



## **2018 PHENOMENA, OBSERVATIONS, & SYNTHESIS PANEL REPORT**

**August 8–9, 2018  
Wilmington, North Carolina**



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## **CONTRIBUTORS**

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## **FRONT COVER IMAGE**

Greenfield Park, Wilmington, North Carolina, photo credit: Matt N Charlotte (flickr)

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# 1

## EXECUTIVE SUMMARY

The 2018 Phenomena, Observations, and Synthesis (POS) Panel meeting focused on the coastal dimensions of US CLIVAR, ocean and atmosphere observing systems, and research efforts using observational synthesis products and modeling. Presentations from Panel members and external meeting participants informed the Panel on the current state of scientific research and community efforts, including workshops and working groups. A major action item emerging from the meeting is to host a monthly webinar series focusing on current and potential POS Panel priorities.

Presentations on coastal research highlighted the complexity of linking together the many research groups and stakeholder activities and interests, ranging from local-scale to large-scale and covering physical and ecological dimensions. These complexities apply equally to the two coastal foci of the POS Panel: on the US East Coast, sea level rise impacts; and on the West Coast, marine ecosystem dynamics and predictability. Discussions aimed to determine the role for US CLIVAR to help facilitate interactions among communities involved in coastal research in the US. These connections will be explored through POS Panel participation in a number of related activities, including a US CLIVAR-supported workshop on coastal sea level on the US East Coast and an NSF Research Coordination Network proposal on ecological forecasts along the US West Coast. The Panel will also work to connect US CLIVAR with research community activities to explore linkages between climate, ecosystem dynamics, and fisheries.

The session on observing systems updated the Panel on community-based efforts to plan, design, and review ocean and atmosphere observing systems. These include

- ongoing participation in the OceanObs'19 effort, to which numerous US CLIVAR members have contributed via community white papers;
- Panel participation in and review of Tropical Pacific Observing System (TPOS2020) reports; and
- review of the US GO-SHIP program, carried out jointly between US CLIVAR and the Ocean Carbon & Biogeochemistry (OCB) Program.

POS Panel members will also participate in relevant reviews of ocean and atmosphere observing systems that may take place in calendar 2019. Additional action items are to submit a US CLIVAR workshop proposal on Arctic observations, and to consider adding Antarctic observations to the POS Panel priorities. In addition, presentations and discussions highlighted the importance and the challenges of using model data assimilation for *observing system* design. Extensive discussion on the state of the art of ocean internal variability in data and models took place. An ongoing interest of the POS Panel is the issue of defining uncertainty metrics for observations, specifically in a data assimilation framework. A new action item is to develop a session on uncertainty metrics for the 2019 US CLIVAR Summit meeting. Uncertainties (for models, observations, and data assimilation) will likewise be a topic in the POS Panel webinar series.

# 2

## SESSION SUMMARIES

### 2.1 Coastal Dimensions

With the recent announcement of the new NSF initiative on Coastlines & People (CoPe), the POS panel had several discussions on the role that US CLIVAR can play to provide expertise in the climate and predictability dimensions of coastal systems. Key to this plan is the engagement and coordination of US coastal observing systems (COOS), including the Northwest Association of Networked Ocean Observing Systems (NANOOS), Southern California Coastal Ocean Observing System (SCCOOS), Gulf of Mexico Coastal Ocean Observing System (GCOOS), Caribbean Coastal Ocean Observing System (CariCOOS), and others. Future engagement with NSF-funded Long-Term Ecological Research Sites (LTERs) is also targeted. Both of these communities could benefit from US CLIVAR expertise, and in many cases have already begun the development of modeling and prediction systems for sea level and ecological dynamics (e.g., harmful algal blooms, hypoxia). Within the scope of the two priorities for the coastal dimension of US CLIVAR, the panel listened to talks from several experts (summarized below) and identified key action items (listed at the end of this document).

#### *US East Coast – Sea Level and Flooding*

NOAA Sea Grant programs are currently supporting a wide array of projects to develop resources and tools to plan the response of coastal states to increased flooding associated with recorded positive trends in sea level measured by tide gauges (presentation by Mona Behl). There is a strong push towards integrating different disciplines (physical, ecosystem, social, law/policy) to allow for resilience and adaptation planning. Sea Grant programs nationally are conducting vulnerability assessments, raising awareness of flood risks, and helping communities to understand infrastructure options. Strategic research priorities include: planning and preparedness, permitting and policy, green and natural community assets, built infrastructure, and response and recovery. US CLIVAR could take the lead in integrating climate science into trans-disciplinary efforts in understanding, protecting, and predicting the future of coastal systems (an example is scenario building for risk assessment and adaptation plans). To this end, the POS involvement in the upcoming US CLIVAR-sponsored workshop on *Sea Level Changes along the United States East Coast* (presentation by Ricardo Domingues) offers an opportunity to set the foundations. The goal is to bring together the scientific community, decision makers, and coastal stakeholders to discuss the state-of-the-art of knowledge about sea-level changes along the United States East Coasts, and to identify a path forward for an active exchange of knowledge that offer enabling solutions for threats related to coastal flooding. Among the different sources of flooding events, e.g., tides, storm surges, and extreme precipitation events that often occur in connection with hurricanes, there was also recognition that ocean circulation on interannual and decadal timescales plays an important role in preconditioning the statistics of coastal flooding (presentation by Shane Elipot). One such example is the AMOC: Atlantic Meridional Overturning Circulation.

