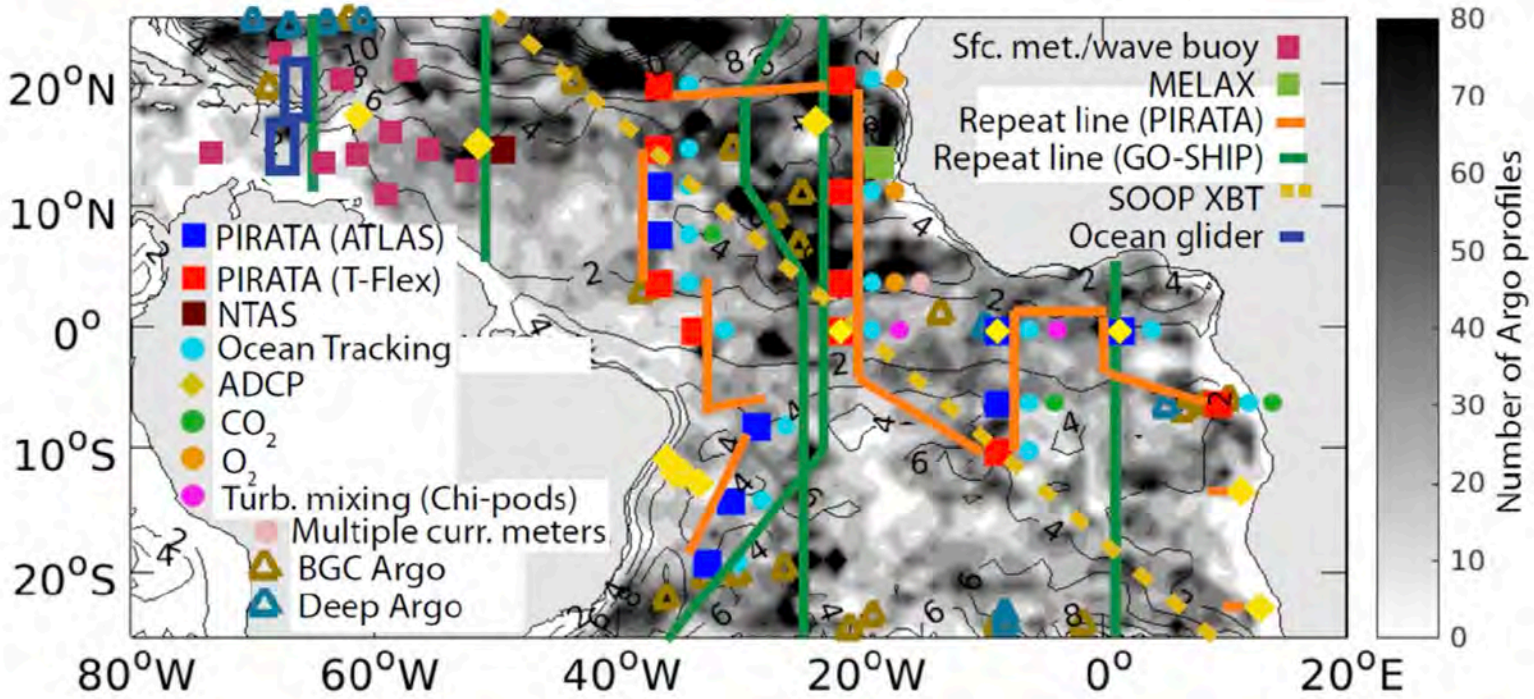
Ships are essential:

- BGC suite along moorings servicing lines
- Underway pCO_2

不安全 — video.ictp.it
clivar-goos coastal workshop - 搜索
CLIVAR-GOOS workshop was successfully organised in August 2022 | www.clivar.org
video.ictp.it/WEB/2022/2022_08_15-smr3731/2022_08_15-10_00-smr3731.mp4

TAOS Review

Key Recommendations



✓ Key elements of the tropical Atlantic in situ observing system

03:50
28:05

不安全 — video.ictp.it
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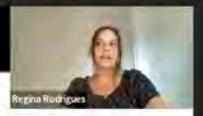


