



Tropical Atlantic Observing System (TAOS) Review Workshop

Portland, US
8-9 February 2018

Supported by



TAOS Review Terms of Reference

- 1. Review and articulate the existing and anticipated future drivers for the Tropical Atlantic Observing System, encompassing research, operational, and societal applications.** Key applications to be considered include: research on tropical Atlantic circulation and variability, coupled atmosphere-ocean variability and change, climate monitoring, modelling and forecasting (climate, ocean, seasonal to decadal and weather prediction), biogeochemistry, and fisheries.
- 2. Evaluate (review/assess/prioritize) existing and potential requirements for sustained observations of essential ocean variables (EOVs) in the tropical Atlantic Ocean** (extending from 25°N to 25°S) - in connection with TPOS2020 and IndOOS - and update them to reflect new knowledge and identified needs for scientific and societal applications.
- 3. Evaluate the adequacy of existing observing strategies to deliver requirements for variables, and characterize their impacts.** Characterize how in situ (e.g., PIRATA, Argo, drifters, and other data) and remote sensing observing systems are contributing to meet these scientific and functional requirements, and identify gaps, inefficiencies, and vulnerabilities.
- 4. Provide recommendations on the current suite and configuration of observing systems to enhance their resilience and robustness** in order to produce data in the most cost-efficient and sustainable manner within the anticipated envelope of capability and resources.
- 5. Identify potential enhancement or reconfiguration of the sustained observing system suite to address gaps and new requirements.**
- 6. Evaluate requirements for delivery of data, and derived products and information, in real time and delayed mode** (e.g., availability, quality, latency, integration/interoperability); evaluate the existing data systems for fitness for purpose.
- 7. Assess readiness of new technologies, their potential impact and feasibility in addressing requirements,** and their potential to contribute towards addressing gaps, improving robustness/resilience, and/or lowering costs per observation in the tropical Atlantic Ocean region; recommend new technologies with greatest potential to meet critical requirements and suggest approaches to improve the readiness for inclusion in the sustained observing system.
- 8. Highlight the impacts of the tropical Atlantic observing system on the delivery of information/services of societal importance and relevance.** Develop a report of the first TAOS Workshop, with recommendations on the development of a process for the ongoing evaluation of the observing system.

Workshop Agenda (Day 1)

Thursday, Feb. 8		
Time	Title	Speaker(s)
8:30-9:00	Registration	
9:00-9:30	Welcome and Introductions	Clivar ARP (Sabrina Speich), TAOS Review Committee (Bill Johns)
	Session I: Requirements for the Tropical Atlantic Observing System Chair: S. Speich	
9:30-10:00	Societal impact and importance of observing the Tropical Atlantic	Moacyr Araujo
10:00-10:30	Tropical Atlantic variability and change	Paulo Nobre
10:30-11:00	Role of the Tropical Atlantic in the climate system	Belen Rodriguez-Fonseca
11:00-11:30	Coffee Break	
11:30-12:00	Impact of Tropical Atlantic biases in climate predictions/projections	Noel Keenlyside
12:00-12:30	Tropical-Extratropical Links	Jeff Knight
12:30 - 14:00	Lunch	
	Session I (continued) Chair: M. Balmaseda	
14:00-14:20	Capabilities for seamless forecasting from days to season: the role of ocean observations	Magdalena A. Balmaseda
14:20-14:40	Extreme Events	Scott Stripling/Ping Chang
14:40-15:00	Evaluation of the Tropical Atlantic observing system from ocean data assimilation perspective: Marine applications	Marie Drevillon
15:00-15:30	Biogeochemical applications in the Tropical Atlantic: Requirements, synergies, and gaps	Toste Tanhua
15:30-16:00	Coffee Break	
16:00-16:30 (remote)	Biology and Fisheries applications: Requirements, synergies, and gaps	Joern Schmidt
16:30-17:00	Presentations from related observational programmes (IMBER, SOLAS, POGO)	Carol Robinson
17:00-18:00	Discussion: Requirements for existing and emerging drivers; essential ocean variables (EOVs) and system design. What is the key information that is being (a) successfully provided and (b) missing from the Tropical Atlantic observing system for these science/societal drivers? (Recommendations from today's session with a special focus on issues to address in the review)	
18.00-19.00	Review Committee meeting (closed session)	
19:30 - 20:30	Reception	

Workshop Agenda (Day 2)

