

## Summary Report of the 14th Session of the GCOS-GOOS-WCRP Ocean Observations Panel for Climate

29 January 2010

19-22 January 2010

NOAA/AOML, Miami FL, USA

<http://ioc-goos.org/oopc-14>

### 1 OPENING

#### 1.1 Welcome

The new Chair of the OOPC, Eric Lindstrom, opened the session at 9:00 on Tuesday 19 January 2010. He welcomed the participants to the meeting, and thanked the local hosts, Gustavo Goni and AOML, for their work in preparing for the meeting.

#### 1.2 Review and adoption of the agenda

The Chair introduced the provisional agenda, noted that two scheduled presenters were unable to attend (Mehta and Speer). The agenda was then approved (see Appendix I).

#### 1.3 OOPC goals, State of the Ocean, and specific meeting goals

The Chair gave a [presentation](#)<sup>1</sup> that reminded participants of the goals of the observing system for climate, and outlined some of his priorities for the panel. These include improving the 'State of the Ocean' ocean climate indices on the OOPC web site, increasing communication about the societal relevance of ocean observations and ocean climate indices, including brief current events of ocean conditions, improving the 'State of the Observing System' information on the status of the in situ and satellite elements, and liaison and review to continue advocating for sustaining and enhancing the observing system. He emphasized the importance of supporting the GCOS Implementation Plan, supporting clear outcomes from OceanObs'09, and initiating reviews of observing system elements where needed.

The director of the GCOS Secretariat, Carolin Richter, emphasized the climate mission of the panel as opposed to other environmental issues brought up at OceanObs'09, hoping for a common approach with the other GCOS panels: the atmospheric AOPC and terrestrial TOPC. The Chair put climate at the center of the mission of the Panel, but wanted to build a broad base of support and advocacy for the ocean observing system, including its climate goal. He planned to focus the panel on making research relevant on a wider basis, to help build advocates for the resources needed to sustain the observing system.

He asked the panel members and invited guests to serve as 'OOPC Ambassadors' when in other venues, and offered his powerpoint slides as a basis for their presentations.

**ACTION** – Fischer/Srinivasan to create a fixed place on web to download latest **OOPC presentation**, for use by panel members on behalf of OOPC

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<sup>1</sup> [http://www.ioc-goos.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=4733](http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=4733)

## 2 SCIENCE FOCUS

### 2.1 Tropical cyclone / hurricane / typhoon

#### 2.1.1 *Atmospheric and oceanic observations in the data-sparse tropical oceans for tropical cyclone forecasts*

Sim Aberson of the NOAA/AOML Hurricane Research Division gave a [presentation](#)<sup>2</sup> on observations for tropical cyclone forecasts. The skill of forecasts of intensity, structure, and rainfall varied from model to model, even as hurricane track forecasts have improved. Only the US and Taiwan augmented regular observations with targeted aircraft-based atmospheric and oceanic observations. Until models were able to produce skillful forecasts of intensity, structure, and rainfall, it was difficult to begin to assess what observations are needed to improve those forecasts.

#### 2.1.2 *Ocean sustained observations for tropical cyclone intensity studies and forecasts*

Gustavo Goni (NOAA/AOML) gave a [presentation](#)<sup>3</sup> on sustained ocean observations useful for tropical cyclone intensity studies and forecasts. His talk was based on two Community White Papers from OceanObs'09. He presented the Tropical Cyclone Heat Potential index, as well as trends. The recommendations can be found in the presentation.

#### 2.1.3 *Process study observations focused on better prediction*

Frank Marks, head of NOAA's Hurricane Forecast Improvement Project gave a [presentation](#)<sup>4</sup> on process study observations for improved hurricane prediction. The overall strategy was based on improving the science, the information technology, the observing strategy, and producing improved products for forecasters. The project was using satellite wind fields and altimetry (for estimations of ocean heat content), as well as air-dropped XBTs and thermistor-chain surface drifting buoys.

#### 2.1.4 *Ocean vector winds and hurricane forecasts*

Mark Bourassa (FSU) gave a [presentation](#)<sup>5</sup> on behalf of himself and Ryan Maue on ocean vector winds and hurricane forecasts. He spoke of the limitations of the climate record of tropical cyclones, including the difficulty in estimating their strength. He presented a number of indices based on Accumulated Cyclone Energy, showing how these have changed globally over time and shifted in space. Future wide-swath scatterometers are expected to improve these studies, and a constellation of wind sensors is needed to improve sampling.

***ACTION*** for Bourassa/Fischer: to include some of the FSU COAPS **hurricane indices** on the OOPC State of the Ocean web site.