TAOS Review

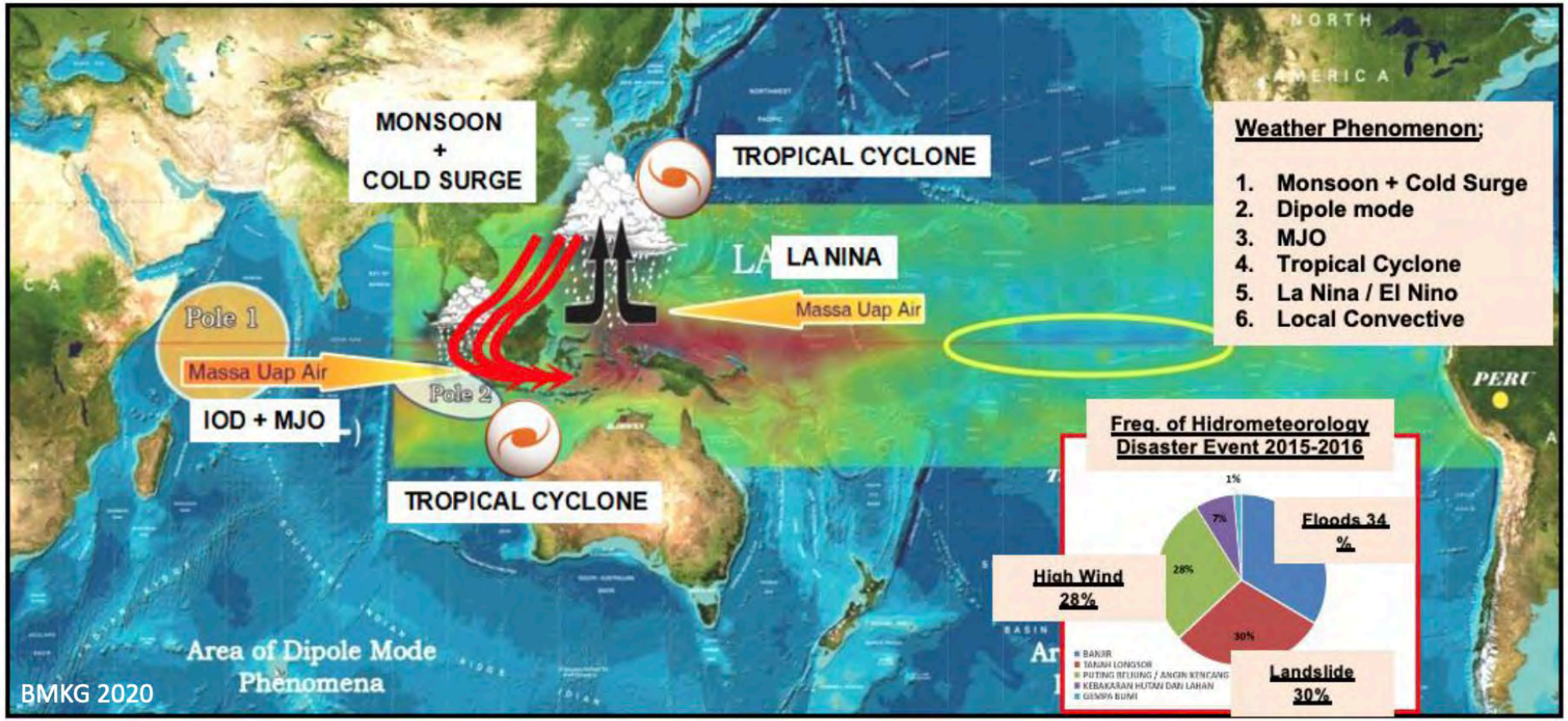
Final Considerations

Biggest success, transition to a vision of an integrated fit-for-purpose TAOS

Least success, stakeholder engagement and the integration of the EOVs/ECVs requirements

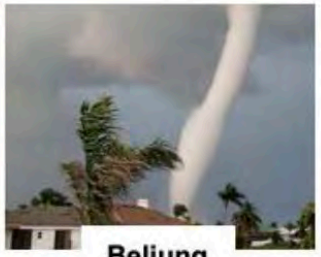
Progress can be made toward an multi-purpose TAOS, but we need to be realistic and define priorities!