Friday, Feb. 9		
Time	Title	Speaker(s)
	Session 2: Tropical Atlantic Observing System Networks: Current Status and plans to 2030 Chair: B. Johns	
8:30-9:00	Mooring Networks	Moacyr Araujo
9:00-9:20	Satellite Observations	Abderrahim Bentamy
9:20-9:40	Lagrangian observations of the Tropical Atlantic	Rick Lumpkin
9:40-10:00	Autonomous Platforms and Sensors	Steve Jayne
10:00-10:20	Vessel-based Observations	Renellys Perez
10:20-10:40	Surface flux measurements from buoys, ships, and gridded products; Atmospheric and marine boundary layer observations	Chris Fairall/Paquita Zuidema
10:40-11:00	Coffee Break	
11:00-12:00	Discussion: Successes and gaps of the observing system network for science/societal applications; How to fill those gaps/optimize the TAOS? Recommendations for future evolution of the TAOS.	
12:00-13:30	Lunch	
	Session 3. Data Flow and Information Products Chair: N. Smith	
13:30-14:00	Current data availability and access (how delivered; present status and future evolution)	Neville Smith
14:00-14:30	Available Analysis Products (how accessed and how used by science/operational community and stakeholders?)	Marie Drevillon
14:30-15:00	Discussion: Gaps in data availability/access and information products? Recommendations for possible improvements in data/information products and delivery.	
15:00-15:30	Coffee Break	
	Session 4. Governance, Review, and Resourcing Chair: K. Hill	
15:30-15:45	Perspectives from the Blueprint for Atlantic Observing	Brad de Young
15:45-16:30 (5-10 min each)	Presentations by agencies with interests in engaging:	
	National Oceanic and Atmospheric Administration (NOAA)	David Legler
	NASA	E. Lindstrom
	MétéoFrance & Institut de recherche pour le développement (IRD)	P. Dandin
	Brazil	Moacyr Araujo
	Cape Verde, Namibia	Vito Melo(remote), Brian Mudumbi
16:30-17:00	Discussion: Proposed governance and review mechanisms. Does the proposed TPOS-2020 structure (a TAOS Resources Forum, under guidance of a TAOS Steering Committee), work for the Tropical Atlantic? Alternate governance/review mechanisms?	
17:00-17:40	Summary: Points of consensus, divergence, issues to resolve	
17:40-18:00	Next Steps: Workshop report; OceanObs '19 White paper, Next TAOS Review meeting (Marseille, October 2018); Closing remarks	
18:00	Meeting Adjourns	
19:00-21:00	Review Committee meeting/dinner (closed session)	

Requirements for the TAOS

Societal drivers:

1. Adaptation to and mitigation of climate change
2. Extreme Events; tropical storms and hurricanes, seasonal prediction and storm forecasting.
3. Human Health and Security (food security, water security, disease mitigation)
4. Marine ecosystem health (biodiversity)
5. The Blue economy (marine transport, economic management of marine resources)
6. Regional Sea level variation and change

Requirements for the TAOS

Science drivers:

- 1) Improved prediction on subseasonal to decadal time scales
- 2) Dynamics and predictability of the Atlantic zonal and meridional modes
- 3) Tropical Atlantic hydroclimate variability; ITCZ, African and South American monsoons
- 4) Remote impacts of Tropical Atlantic Variability (ENSO and extratropical connections)
- 5) Understanding of mixed layer heat balance and dominant processes (seasonal and interannual)
- 6) Understanding causes of coupled climate model biases
- 7) Improved TC prediction and landfall distribution; linkages to ENSO/AMM/AMO/MJO
- 8) Impacts of AMOC variability on the Tropical Atlantic; role of boundary currents in tropical AMOC variability
- 9) Impacts of TAV on Biogeochemistry, Fisheries and Ecosystems
- 10) Long-term climate change and impacts: hydroclimate, temperature rise, sea-level rise, CO₂ fluxes, ocean acidity, Oxygen minimum zones, TC frequency and intensity
- 11) Importance of diurnal cycle in tropical convection, TC intensification
- 12) Improved understanding of momentum mixing in the lower atmosphere (part of 6?)*

Requirements for Essential Ocean Variables

FOO: "The Framework is designed to approach ocean observations with a focus on Essential Ocean Variables, ensuring assessments that cut across platforms and recommend the best, most cost effective plan to provide an optimal global view for each EOv."

PHYSICS	BIOGEOCHEMISTRY	BIOLOGY AND ECOSYSTEMS
Sea state	Oxygen	Phytoplankton biomass and diversity
Ocean surface stress	Nutrients	Zooplankton biomass and diversity
Sea ice	Inorganic carbon	Fish abundance and distribution
Sea surface height	Transient tracers	Marine turtles, birds, mammals abundance and distribution
Sea surface temperature	Particulate matter	Hard coral cover and composition
Subsurface temperature	Nitrous oxide	Seagrass cover
Surface currents	Stable carbon isotopes	Macroalgal canopy cover
Subsurface currents	Dissolved organic carbon	Mangrove cover
Sea surface salinity	Ocean colour (<i>Spec Sheet under development</i>)	Microbe biomass and diversity (*emerging)
Subsurface salinity		Benthic invertebrate abundance and distribution (*emerging)
Ocean surface heat flux		

Recommendations for TAOS evolution

Recommendations from PIRATA White Paper:

- Essential to continue the long time series at the mooring sites that have already been established in PIRATA
- Add more instrumentation in the near surface layer to better define mixed layer structures, processes, and ocean-atmosphere feedbacks
- Multi-disciplinary enhancements for carbon cycle and biogeochemical studies;
- Expanding the array to regions that are presently undersampled by moored time series and that would benefit from high temporal resolution, multi-variate, and multi-disciplinary sustained time series.
- Some PIRATA buoys are already equipped with CO₂ and O₂ sensors; more of these and other biogeochemical sensors would be very valuable.

The Path Forward

- Follow the GOOS roadmap to join overarching societal drivers to specific science/operational drivers.
- Form task teams for each science/operational driver to specify requirements in terms of EOVs?
- Synthesize matrix of requirements to make recommendations for observing system enhancements or modifications to the TAOS.
- Separate task teams examine status and options for:
 - data delivery
 - governance and resourcing mechanismsand make recommendations for future evolution.

Next Steps

- Workshop report (~April 2018)
 - will follow Workshop Agenda, w/ Exec. Summary
 - contributions from presenters (short) collated by session chairs/ co-chairs
- OceanObs '19 White paper (abstract due Mar. 15!)
Foci:
 - Importance of observing the TA
 - Key science/societal issues where more or improved data is needed
 - incorporate findings from TAOS Review as they come available (1st draft due Sept. '18)
- TAOS Review Report (when?) w/opportunity for stakeholder review/comment
- Next TAOS Review meeting: Marseille, October 22-26, 2018 alongside PIRATA meeting; hosted by IRD.