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Report from the OOPC Representative

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The Ocean Observations Panel for Climate (OOPC) is sponsored by the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS), and the World Climate Research Programme (WCRP). It is a scientific expert advisory group charged with making recommendations for a *sustained global ocean observing system for climate* in support of the goals of its sponsors. This includes recommendations for phased implementation. The Panel also aids in the development of strategies for evaluation and evolution of the system and of its recommendations, and supports global ocean observing activities by interested parties through liaison and advocacy for the agreed observing plans.

The sustained global ocean observing system for climate is designed to provide data and information products for: climate monitoring and forecasting, climate assessment, and climate research. It is also the foundation for global operational oceanography, including global weather prediction and marine forecasting, global and coastal ocean prediction and marine environmental monitoring.

This report will focus on the growing networks that make up the system and positive news emerging about them, as well as on challenges in moving to a fully functional and integrated observing system. A full report of the last OOPC meeting can be found on its web site.¹

1. Planning and endorsements

a. GCOS Implementation Plan, UNFCCC, G8 and GEO

2005 saw continued engagement by the GCOS-GOOS-WCRP sustained and research ocean observations communities with the UN Framework Convention on Climate Change and GEO. Recall that the Conference of the Parties (COP) of the UNFCCC accepted the GCOS *Second Report on the Adequacy of the Global Observing System for Climate*² (2AR) in December 2003 and requested that an implementation plan be prepared with specific recommendations for phased implementation over 5 years and 10 years. This GCOS Implementation Plan³ (GCOS-92) was prepared and then reviewed in a manner similar to that used with the 2AR; the research and sustained ocean observation communities were essential participants. GCOS-92 was accepted by the GEO 10-year implementation plan for its “climate” societal benefit area and by the UNFCCC at COP-10 in December 2004. The UNFCCC also called for the Parties to the convention to implement the plan, and report regularly on their progress in achieving the goals outlined in the plan. The G8 Gleneagles Climate Change Plan of Action (July 2005) committed to moving forward with GEOSS and GCOS implementation by G8 and developing nations.

The Executive Summary of GCOS-92⁴ is suggested reading for an overview of the strategy and specific actions that have been recommended.

GCOS-92 provides recommendations for actions to be taken in the atmospheric, oceanic and terrestrial domains. Although there are a number of issues that cut across all three domains (particularly involving data access, data systems, data collection following the “GCOS Climate Monitoring Principles” and enhanced sustained analysis and reanalysis products useful to policy makers and non-specialists) the ocean domain situation is substantially different in important respects.

Arguably chief among these is the extent to which the present observing system is the work of the research oceanography community, the degree to which it is financed with support from national

¹ direct link: http://ioc3.unesco.org/oopc/meetings/oopc-10/docs/OOPC-10_Report.pdf

² GCOS Report No. 82, WMO/TD No. 1143, available as a background document on the OOPC web site: <http://ioc.unesco.org/oopc/>.

³ *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC*, GCOS Report No. 92, WMO/TD No. 1244, also available at the link above.

⁴ direct link: [http://www.wmo.ch/web/gcos/Implementation_Plan_ES_\(GCOS\).pdf](http://www.wmo.ch/web/gcos/Implementation_Plan_ES_(GCOS).pdf)

ocean research and research satellite entities and that the path forward over the next 5 to 10 years appears to depend upon sustaining and enhancing these activities, relationships and sponsorships.

b. Integration and Interdependence of Ocean System Elements

The ocean system needs all its elements to deliver information for science and society. The extent to which the ocean system is integrated and interdependent on its elements needs also to be emphasized. An example is the extent to which the ships of opportunity that provide the repeat XBT surveys also deploy surface drifting buoys and Argo floats as well as being the primary source of underway observations of high resolution air-sea flux information (which need to be referenced against the OceanSITES observations) and underway ‘wet’ observations like pCO₂ and surface salinity (and increasingly other variables). Another is the extent to which interpretation of global sea level data from altimeter observations depends upon thermobaric information inferred from Argo floats, which depend upon the high accuracy CTD observations of the repeat hydrography surveys for calibration, as well as upon reference tide gauge data. The list is easily extended; in our dramatically undersampled global ocean we depend upon best use of every available observing asset. The seeming-patchwork of recommended observing activities is the result of making the best (and multiple) use of every ocean observing effort. The recommendations also ensure that almost every coastal nation can contribute to the global ocean observing system.