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<sup>2</sup> [http://www.ioc-goos.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=4734](http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=4734)

<sup>3</sup> [http://www.ioc-goos.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=4735](http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=4735)

<sup>4</sup> [http://www.ioc-goos.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=4736](http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=4736)

<sup>5</sup> [http://www.ioc-goos.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=4738](http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=4738)

## **2.2 Deep ocean observations: what are the scientific (and societal) requirements?**

Silvia Garzoli (NOAA/AOML) gave a [presentation](#)<sup>6</sup>, followed by Greg Johnson (NOAA/PMEL) with a complementary [presentation](#)<sup>7</sup>, both on the requirements for deep ocean observations. These presentations were supported a number of OceanObs'09 Community White Papers, the Plenary Presentation by Steve Rintoul, and the newly-published GO-SHIP hydrography program strategy (available on the meeting website as background documents). The deep oceans were a major reservoir of both heat and carbon in the climate system, and their changes were poorly observed. Assessing the overall climate sensitivity, climate commitment, and levels of sea level rise were dependent on the deep ocean. Questions remained about the evolution of the deep ocean, future changes, and the uncertainty associated with both.

There was a need to continue development of new cost-effective deep observing technologies, such as deep profiling floats, bottom instruments with expendable data capsules, deep gliders, and deep carbon sensors. Repeat hydrography was sparse and expensive, and better space and time sampling of the deep ocean were required to reduce uncertainty.

The chair also pointed to satellite altimetry and gravity measurements, as well as measurements of the cryosphere, as being connected to an understanding of the deep oceans. Leaving the deep ocean heating as a residual in other calculations of the mass and sea level rise budgets was unsatisfactory. The Panel considered over the week, and decided an action on deep ocean observations under Agenda Item 8.

## **3 OCEAN INDICES/INDICATORS: DEVELOPING INFORMATION USEFUL TO SOCIETY**

### **3.1 General review, and how to emphasize impacts**

Albert Fischer gave a [presentation](#)<sup>8</sup> on the OOPC State of the Ocean climate indices website, demonstrating the indices available, the geographic browsing view and graphical overview of all indices, and speaking of its steady number of visitors. A number of these visitors provided feedback when the site failed to update, by e-mail. He focused on how it could be improved as a tool for advocacy on the need for ocean climate observations - through an additional 'reversed' presentation, or 'impacts view'. Issues addressed could be seasonal rainfall/drought, storminess/tropical cyclones, sea level rise (global and regional), sea ice (global), decadal change/global change/early indicators of change, carbon uptake, waves, etc. Some could have only decadal/updated information with large uncertainties to underline the point that the observations are missing. Fischer pointed to the CLIVAR Basin Panels as key potential partners in developing and promoting this information.

### **3.2 Real-life example of use of ocean and climate indices: South Florida Water Management District**

Paul Trimble of the South Florida Water Management District (SFWMD) gave a [presentation](#)<sup>9</sup> on the use of climate indices in the management of the highly

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<sup>6</sup> [http://www.ioc-goos.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=4740](http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=4740)

<sup>7</sup> [http://www.ioc-goos.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=4739](http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=4739)

<sup>8</sup> [http://www.ioc-goos.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=4741](http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=4741)

<sup>9</sup> [http://www.ioc-goos.org/index.php?option=com\\_oe&task=viewDocumentRecord&docID=4742](http://www.ioc-goos.org/index.php?option=com_oe&task=viewDocumentRecord&docID=4742)

regulated water resources of central and south Florida, which are controlled for a mix of flood protection, water supply, and environmental needs. There are numerous flood control and diversion structures, and the levels of Lake Okeechobee are regulated based on law as well as on climate outlooks. The staff of the SFWMD have weekly meetings and look particularly at the status of the Atlantic Multidecadal Oscillation index, the El Niño indices (and the recent ideas of El Niño 'modoki'), and the Arctic Oscillation index. Trimble noted he even looked at the MJO and the propagation of Kelvin waves in the Pacific to look for signs of the evolution of El Niño. They are always looking for ways to improve their use of climate data in the regulation of water levels to balance the competing demands on the resource.

### 3.3 Discussion

Meyers pointed out that farmers in Australia had a similar approach to using climate information, as one additional piece of data they use in managing their complex operations. He recalled the 2006 Indian Ocean Dipole, which was not forecast by all models, and was a reason Australia was a strong follower of the OOPC State of the Ocean indices page.