# Building Blocks of Climate Adaptation



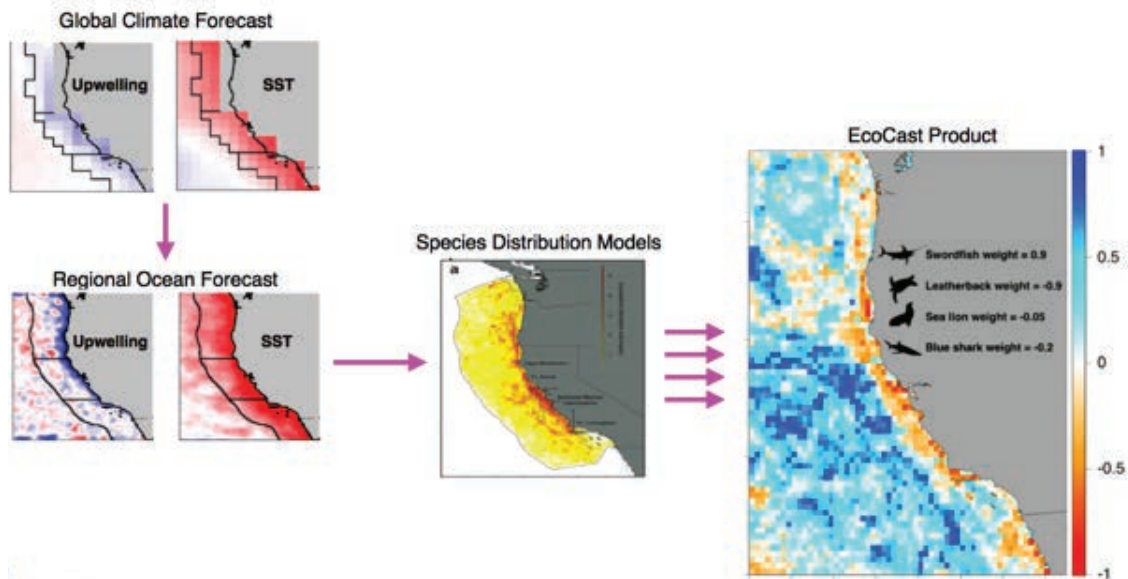
Figure 1. “Building blocks of climate adaptation” advocated for by Georgia Sea Grant (from Mona Behl).

## US West Coast – Ecological Forecasting

Following the NOAA Modeling, Analysis, Predictions, and Projection (MAPP) program’s FY17 competition, a new Marine Prediction Task Force (MPTF) made up of funded PIs is coordinating research on climate and ecosystem predictability. These efforts focus on coastal ecological impacts of predictable large-scale Pacific climate dynamics along the US West coast associated with

1. ENSO on seasonal timescale (presentation by Mike Jacox, co-chair of the MPTF);
2. tropical and extra-tropical coupling associated with Meridional Modes on interannual scales; and
3. subsurface advection of bio-geochemical anomalies in the California upwelling systems on decadal timescales (presentation by Nikki Lovenduski).

Most of these efforts rely on large-scale datasets, regional modeling hindcasts, and the recent Community Earth System Model (CESM) large-ensemble. US CLIVAR could take a lead role in connecting and coordinating these efforts with the coastal ocean observing networks and the long-term ecological research site active on the US West Coast, which also are very interested in ecological forecast (e.g., harmful algal blooms (HABs); presentation by Clarissa Anderson, Director of the Southern California Coastal Ocean Observing System). To this end, a successful scoping call last spring with representatives of these different groups was conducted and led by the POS panel. There is strong interest in developing a proposal for an NSF Research Coordination Network (RCN) to coordinate these efforts towards developing a pilot ecological forecasting system for the US West Coast (presentation by Emanuele Di Lorenzo).



**Figure 2.** Example of a MAPP project led by Dr. Mike Jacox, titled “Downscaled Seasonal Forecasts for Living Marine Resource Management off the US West Coast.” The objective of this project is to forecast distributions of targeted and bycatch species to inform management actions for an environmentally and economically sustainable fishery.