c. National Planning and Reporting

There is no international governance of the global ocean system comparable to that of the atmospheric system – there is no “World Ocean Watch” structure akin to the “World Weather Watch” structure. The international ocean observing and analysis effort is the sum of national contributions carried out to address particular national objectives. Coordination is offered via JCOMM groups and global research programs and efforts like the IOCCP and IOCCG. Over the past five years it has become evident that typically there is no national focal point for planning or oversight of national global ocean efforts. Coordination at present is heavily dependent upon research principal investigators participating in international programs. Like-interest groups such as the CEOS and IGOS-P also provide coordination for satellite activities. The UNFCCC has called for national reporting on progress toward implementing the global ocean system, in hope that this will raise governmental awareness of national efforts and will promote national planning, and that these will foster enhanced regional and international planning and activities.

d. Intergovernmental Bodies

There is new leadership at the WCRP, JCOMM, GOOS, GCOS and GEO. Their Secretariats all have new directors and there are changes in the leadership of most of the senior advisory bodies of these groups. It is hoped that the consensus developed under previous leadership will continue.

2. Linkages between Global and Coastal Oceans

Gathering examples of observed and/or hypothesized linkages between the global and coastal oceans deserves increased effort, if a unified advocacy effort is to be developed. It is not clear that coastal ocean (including ecosystems) historical data records have been sufficiently examined for linkages. GODAE is working to develop linkages with coastal ocean data assimilation efforts.

3. Ocean Information Products

Development of such products needs additional attention. Efforts to develop ocean climate indices are underway but are not progressing quickly⁵. Much of this is the result of the limited historical data base; this is an unfamiliar type of activity. The global ocean research community is not used to

⁵ The OOPC secretariat efforts to collect and visualize ocean climate indices for evaluation of the ocean state and observations can be found at: http://ioc.unesco.org/oopc/state_of_the_ocean/.

working either in near-real time or via making use of simplified measures of oceanic conditions. CLIVAR ocean basin panels are working on the development of indices of the climate state of the ocean. GODAE partners routinely make available high spatial resolution ocean state estimates for operational ocean purposes, and have been invited to contribute to the development of basin scale indices. The SST/Sea Ice working group will be looking into the uncertainty in present estimates of polar sea ice indices.

4. System Status 2005

Progress toward implementation of the *in situ* elements of the initial global ocean system was modest but non-trivial in 2003 (45% of designed system), 2004 (48%) and 2005 (55%). Its rate of increase is projected to slow; implementation at the end of 2006 is estimated to be only 57%. At the present level of progress it will be more than 20 years before the initial system can be completed.

Overall metrics of system completion obscure the progress that was made by the Argo community and the surface drifting buoy community. As this is written Argo has nearly 2400 reporting floats, against its initial goal of 3000, and the surface drifting buoy program has about 1380 drifters reporting, against its goal of 1250 (although improved global distribution remains to be accomplished for both Argo and surface drifters).

On the other hand particular challenges are easily identified. The Volunteer Observing Ship fleet faces reduced support from national weather services and the VOSclim element of the observing system is not progressing as had been planned. The underway high resolution air-sea observation program also has not progressed as desired. And the rapidly evolving patterns of surface marine commerce continue to challenge the goal of global repeat XBT coverage. Support for the global repeat carbon inventory survey also remains incomplete. Scheduling of ocean satellite missions also suggests increased advocacy is needed promptly to assure mission continuity and compatibility with the historical record of surface height variability, microwave SST, sea ice and rainfall, ocean color and surface vector winds. Other examples of concern are that the decade-long German observing efforts in key ocean transport sites are scheduled for termination as research efforts, and the US sustained ocean observing budget has been reduced and faces uncertain prospects.