**ACTION for Fischer/Meyers:** link from the IOD page, now only linked to the Japanese forecast page, to the various **coupled model forecasts of the Indian Ocean Dipole**

The Panel agreed with Fischer's idea of developing an impacts view into the ocean climate indices, and suggested improving mechanisms for user feedback, potential crowd-sourcing of climate connections to ocean indices, and for making the indices more widely available. These mechanisms could include a blog updated regularly with a 'curated view' of the current state of the ocean, allowing feedback (Fischer pointed out this was an outstanding OOPC action from a previous meeting), making Twitter feeds out of the indices, or allowing the impacts side to be edited by the public through a wiki system. The Chair envisioned capturing the power of the human mind to recognize patterns, that the Panel could provide a few concrete examples, but then open to feedback. Richter pointed out a possible link to the WMO Climate Outlook Fora.

**ACTION for Fischer, Goni, Meyers** - link to or calculate relevant indices for **tropical cyclones** on the AOML page (for example a map of heat content  $> 50 \text{ kJ cm}^{-2}$ ), potential simple surface transport indices such as a count of Agulhas or Brazil current rings, and more **subsurface indices**, such as those based on thermocline depth in the tropics, the Atlantic Warm Pool, etc.

Development of future indices could include:

- Deep ocean index: decadal update time scale; based on hydrography with an uncertainty calculation – heat content, AABW temperature change, or MOC heat transport from MOCHA/RAPID
- An ocean carbon uptake index
- El Niño vs. El Niño Modoki
- Southern Ocean indices that are being measured (feasible) and teleconnection impacts either through atmosphere or global impact through sea level rise - in cooperation with the CLIVAR-CLiC Southern Ocean Panel

**ACTION for Fischer** - create Wiki and **template to hold the 'impacts view' of the indices**

**ACTIONS for those listed below**

Develop specific examples to start:

- for Meyers: **South or West Australia**: region influenced by the Indian Ocean
- for Fischer w/ input from Trimble and others at AOML: **South Florida**
- for JPL: **Southern California**
- for Fischer: **East Africa** with connection to Indian Ocean

## 4 HOW IS THE PANEL SUPPORTING ITS SPONSORS?

### 4.1 GCOS, and the developing climate services framework

Carolyn Richter, Director of the Global Climate Observing System (GCOS) Secretariat, gave a [presentation](#)<sup>10</sup> on GCOS and the development of a new Global Framework for Climate Services. She emphasized GCOS's 3 components: atmospheric, oceanic, and terrestrial, a fact sometimes forgotten in GCOS's host agency WMO. GCOS and the WCRP were the observations and research components underpinning a future Framework for climate services. Richter proposed parallels to the GCOS atmospheric networks with a potential 'GCOS Sea Level Network' for example, and also noted the importance of System Improvement efforts via the GCOS Cooperation Mechanism in building developing country understanding and appreciation for climate observations.

Lindstrom recalled some of the fundamental differences between the domains: that (open) ocean observations were all essentially developed on a climate rationale, and that all observations and not just a subset had to be brought up to climate standards. Another fundamental difference is that 70% of the ocean is outside of national jurisdiction, a global commons, and so developing observations specifically in developing countries is not necessarily as central to ocean observations as it may be to atmospheric or terrestrial observations. Some Panel members quickly pointed to small-scale projects where countries had been helped to participate in open ocean observations as being helpful for many reasons.

Fischer spoke of the equivalence between the GCOS ocean component and the GOOS open-ocean/climate module which meant that GCOS did in fact have Essential Climate Variable (ECV)-oriented observing networks, though this misses coastal observations important to climate. The Panel agreed that it was important to continue advocating for observations for climate - a focus on climate services could mean a reduction of focus on climate research and observations, so the message that research and observations underpin the development of services is key.

***ACTION** for Chair, secretariat* - to stay engaged with PICO in considering coastal observations important for climate, as well as improve work at the interfaces with AOPC and PICO (see related action under 7.4).

### 4.2 GOOS

Fischer gave a [presentation](#)<sup>11</sup> on the Global Ocean Observing System (GOOS) as a system, and as a management structure. One of the original concepts of GOOS, a transition of observations from research to operations, was called into question by the Panel. POGO represents research institutions which may in some ways be more stable than governments. In the satellite world, observations that started in a research agency are often made in partnership with an operational agency in future missions. Research is important for maintaining quality and reviewing systems. Fischer suggested that raising the profile of the open-ocean

<sup>10</sup> [http://www.ioc-goos.org/index.php?option=com\\_oa&task=viewDocumentRecord&docID=4745](http://www.ioc-goos.org/index.php?option=com_oa&task=viewDocumentRecord&docID=4745)

<sup>11</sup> [http://www.ioc-goos.org/index.php?option=com\\_oa&task=viewDocumentRecord&docID=4746](http://www.ioc-goos.org/index.php?option=com_oa&task=viewDocumentRecord&docID=4746)

component of GOOS with IOC governing bodies and with the GOOS Scientific Steering Committee (GSSC) would be important to build advocacy for the system.