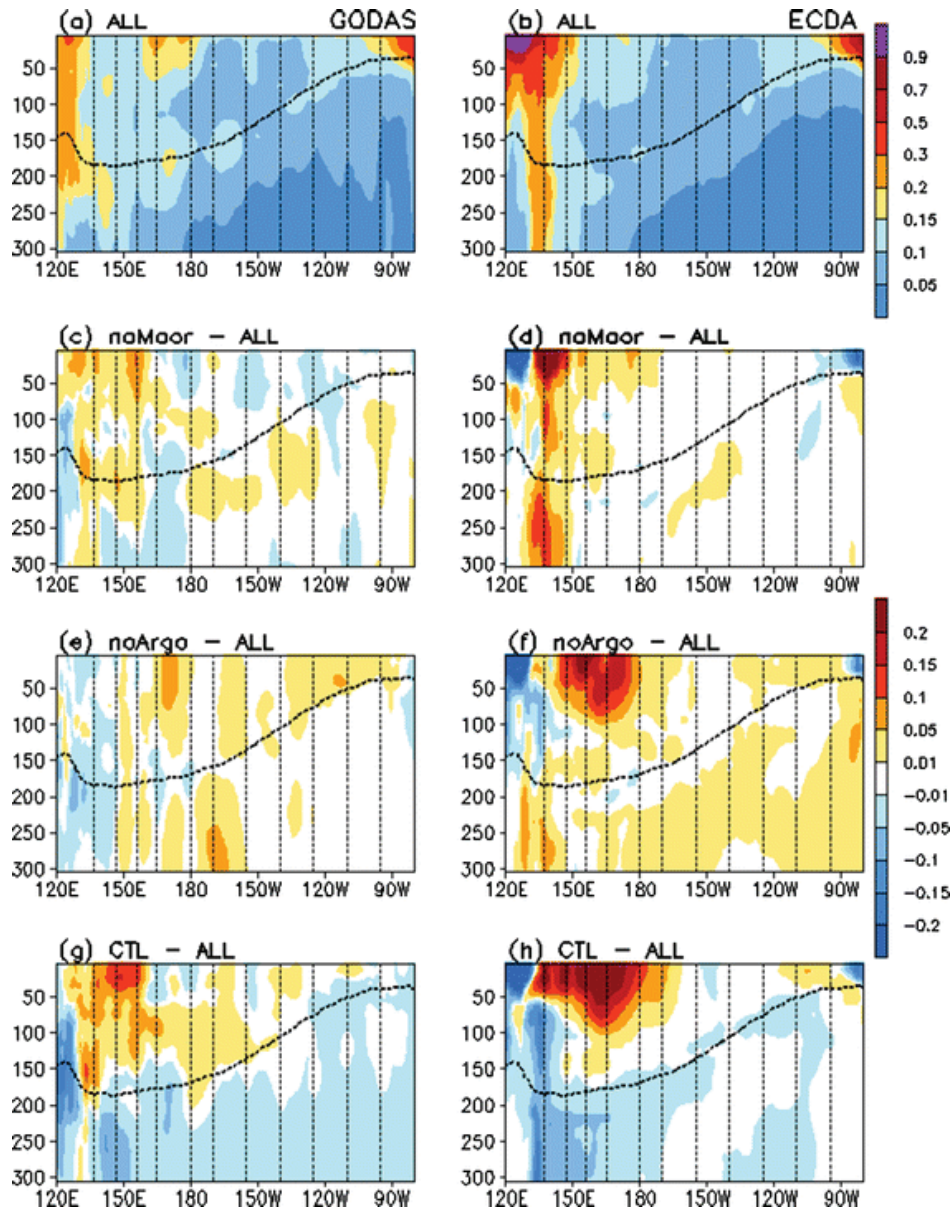
## 2.2 Designing Observing Systems

### Observation system experiments in a DA framework

A major focus of this session was to understand the use of observation system experiments in a data assimilation (DA) framework, including the use of models for observing system design; observation sensitivity experiments (presentation by Nikki Prive); coupled data assimilation (presentation by Steve Penny); and Observation System Simulation Experiments (OSSEs) for the Carbon Cycle (presentation by Lesley Ott).

Observing system experiments (OSEs) are an effective tool to evaluate the impact of existing observing systems on forecasting. A good example is the tropical Pacific observing system (TPOS): in the course of the TPOS2020 effort, several studies have used a range of observations from the current TPOS array to determine the impacts of particular elements of the array (e.g., moorings, Argo floats). Observation System Simulation Experiments (OSSEs) are used to evaluate the impact of new observing systems on forecasting. OSSEs and OSEs are useful tools, but both suffer from the challenge of selecting the “best” metric to optimize for—defining this should be a community priority. In addition, validation is critical, and careful consideration of research goals is needed to guide each step of the OSE or OSSE process.





**Figure 3.** OSE for the Tropical Pacific Observing System (TPOS) using NCEP and GFDL models. Root-mean-square difference (RMSD) of salinity anomaly with EN4 averaged in 2°S–2°N in 2004–2011 for GODAS (left column) and ECDA (right column) experiments. **a, b** ALL. **c, d** NoMoor – ALL. **e, f** NoArgo – ALL. **g, h** CTL – ALL (unit: PSU). The vertical dashed lines indicate where the TAO/TRITON buoys are located. From Xue et al. 2017.

Coupled DA (CDA), which uses a coupled forecast model, is a promising new tool. Despite numerous challenges (including the necessity to coordinate between different fields, disciplines, and agencies), there have been a number of advances. For example, ECMWF recently released the CERA-SAT reanalysis dataset as a proof-of-concept for a CDA, and NOAA's strategic implementation plan involves improvements to coupled modeling.