COMPLEXITY OF ATMOSPHERIC-OCEANIC




Landslide


Floods

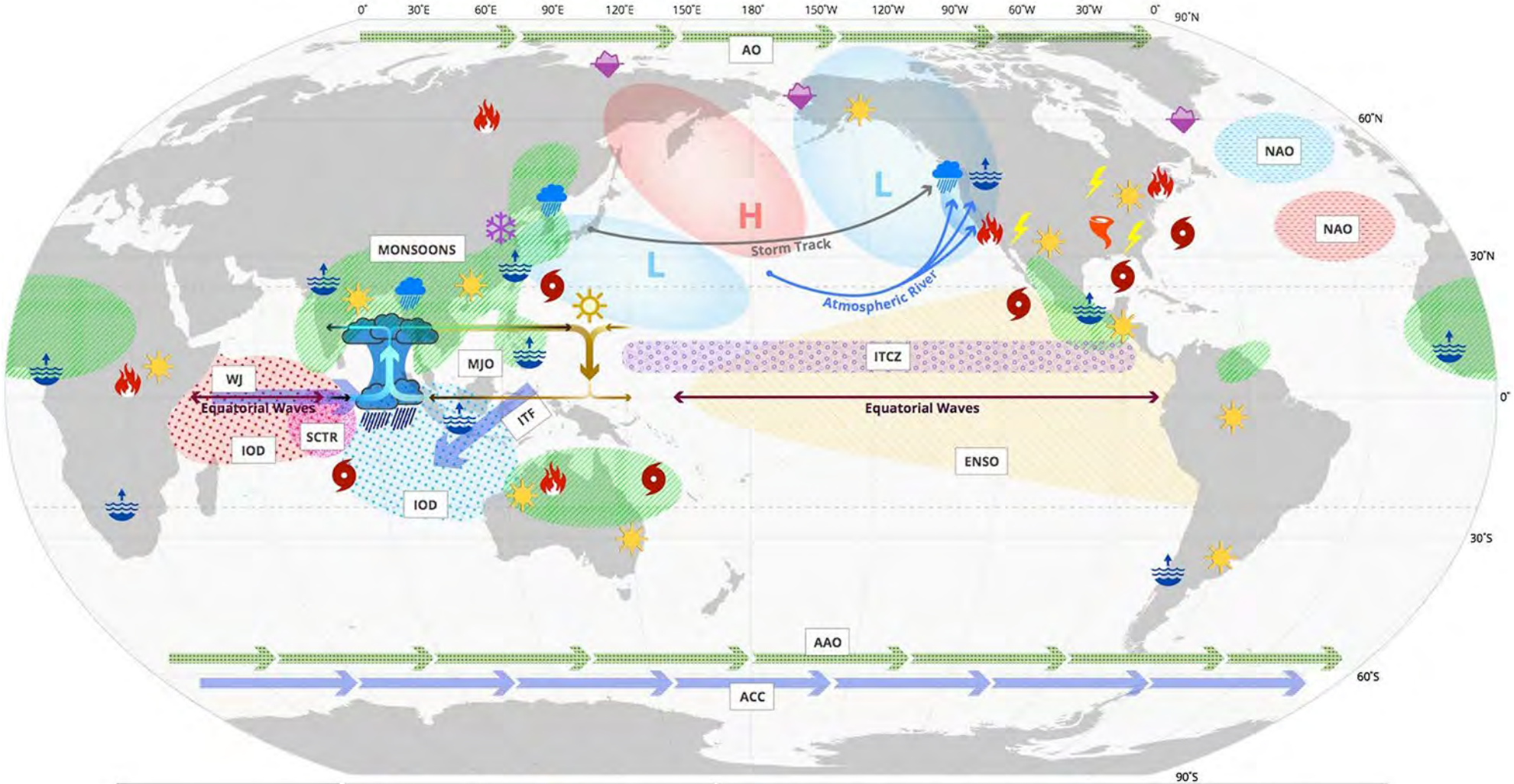

Beliung

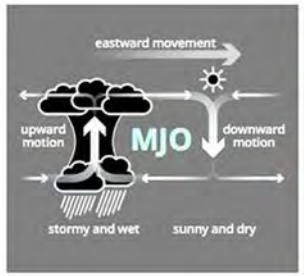

Strong Wind


Land Fire


Rough Sea

MADDEN-JULIAN OSCILLATION (MJO): GLOBAL IMPACTS