***ACTION for all Panel members*** – if involved in **GOOS Regional Alliance**, bring OOPC perspective through presentation or presence at meeting, to help identify and highlight links to regional ocean observing systems and coastal observations.

### 4.3 WCRP

David Legler, Director of US CLIVAR, gave a [presentation](#)<sup>12</sup> focused on the intermediate and long-term plans of the World Climate Research Programme (WCRP) and CLIVAR. He also brought an update from the CLIVAR Global Synthesis and Observations Panel (GSOP) which reported on their interest in improving ocean reanalysis and state estimation, including involvement in intercomparisons and development of decadal forecasting initializations. GSOP is also interested in implementation of new parts of the ocean observing system: particularly the deep ocean and boundary current observations; and in working on the quality and fidelity of the historical record.

The Panel also was directly posed a question by Kevin Trenberth, chair of WCRP's Observation and Assimilation Panel (WOAP), on the mismatch between recent (this decade) estimates of the upper ocean heat content from Argo floats, XBTs, and hydrography, and sea level rise from altimetry and tide gauges showing continued increase of the ocean volume. Continued ocean heat uptake during this period is also suggested by CERES radiation budget calculations from Terra and Aqua satellite data. On WOAP, Keeley also recalled that he was working with Howard Cattle to develop a report surveying WCRP data systems for the upcoming WOAP meeting.

The chair felt that the scientific teams working on ocean altimetry and sea level were making good progress on its error budget, but there was scope for expanded cooperation between the ocean observation and cryosphere communities, in particular to look at ocean-ice sheet interactions.

Discussion by the Panel centered on the accuracy and representativeness of Argo and XBT temperature profiles, and how to build a systematic approach around the subsurface ECV of temperature. After further discussion under Agenda item 8, and the outlining of a potential workshop on ocean thermal requirements which would look at the error budget and sampling requirements, the Panel felt it premature to call a workshop in 2010. The XBT community and Argo communities were working on the error budget, and the Panel would revisit this question in the future.

### 4.4 OOPC membership

The OOPC members held a special session to discuss OOPC membership and its renewal based on the potentially expanding scope of the panel, and the constraints imposed by the budgets supporting OOPC from GOOS/IOC and GCOS secretariats. The IOC budget for OOPC was now only enough to barely support the one panel meeting per year (~50% of previous levels), leaving no funds for workshops or activities.

***ACTION for Fischer:*** **collect suggestions** for new panel members from OOPC members, sponsors, attendees for these areas:

<sup>12</sup> [http://www.ioc-goos.org/index.php?option=com\\_oie&task=viewDocumentRecord&docID=4747](http://www.ioc-goos.org/index.php?option=com_oie&task=viewDocumentRecord&docID=4747)



- **biogeochemistry / carbon / (ecosystems impacts?)**
- data management
- satellites
- MOC / deep ocean

## 5 **BASIN FOCUS: SUPPORTING CLIVAR SCIENCE WITH SUSTAINED OBSERVATIONS AND DEVELOPING INFORMATION FROM THE RESEARCH**

The panel received presentations from the Atlantic Implementation Panel, the Pacific Panel, the CLIVAR-GOOS Indian Ocean Panel, and the Southern Ocean Panel. These are available on the [meeting website](#).

### 5.1 **Discussion and bulleted actions**

Future requests for input from CLIVAR for OOPC:

- to ask for information about data availability
- request to come earlier and be more consistent
- Request information about both space and in situ observations in support of Panel's research goals

If possible to **feed back OOPC response** through presence at CLIVAR Panel meetings [reciprocal partnership: hope that OOPC members find way to go to basin panel meetings; represent global picture]

**OOPC Ambassadors.** *[flag as ongoing expectation, need to enable]*

- may be that global issues influence local tactics
- way to communicate to community

ERIC will bring this idea to WCRP JSC.

ALBERT to make regularly updated ppt available in fixed place.

ASK CLIVAR SSG: to call on their research programmes to **articulate need for sustained, legacy observations** out of the process studies; this is currently happening randomly.