## OceanObs'19 efforts

The POS Panel has collected a list of OceanObs'19 community white papers with authorship by US CLIVAR members to be submitted for publication in a special issue of *Frontiers in Marine Science* prior to the OceanObs'19 conference in September 2019. The Panel will continue to track and update this list as the articles are published over the next year. In addition, the POS Panel plans to submit an abstract to present a poster at the OceanObs'19 conference on Uncertainty Metrics in observations and data assimilation.

## Water Isotope Network

POS Panel member Sam Stevenson is a member of the new US CLIVAR Water Isotope Network working group. The POS Panel provided feedback (e.g., suggestions for how to improve the network) that will be communicated to the working group via Sam. Results have also been communicated to the TPOS2020 steering committee, and Sam will continue to facilitate engagement between the POS Panel, the Water Isotope WG, and TPOS2020.

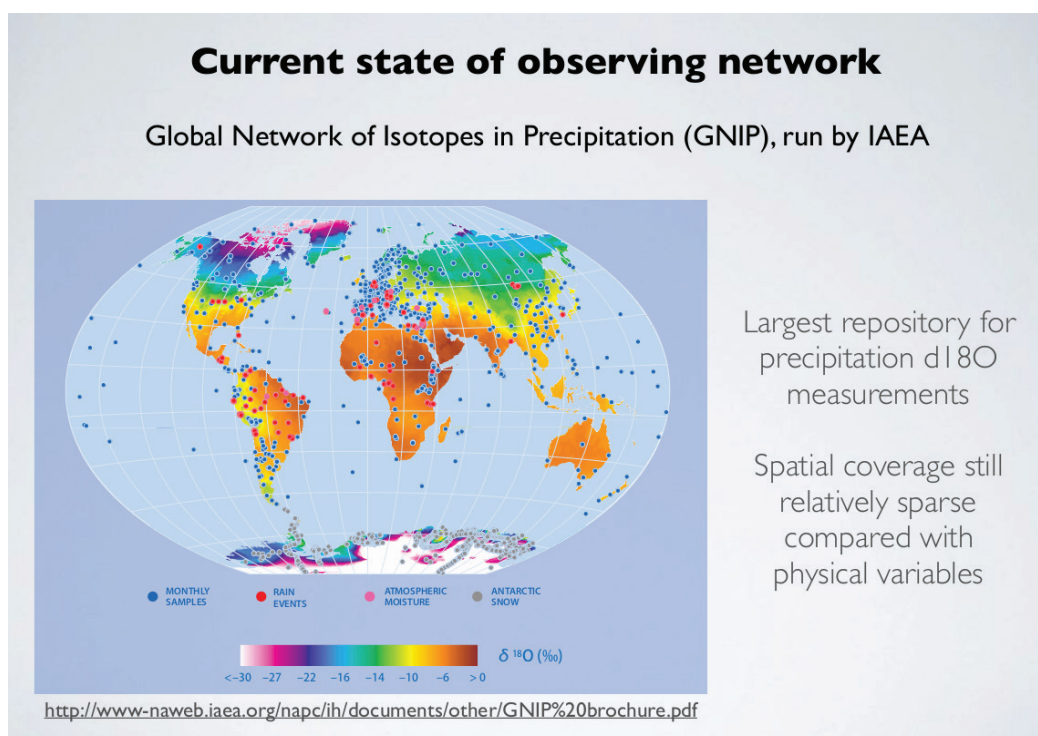


Figure 4. Current state of the water isotope network.

## Updates on relevant action items

The POS Panel has numerous action items related to the Observing Systems topic. Yolande Serra led an open letter to Congress and NOAA regarding concerns about the commercialization of data acquisition by NOAA (*Serra et al., BAMS, May 2018*). A current action item is to approach the National Academies of Science, along with other relevant communities, about this topic. Fred Bingham will lead the joint US-CLIVAR/OCB review of US GO-SHIP to take place in 2018-2019. The POS Panel has been involved with several OceanObs'19 community white papers related to air-sea flux measurements, and will provide guidance to the organizing committee of a 2019 US CLIVAR-sponsored workshop on Atmospheric Convection and Air-Sea Interactions of the Tropical Oceans. The Panel will provide input to the latest draft of the Indian Ocean Observing System (IndOOS) review, TPOS2020 review, Deep Ocean Observing Strategy review, and any other relevant observing system reviews that arise.

## 2.3 Climate Internal Variability: Models vs. Observations

### *Ocean internal decadal variability: models vs. observations*

There are numerous mechanisms for decadal predictability, such as the North Atlantic Oscillation (NAO) and Pacific Decadal Oscillation (PDO) that are used for understanding and prediction of, for example, the Atlantic Meridional Overturning Circulation (AMOC). Decadal prediction has numerous challenges, including that there are many regions for which decadal variability is not well described by any metric—for example the Southern Ocean and south Pacific. Interbasin interactions may also be important, suggesting interbasin indices (e.g., a tropical Pacific decadal variability index).