But other good news is that the JCOMM Observations Coordination Group is fostering an increasing systems approach to deployment and observing system element cross-communication. Progress in development of a unified ship cruise data base is welcomed. Argo and the ocean data community are steadily improving real time metadata transmission and near-real-time quality control. A renewed GCOS-WCRP SST-Sea Ice working group will elucidate sea ice analysis uncertainties. GODAE efforts continue to progress in a number of nations, bringing awareness of the societal utility of enhanced real time ocean observations. Interaction with the SCOR, IGBP and IHDP communities is increasing steadily as awareness of opportunities for mutual benefit has grown (sponsorship by the Sloan Foundation for coordination has been very helpful) and these groups increasingly explicitly support the sustained observing system plan. Enthusiasm to sustain and enhance existing efforts by PIs within the research community remains strong and awareness of the advantages of real-time data transmission is growing. OOPC links with the CLIVAR basin panels and its Global Synthesis and Observations Panel (GSOP), focused on ocean reanalyses, are strong.

5. Looking forward in 2006

2006 is a year of great opportunity for the sustained global ocean observing system. Relationships between the research and sustained observations community are good and are strengthening; national implementation of the agreed plan has been called for by the UNFCCC, GEO, and the G8. This degree of high level endorsement of our community plans is unprecedented. Technology continues to improve and the 'observing system community' is exploiting opportunities to collaborate ever more effectively. The satellite community also is engaged - CEOS are working with GCOS to prepare a

CEOS implementation plan to respond to the GCOS IP. The IGOS-P Ocean Theme report also is under review and will be revised in 2006.

The JCOMM Observations Coordination Group is functioning well in its coordination role.

Resources are the primary constraint on implementation of the agreed initial global system. Under existing national institutional and budgetary frameworks, progress will depend in most nations very heavily upon successful advocacy by the research community for sustained (and enhanced) support in order to address science issues. It appears timely to consider how best this support can be organized, and the suggestions of the GSSC and consideration of the role of I-GOOS are welcome.

Another opportunity is posed by the 2006 GEO work plan request to GEO partner nations to:

CL-06-04: Identify lead international entities and national focal points for ocean observation efforts that can articulate national goals for their ocean observing sector and coordinate national activities with other designated national entities in order to evolve toward a truly global system of ocean observations.

How can GOOS respond to this? Does the GSSC have suggestions?

6. Suggestions for discussion by the GSSC

Given that the nations involved in making global ocean observations typically have not moved to establish new organizational structures to foster sustained ocean observations, there is in practice little difference between the research and the sustained ocean observing communities. This situation is different than the one envisioned by GOOS. The GSSC is invited to consider the implications of the existing situation and to consider whether a more explicit partnership with the global research programs might be appropriate.

Continuity, under the GCOS Satellite Operating Principles, for the critical ocean satellite missions in the agreed initial system generally has not been provided for in national and regional satellite agency plans. Operational satellites continue to have their requirements dominated by cost and numerical weather prediction needs. While there appears to be interest in some research satellite agencies to continue the needed missions, there does not appear to have been serious discussion of this option at the necessary governmental levels. Unless the needed ocean information is accepted as needed for usefully improved weather forecasts, the prospect of operational provision of the needed ocean satellite data seems remote.

There has been little progress making a 'business' case for the global ocean system and its products, except as a 'global public good'. Given the present high level interest in information about the global ocean, there appears to be a window of opportunity to be taken advantage of to advance acceptance of the system as a global public good. The GSSC is invited to take action to this end if it agrees. If it differs, the GSSC is urged to undertake actions to develop a business case for the global ocean system, as such a case is unlikely to be forthcoming from the ocean research community or the GODAE community.

The development of global ocean indices is not advancing as rapidly as wished. Outside of the realm of seasonal to interannual forecasts, for most questions of policy relevance, data are inadequate to provide for time series of sufficient duration to be useful for policy makers. Communication about the state of the ocean with the public and with policy makers appears to happen most frequently via press releases related to publication of refereed journal articles. This approach has tended to emphasize 'headline grabbing' but controversial results, and has not developed the appetite for context or for the continuing provision of oceanic information that is requisite for support of the global system. The GSSC is invited to consider the challenges of communicating about the state of the global ocean with the larger world.