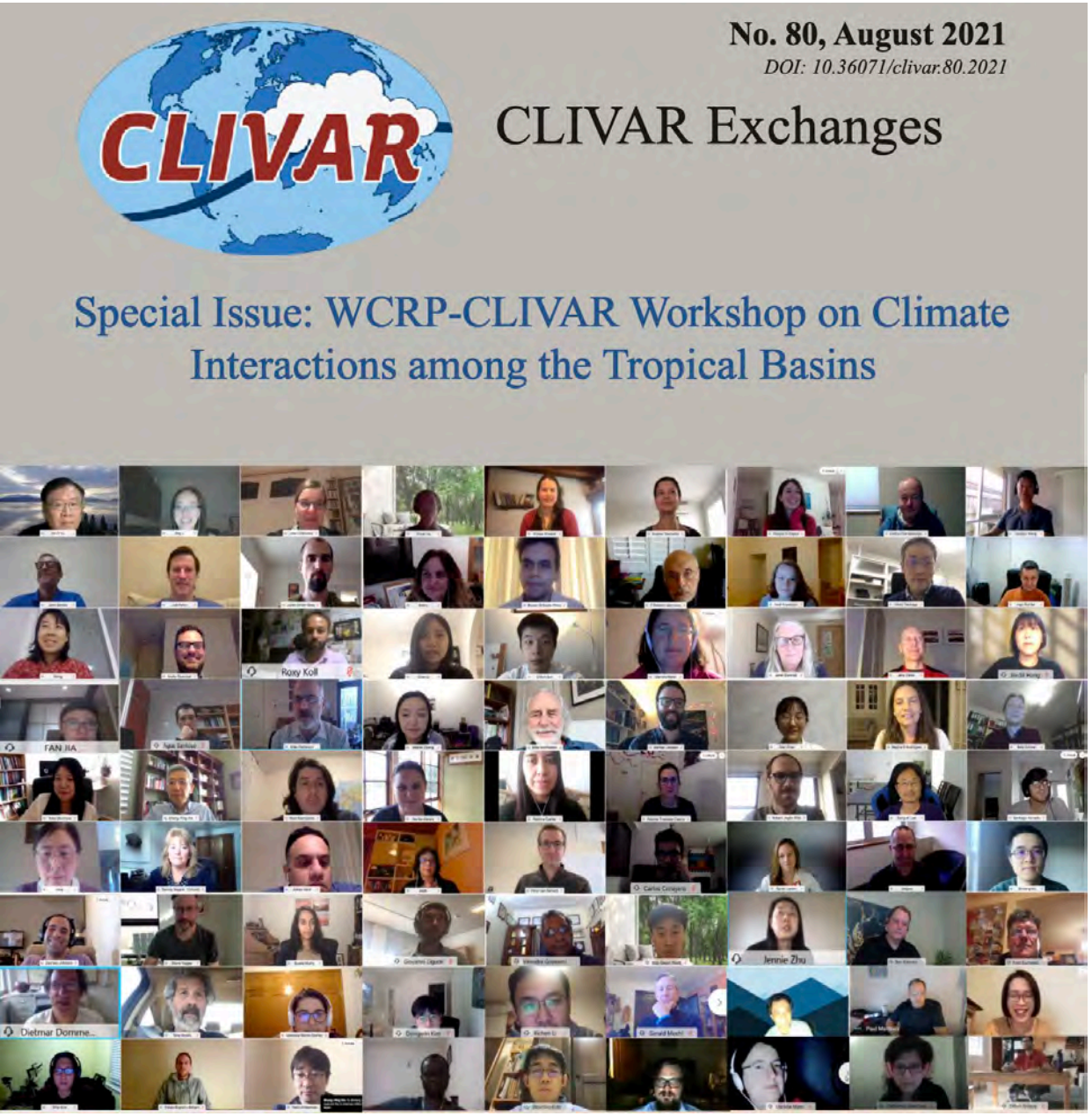


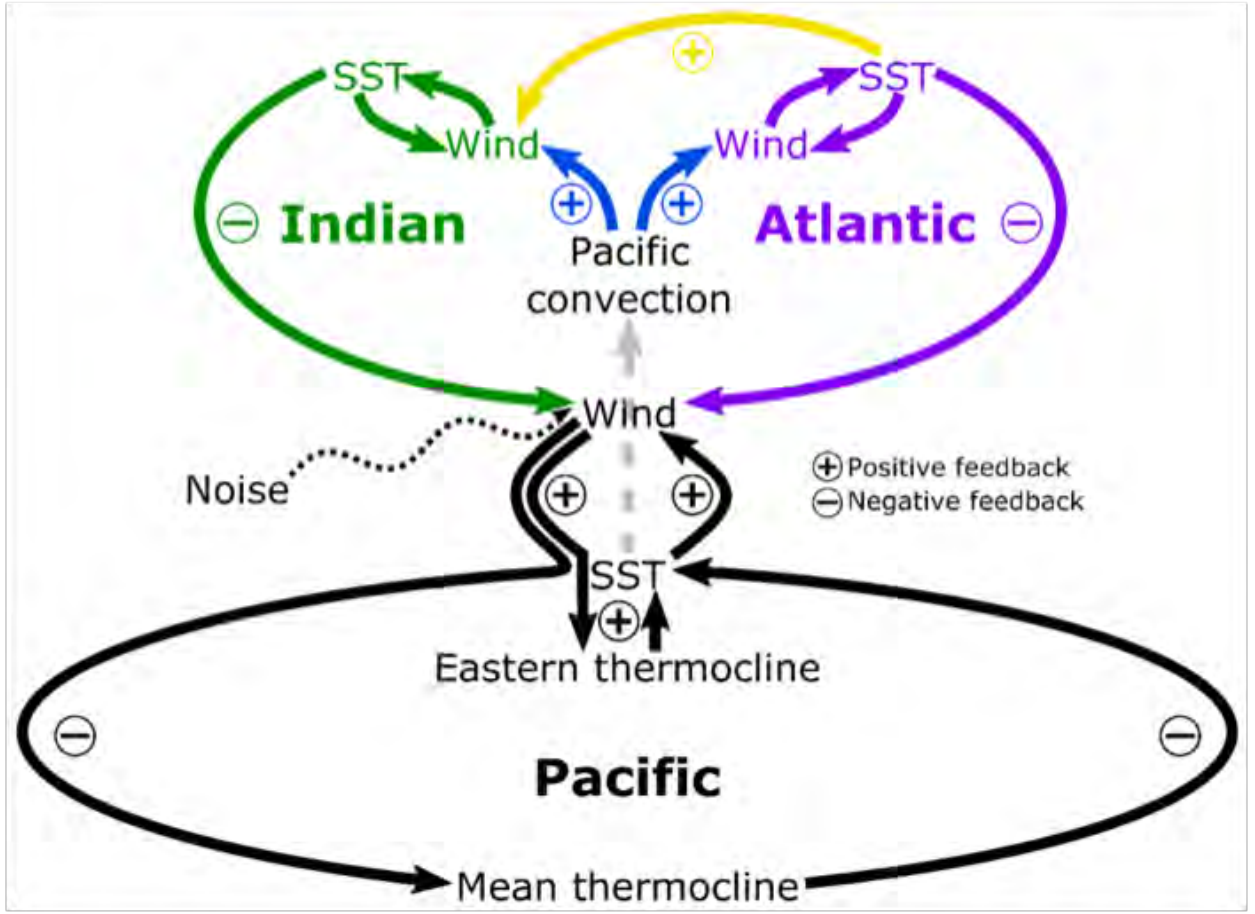
- Atmospheric River
- Cold Surges
- Equatorial Waves
- Extreme Rainfall
- Fires
- Flood
- Heat Waves
- Lightning
- Sea Ice
- Storm Track
- Tornados
- Tropical Cyclones

- Atmospheric Circulation (AO, AAO)
- El Niño-Southern Oscillation (ENSO)
- Indian Ocean Dipole (IOD)
- InterTropical Convergence Zone (ITCZ)
- Monsoons
- North Atlantic Oscillation (NAO)
- Oceanic Circulation (ITF, WJ, ACC)
- Seychelle-Chagos Thermocline Ridge (SCTR)