### *Internal variability of hydroclimate in Large Ensemble Simulations*

Observations have shown that internal variability can generate multi-decadal drought, and large ensemble simulations have projected forced changes in hydroclimate. Models also predict precipitation regime changes in certain regions, areas with Mediterranean climates are predicted to have reduced total rain but more extreme rain events. In general, large ensembles are a key tool for investigating the relative importance of forced vs. internal climate variability, and their utility as community resources was highlighted.

### *Internal variability of Arctic and Antarctic and ice dynamics*

The need for a viable Arctic Ocean and Sub-Arctic Seas observing system is greater than ever. A review of sessions at the 2017 American Geophysical Union Fall Meeting (AGU-FM) and Ocean Sciences Meeting (OSM) showed that research on changing Arctic Ocean circulations and the connection to global climate is very active. However, sampling biases and challenges are persistent, and funding is declining (e.g., the NSF Arctic Observing Network has lost multiple elements). There are numerous logistical, political, and financial challenges related to observing in the Arctic. The POS Panel came up with several recommendations:

1. A national Arctic Ocean observing plan coordinated with other countries should be developed in order to overcome the common sampling problems.

2. Arctic Ocean in situ observing projects supported through NSF Polar Programs could better engage those of NSF Physical Oceanography in order to facilitate collaboration across ocean observing efforts.
3. Arctic Ocean remote sensing could benefit by being included in the NASA Physical Oceanography portfolio.
4. A strong CLIVAR report emphasizing the importance and current deficiencies of Arctic Ocean observing could motivate these kinds of actions.

Although a recent proposal for a US CLIVAR working group on the Arctic Ocean, marine environment, and interactions with climate timescales was not supported, Jamie Morison plans to submit a proposal for a US CLIVAR workshop focused on Arctic observations, which would have international participation and to which program managers from NOAA, NSF, and NASA would be invited.

A review of sessions at the 2017 AGU-FM and Ocean Sciences Meeting (OSM) also revealed broad research in the Antarctic, including interactions of Earth system components, variability, ice sheet observations and modeling, and links to sea level rise. The POS Panel currently has no Antarctic expertise and will consider adding this to POS priorities. An action item is to organize a webinar on the state of the art of Antarctic observing systems.

## **2.4 International Efforts**

The POS panel reviewed the outcome of the recent symposium on the *Effects of Climate Change on the World Ocean* conference (Washington DC, June 2018, presentation by Anne Hollowed, NOAA NMFS). This meeting was extremely well attended, with over 700 participants from around the world. An important ongoing effort among marine ecosystem scientists who attended the symposium is a Fish-MIP future projections, which is currently coordinated through a joint group of scientists in the North Pacific Marine Science Organization (PICES) and the International Council for the Exploration of the Seas (ICES). It is apparent that US CLIVAR could share best practices and lessons learned on how to conduct the Fish-MIP (Model Intercomparison Project), which in the current phase relies on downscaling the output of the Coupled Model Intercomparison Project (CMIP) models on specific regions to drive fish models, without taking into account the issues related to the internal variability (which could have very different regional expressions in realizations of the same model). To this end, the POS panel suggested using some of the large-ensemble projects.



# 3

## BUSINESS AND PROGRAMMATIC DISCUSSION

### 3.1 Description of short- and long-term priorities (2-3 years; 4+ years)

The POS Panel has several short-term priorities:

1. The Panel will continue to focus on the impacts of climate variability and change on coastal systems, on both the US east coast (with a focus on sea level) and west coast (with a focus on marine ecosystem dynamics). These issues involve research from a broad range of disciplines, and a priority for the Panel will be to try to facilitate the interaction between some of these groups.
2. A second Panel priority is to continue evaluating new and existing observing systems, including atmospheric components of the observing system.
3. A third short-term priority is to better understand the challenges of Arctic Ocean research and advocate for improvements to the Arctic observing system.
4. Finally, the POS Panel will prioritize and advocate for better quantification of uncertainty metrics in observations and data assimilation products.

In the long term, the POS Panel will focus on its core objective of improving understanding of climate variations and to improve the global climate observing system. More specifically, the Panel will expand its focus to place greater emphasis on high-latitude observing systems. In addition, the goal is to expand understanding and evaluation to encompass the links between the climate system and biogeochemical variability.

### 3.2 2017-2018 Action Items

- i. **Coastal sea level in the Southeast US multi-disciplinary workshop.** Emanuele Di Lorenzo will help organize a US CLIVAR sponsored workshop on Sea Level Changes: Drivers, Impacts, and Adaptation along the United States East Coast. The primary contact is Ricardo Domingues. The workshop is planned for April, 2019. Shane Elipot will represent US CLIVAR and the POS panel at the World Climate Research Programme (WCRP) Grand Challenge Sea Level programmatic meeting in Boulder in 2018. A POS Panel webinar will focus on this topic. *Action item moved to 2018-2019.*
- ii. **50/50 US CLIVAR Webinar series.** *Action item moved to 2018-2019.*
- iii. **NSF RCN on ecological forecasts along the US West Coast.** Emanuele Di Lorenzo organized telecons to brainstorm about key deliverables and identify leads on the ecosystem and modeling side of NSF-Research Coordination Networks (RCN) to support ongoing efforts on the climate ecological forecasts along the US West Coast. *Action item moved to 2018-2019, with Aneesh Subramanian to take the lead.*