Action for Eric, Sylvia, Molly: to influence **AMOC**: we have 3 AMOC meetings coming up in next 6 months; we should call on them to find some systemization of the observations – [principles, priorities] – to have a clearer system to sell

NEXT MEETING: have a deeper discussion on the requirements for western boundary current monitoring

## 6 **OCEANOBS'09: OUTCOMES AND THE FUTURE ROLE OF THE OOPC**

DECISION on integrating biogeochemistry and biology in the sustained open-ocean observing system: **orient around the conventions: UNFCCC for climate and Convention Biological Diversity**; organize the observing system around this with new panel for biology/biogeochemistry; have liaison between them.

Climate is still core of OOPC

We might need to have more correspondance with PICO as well. Perhaps 3 panels: PICO coastal, OOPC life or OOPB biodiversity, OOPC climate.

**OOPC focus on the GCOS Implementation Plan.**

Biogeochemistry and biology relevant to climate should feed into the GCOS IP  
Important to keep OOPC sponsors behind panel.

**7 ESSENTIAL CLIMATE VARIABLE FOCUS****7.1 SST: integrating space and in situ observations**

The Panel heard presentations on the uncertainty budget for SST, climate data records for SST, and the surface drifter network. These presentations are available on the [meeting website](#).

**7.1.1 Discussion**

The Panel encouraged conversation between GHRSSST, Argo, DBCP drifters on possible updated recommendation for Argo near-surface T, and exploration of accuracy requirement of surface drifters.

ACTION (OOPC to encourage space agencies creating climate data records)  
- Encourage **documentation** [needs definition: transparency in processes data went through, versions] of the **Climate Data Records** of SST to allow for proper peer review

**7.2 Expanding networks to better address biogeochemical and ecosystems ECVs**

The Panel heard a [presentation by Alberto Piola](#) on the possibilities of expanding networks to better address biogeochemical and ecosystems ECVs.

**7.3 Data Management****7.3.1 Global data systems, including for non-traditional OOPC ECVs (biogeochemistry and ecosystem variables)**

Bob Keeley gave a [presentation](#) with an overview of the Data Management landscape.

The Panel decided to insert an Action in the GCOS Implementation Plan for **regular tracking of data sharing / adherence to data sharing policies** (action for DACs/observing networks, IODE), including national breakdown, and to insert an action in the GCOS IP for **establishment of dois for data / journal for data**, action for societies.

**7.3.2 Observing system metrics by ECV**

Keeley then gave a [presentation](#) on observing system metrics by ECVs. This remained an area of future OOPC action.

**7.4 Review of the GCOS Implementation Plan 2010 update**

The Panel reviewed work on updating the GCOS Implementation Plan and reporting to the UNFCCC. The Panel made the following decisions and actions:

*for surface fluxes*

ACTION for Mark – help us work on **flux strategy for GCOS**



Highlight the ECVs and the requirements on them to go after fluxes particularly.

impacts on requirements / tradeoffs between types of observations?

deadline: AOPC meeting

goal – joint plan highlighted as part of IP (or through next Progress Report)

ACTION for all - Put **GCOS IP revisions/suggestions**

ACTION for Albert/Eric – some targeted requests for input on the GCOS IP

DECISION: Develop some sort of **requirements review process** for the GCOS progress reports – nice component to add. Thinking of modifying requirements as positive progress, based on scientific understanding.

## 8 REVIEWS OF OBSERVING NETWORKS AND IMPLEMENTATION GOALS

The Panel discussed the possibility of an Ocean **[Thermal] Data requirements** review. This responded to a question raised by Trenberth – Sea level and global energy budget : were these properly sampled?

Communities involved would include: XBT, Argo, research ships, deep ocean, moorings, and space (altimetry, gravity), legacy dataset issues

error budgets and **sampling requirements**

Part of this review would be to review the metrics of implementation (JCOMM) with consideration of both individual network metrics and the overall ECV metric

The Panel however decided that it will re-consider this activity next year with more input.

The Panel **decided** to initiate a **Deep Ocean Observing requirements** review, with a focus on expanding the observing system, looking more broadly across the ECVs, not just temperature.

## 9 REVIEW OF DECISIONS AND ACTIONS

The Panel reviewed a short list of decisions and actions, refining a number of them. They have been incorporated into the report above.

## 10 CLOSING

The Chair, consulting with the Panel, decided to maintain a January OOPC meeting (around the time of the annual AMS meeting), with the final choice of venue to for the next meeting to be decided by consultation by e-mail. It welcomed the potential for one-off back-to-back meetings with other panels such as PICO or a possible future panel dealing with open ocean biodiversity and ecosystems. However the Panel felt it better that these not be regular back-to-back meetings.

The Panel thanked the local host. The meeting closed at 12:15pm on Friday 22 January 2010.