Not represented on map: Aerosol, Carbon Dioxide, Earth's Annular Momentum, Electromagnetic Field (Schumann Resonance), Length of the day, Ocean Chlorophyll, Ozone

pmel.NOAA.gov

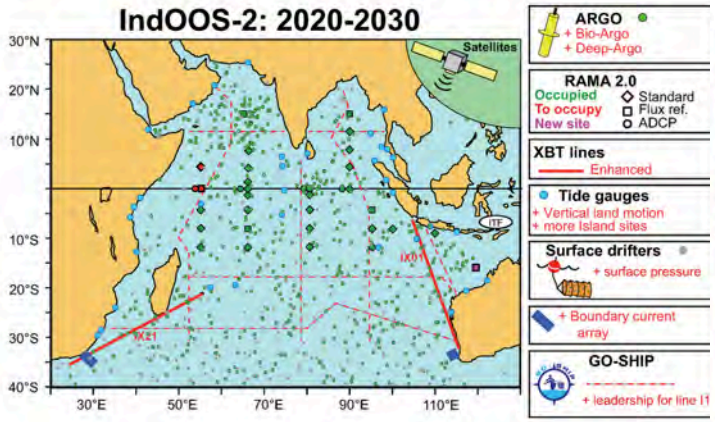




Cai et al., 2019, Nature

CLIVAR/IOC-GOOS Indian Ocean Region Panel

About Us



Pacific Region Panel

About Us

Individually we are a drop, together we are a *fit-for-purpose* ocean *observing system*

CLIVAR/CliC/SCAR Southern Ocean Region Panel

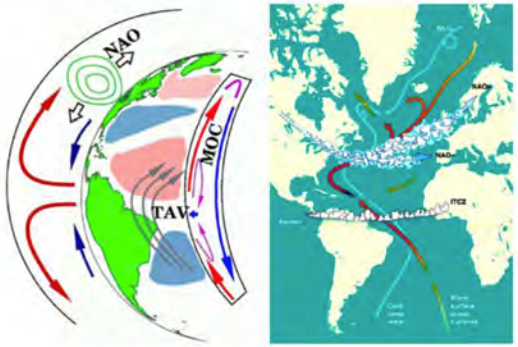
About Us

CLIVAR /CliC Northern Oceans Region P

About Us

Atlantic Region Panel

About Us



WCRP
World Climate Research Programme

CLIVAR

UNESCO
United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

The Global Ocean Observing System
GOOS

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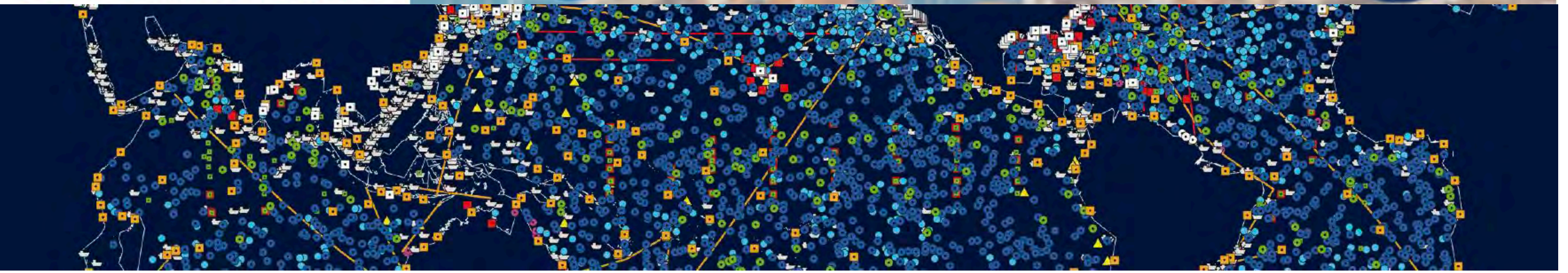

Proposal to debate:

Tropical ocean observing systems are evolving into a very good shape to explore the idea as the protocol of real one integrated tropical ocean observing system, based on the experience from IndOOS, TPOS and TAOS?