- iv. **OceanObs'19 publication.** The POS Panel tracked US CLIVAR contributions to abstracts and articles submitted for OceanObs'19 publications. *Action item moved to 2018-2019, to continue tracking publications.*
- v. **Input to Indian Ocean Observing System (IndOOS) review.** Aneesh Subramanian attended the IndOOS review panel meeting in March and presented on one chapter (S2S). As of August 2018, the chapters are being revised based on input from a review panel and the community. They were to be submitted back to the group in August 2018. *Action item closed.*
- vi. **Input to the Tropical Atlantic Observing System (TAOS) review.** The first TAOS Review meeting was held in February 2018 in Portland, Oregon and was attended by former POS Panel member Renellys Perez. A report is being drafted from that meeting. The second TAOS Review meeting was held in conjunction with the PIRATA-23 meeting in Marseille, France on October 22-26, 2018; Gregory Foltz (PSMI panel member) and Renellys attended. *Action item closed.*
- vii. **GO-SHIP Review.** Fred Bingham will chair the committee for the US GO-SHIP review by US CLIVAR and OCB. The POS Panel nominated the other members of the review committee from US CLIVAR. *Action item moved to 2018-2019.*
- viii. **Data sharing town hall.** The panel decided against organizing a town hall. Yolande Serra organized a community letter to Congress and NOAA about commercialization of data acquisition by NOAA, which was published in BAMS (Serra et al., BAMS, May 2018). *Action item moved to 2018-2019: this issue will be brought to the attention of the National Academies of Science.*
- ix. **Air-sea flux measurements.** Samantha Stevenson and Aneesh Subramanian were involved in the organization of a workshop on TPOS2020 observations, modeling and data assimilation. Several groups submitted abstracts to OceanObs'19 on measuring air-sea fluxes in existing observational networks. Yolande Serra will connect with organizers of the upcoming CLIVAR Workshop: *Atmospheric Convection and Air-Sea Interactions over Tropical Oceans.* *Action item moved to 2018-2019.*
- x. **Uncertainty metrics.** The POS Panel is retiring this action item and instead adding a new action item, to organize a session on uncertainty metrics at the 2019 US CLIVAR summit. *Action item done.*
- xi. **Connection to DA/CDA community.** Members of the POS Panel (Aneesh Subramanian, Samantha Stevenson) joined the organizing committee of the 2018 Bridging Sustained Observations and Data Assimilation in Advance of the Next Generation Tropical Pacific Observing System workshop. Kyla Drushka also attended. A report of the workshop was presented at the 2018 Panel meeting. *Action item done.*
- xii. **Arctic Ocean research.** Jamie Morison organized a session at the 2018 Ocean Sciences Meeting entitled *Polar Oceans: Similarities, Differences, and Connections with the World Ocean, and Climate*, and 2017 AGU Fall Meeting Union Session on the Arctic. *Action item moved to 2018-2019: submitting a US CLIVAR workshop proposal.*
- xiii. **Early Career Award.** The Panel drafted an early career award. *Action item moved to 2018-2019.*

### 3.3 2018-2019 Action Items

Following are the POS Panel Action items with assignments to one or more members of the panel. The list may change during the year, and some will carry over into the next year.

1. **Coastal sea level in the Southeast US multi-disciplinary workshop.** Help organize the US CLIVAR workshop on *Sea Level Changes along the United States East Coast: Drivers, Impacts, and Adaptation*. (Priority 1; Manu Di Lorenzo, Shane Elipot).
2. **US CLIVAR Webinar series.** Organize a monthly US CLIVAR webinar to inform POS about existing or possible observing networks and other topics of interest that address action items. There will be a focus on having early career scientists as speakers. Proposed topics include: (Priority 1-3; Shane Elipot, Alison Macdonald)
  - a. East coast observing networks and relationship to climate and sea level change
  - b. Technology advances in deep ocean observing
  - c. IQuOD - uncertainties and meta data for assimilations
  - d. Ocean surface velocity measurements from air and space
  - e. Deep gliders, deep abyssal hydrography
  - f. ENSO mechanisms
  - g. Antarctic science
3. **Explore the establishment of an NSF Research Coordination Network (RCN) on ecological forecasts along the US West Coast:** Support ongoing efforts on the climate ecological forecasts along the US West Coast (e.g., NOAA MAPP, Joint PICES/CLIVAR Working Group on Climate & Ecosystem Predictability) and help coordinate key activities within the coastal observing systems and NSF LTERs. (Priority 1 and 3; Aneesh Subramanian)
4. **Track US CLIVAR-related OceanObs '19 publications.** Track US CLIVAR articles published for OceanObs'19. (Priority 2; Shane Elipot, Kyla Drushka)
5. **Session on Uncertainty Metrics at the 2019 US CLIVAR Summit Meeting.** Lead or co-lead a session, with a possible goal/focus of developing a framework for defining uncertainty metrics in observations, involving both the modeling and observational (satellite and in situ) community. (Priority 2; Mike Patterson, Kristan Uhlenbrock)
6. **Arctic Ocean workshop proposal to US CLIVAR.** Submit a proposal for a US CLIVAR workshop focused on Arctic observations, which would have international participation and to which program managers from NOAA, NSF, and NASA would be invited. (Priority 3; Jamie Morison, Mike Patterson).
7. **GO-SHIP Review.** Organize and participate in external review of US GO-SHIP jointly with the US OCB program. (Priority 2; Fred Bingham, Mike Patterson)
8. **Approach NAS on the data commercialization topic.** The issue of data commercialization of data acquisition by NOAA will be brought to the attention of the National Academies of Science. (Priority 2a, Yolande Serra, Mike Patterson)



9. **Connecting US CLIVAR with Fish/Climate/Ecosystem Community.** Following on Anne Hollowed's report about ongoing efforts to determine the effects of climate on marine ecosystem, connect to the Predictability, Predictions, and Applications Interface (PPAI) panel for seasonal forecasts applications for fisheries. Connect Earth system modelers for comparing notes on biogeochemical components. (Priority 3; Samantha Stevenson, Manu Di Lorenzo).
10. **Review efforts to measure air-sea fluxes.** Explore if possible, jointly with CLIVAR GSOP and GEWEX SeaFlux, the status and needs for measuring air-sea fluxes globally, and develop recommendations for additional flux measurements within the global ocean observing system. Advise the organizing committee of the upcoming US CLIVAR workshop: *Atmospheric Convection and Air-Sea Interactions over Tropical Oceans* (Priority 2, Samantha Stevenson, Yolande Serra, Aneesh Subramanian)
11. **Input to the 2nd TPOS report.** Comment as a panel on the TPOS2020 review during the public comment period (Priority 2; Yolande Serra, Kyla Drushka)
12. **Submit poster abstract for OceanObs'19 about Summit discussion on Best Practices for Uncertainty.** Poster could be based on the discussions on this topic during the 2019 Summit meeting. (Priority 2; Shane, Aneesh, Kyla)
13. **Input to Deep Ocean Observing Strategy (DOOS) project.** Comment on the DOOS review (Priority 2; Fred Bingham, Alison Macdonald)

## Appendix A: Participants

POS Panel Members	Affiliation
Fred Bingham ( <i>Meeting Host</i> )	University of North Carolina, Wilmington
Emanuele Di Lorenzo ( <i>Panel Co-Chair</i> )	Georgia Tech University
Kyla Drushka ( <i>Panel Co-Chair</i> )	University of Washington
Shane Elipot	University of Miami
Michelle Gierach	NASA Jet Propulsion Laboratory
Tony Lee	NASA Jet Propulsion Laboratory
Alison Macdonald	Woods Hole Oceanographic Institution
Jamie Morison	University of Washington
Cécile Rousseaux	NASA Goddard Space Flight Center
Yolande Serra	University of Washington
Samantha Stevenson-Michener	University of California, Santa Barbara
Aneesh Subramanian	University of Colorado
Xiaosong Yang	NOAA Geophysical Fluid Dynamics Laboratory

Invited Remote Speakers	Affiliation
Mona Behl	University of Georgia, Georgia Sea Grant
Ricardo Domingues	University of Miami
Mike Jacox	NOAA Southwest Fisheries Science Center, NOAA Earth System Research Laboratory
Nikki Lovenduski	University of Colorado
Clarissa Anderson	Scripps Institution of Oceanography
Nikki Prive	Morgan State University, NASA Global Modeling and Assimilation Office
Steve Penny	University of Maryland, NOAA National Centers for Environmental Prediction
Lesley Ott	NASA Goddard Space Flight Center
Anne Hollowed	NOAA National Marine Fisheries Service

US CLIVAR Staff	Affiliation
Mike Patterson	US CLIVAR Project Office
Kristan Uhlenbrock	US CLIVAR Project Office

# Appendix B: Agenda

## Day I, August 8, 2018

9:00 *Introductions and meeting goals (Manu, Kyla)*

10:00 *Session I: Coastal dimensions*

The Coastal dimension in US CLIVAR: overview & vision (Manu)

*1a) US East Coast – Sea level and flooding (Shane, Alison, Manu) Rapporteur: Kyla*

- Current efforts and priorities of coastal sea level science and engineering along the east US coast (Mona Behl, Georgia Sea Grant)
- 2017 WCRP “Regional Sea Level Changes and Coastal Impacts” conference in New York and Future Steps (Mike Patterson, US CLIVAR)
- Proposed workshop Sea Level Changes along the United States East Coast: Drivers, Impacts, and Adaptation (Ricardo Domingues, U. Miami)
- Relations of sea level with large-scale climate variability (e.g., AMOC) (Shane)

11:00 *Break*

11:30 *1b) US West Coast – Ecological forecasting (Manu, Aneesh, Michelle) Rapporteur: Alison*

- Forecasts associated with coastal ecological impacts of large-scale Pacific climate dynamics along the US West coast. Updates also from NOAA-MAPP Marine Coastal Prediction task team (Mike Jacox, NOAA SWFSC & NOAA ESRL)
- Ensemble decadal predictions of marine productivity and acidification, WG-Ensemble-US-CLIVAR (Nikki Lovenduski, U. Colorado)
- An overview of the climate dimension of the coastal observing system and LTERs (Long term ecological research) (Clarissa Anderson, Scripps Institution of Oceanography)

*1c) Updates on relevant action items Rapporteur: Cécile*

- Coastal ocean observing community engagement webinar (Alison, Manu, Shane, Aneesh)
- NSF RCN on ecological forecasts along the US West Coast (Manu, Aneesh)

12:30 *Lunch and tour of CMS facilities*



**1:30** *Session 2: Designing observing systems*

**2a) Observation system experiments in DA framework (Aneesh, Cécile) Rapporteur: Fred**

- Use of models (operational and climate models) for observing system design (e.g., TPOS2020 workshop) (Aneesh)
- Discussion on observation sensitivity experiments (Nikki Prive, Morgan State U., NASA/GMAO)
- Coupled data assimilation: Challenges and progress (Steve Penny, U. Maryland, NOAA NCEP)
- OSSEs for Carbon Cycle (Lesley Ott, NASA/GSFC)
- Uncertainties in analysis/reanalysis products and how to effectively address them

**2:30** **2b) OceanObs'19 white papers (Shane, Kyla) Rapporteur: Manu**

- Outline and update on POS-related white papers
- Discussion of POS Panel's role in OceanObs'19

**2c) Water Isotope Network (Sam) Rapporteur: Cecile**

- Webinar was given July 16
- Overview of Isotope network and its ability to track climate/hydrological processes
- How to integrate this information in modeling systems

**3:10** **Break**

**3:40** **2d) Updates on relevant action items (Aneesh) Rapporteur: Michelle**

- Data sharing - publication and/or town hall (Yolande)
- US GO-SHIP review (Fred, Mike)
- Uncertainty metrics (Kyla, Shane, Yolande)
- Air-sea flux measurements (Sam, Yolande, Aneesh)
- Data streams/uncertainty information webinar (Alison, Kyla)
- Input to IndOOS review (Kyla, Aneesh)
- Connect with DA/CDA community (Aneesh, Sam)
- Input to Deep Ocean Observing Strategy project (Kyla)

**4:30** **Overview of day 1 (next steps/outcomes) Rapporteur: Michelle**

**5:00** **Adjourn**

**Panel dinner @ 6:30pm: Pilot House Restaurant, 2 Ann St.**

## Day 2, August 9, 2018

### 9:00 Session 3: Internal variability

#### 3a) Ocean internal decadal variability: models vs. observations (Sam, Aneesh, Xiaosong) Rapporteur: Yolande

- How do Large Ensembles (LENS) capture the mechanisms of decadal variability in the ocean surface and subsurface? (Aneesh)
- Which mechanisms of decadal variability provide the basis for longer-term predictions (joint PPAI?) (Xiaosong)
- Internal variability in hydroclimate (Sam)
- Connect with LENS US CLIVAR WG (Sam)

#### 3b) Internal variability of Arctic and Antarctic and ice dynamics (Jamie, Fred, Alison) Rapporteur: Aneesh

- AGU & Ocean Sciences Arctic sessions (Jamie)
- AGU & Ocean Sciences Antarctic sessions (Alison)
- New CLIVAR /CliC Northern Oceans Region Panel

### 11:00 Break

### 11:30 3c) Updates on relevant action items Rapporteur: Manu

- Reassess and revise workgroup proposal for Arctic Ocean research (Jamie, Fred)

### 12:00 Lunch and boat ride of Masonboro Sound

### 1:30 Session 4: International efforts/collaboration opportunities (Manu) Rapporteur: Shane

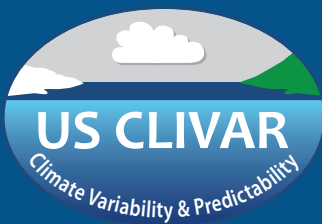
- Report on the “Effects of Climate Change on the World Ocean” conference (Washington DC, June 2018) (Anne Hollowed, NOAA NMFS)
- WCRP/CLIVAR Grand Challenge of Sea Level (Mike Patterson, US CLIVAR)
- >>> save for future telecon in order to have more time for afternoon discussion:
  - The UN 10-year decadal of ocean science and discovery, September planning meeting in Paris looking for community people to be engaged in a steering committee
  - Decadal predictability working groups in ICES and PICES
  - AMOC updates and sunset plan
  - Coastal AMS community (Mona Behl, Georgia Sea Grant)
  - TPOS2020 updates on where it stands and workshop (Yolande, Kyla)

### 3:00 Break

### 3:30 Panel business/next steps (Kyla)

- Future directions of POS Panel (suggestion from SSC: include more atmospheric dynamics)
- Early career award, need to draft one for US CLIVAR
- 50/50 US CLIVAR Webinar series, need to find a more compelling name/motivation (Alison, Manu)
- New panel priorities and members

### 5:00 Adjourn



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