
Objectives

• To discuss the need for deep ocean observations by autonomous devices, identifying what variables should be observed and with what sampling.

• To identify the challenges to be faced (e.g., calibration, stability, power consumption).

• To summarize the present state of the art (what exists, what is needed).

• To call out the need for further development.
The deep ocean is also changing

- broad scale abyssal warming detected since 1990
- freshening trends of bottom waters around Antarctica, strong water mass decadal variability in the GIN seas and North Atlantic
- significant contributions to both ocean heat content and sea level
Tracking the planetary energy imbalance?

How correlated are DECADAL trends in SST or ocean heat content with the global energy change? Hadley Centre Coupled Models:

SST is a poor proxy, Ocean Heat Content is an excellent proxy!

Palmer et al (2011)

OceanSITES “rapid response” to Deep Ocean Observing System

Many PI contributions in response to OceanSITES call (approx. 30)

Donations for matching pool, mainly in response to POGO action:
- SIO (3), WHOI (3), Geomar (3), AWI (3), SNU&KIOST (3), NOC (20), Sea-Bird Inc (5+);
- Still checking/discussing: Brazil, Jamstec, .... (others ?)

many THANKS to POGO
Several Deep Profiling floats have been developed

Japan: JAMSTEC and Tsurumi Seiki Co. Ltd. (TSK) had developed Deep NINJA (4000 m). Deep NINJA has been on sale since April 2013. Oxygen to be added. NINJA has successfully taken deep profiles under the sea ice off the Antarctica.

France: Deep Arvor (4000m) – 2 prototypes successfully tested. Future deployments planned.

USA: Deep APEX has made successful prototype deployments (by Teledyne Webb) to 4000 m (near Hawaii) and 6000 m (Puerto Rico Trench). University of Washington Argo plans to test and evaluate the Deep APEX.

USA: A Deep SOLO 6000 m prototype float (Scripps float group) was deployed off central California in Jan 2013, and completed over 100 cycles, mostly to 4000 m, before it was successfully recovered in October 2013.

AUVs
Advisory Teams

Co-chairs
- Eric Lindstrom
- Albert Fischer

Climate and Physical Observations
- Gregory C. Johnson
- Bernadette Siolyan
- Patrick Heimbach

Carbon, Biogeochemistry Observations
- Rik Wanninkhof
- Toste Tanhua

Biodiversity and Ecosystem Observations
- Myriam Sibuet
- Antje Boetius
- Lisa Levin

Consultative Draft Report: www.ioc-goos.org/doos
(Available January 2014)

Framework Report: www.oceanobs09.net/foo/

Email Contact: Andrea McCurdy
amccurdy@oceaneleadership.org

Objective:
Develop a statement of requirements and an initial strategy for sustained global deep ocean observations; considering all Essential Ocean Variables, regions, and technologies to extract high priority and feasible actions for the next 5-10 years.

Approach:
Framework for Ocean Observing experiment in integration across disciplines: physics/climate, carbon/biogeochemistry, biology/ecosystems

Goal: Enhance subset of existing platforms with a minimal set of identical physical, biogeochemical, ecosystem observations (air-sea flux, mixed-layer, 15m currents, pCO₂ and O₂, nitrate, phytoplankton biomass from shortwave absorption)

It is 95% done, how can we fund the remaining 5%? Donation/sponsorship (2Mio$) ?
Existing operators can request funding for "missing" sensors, or different PIs can get funding to add sensors to moorings of others (depends on agency, PI, etc).

This gives a lot of impact for each $ spent, since platforms and cruises already there, and a lot of synergy/leveraging is generated. This is a low-hanging fruit. One OceanSITES priority.
The OA community needs to add/share funding, operational effort/cost/ship time/people, sensors, data processing/management; in a few cases take ownership of complete moorings.

Yellow: collecting SOME OA parameters already
Orange: likely to happen in next years
Red: unlikely to happen without strong push from this community

Discussion

• Societal needs – communicating the need for observations
• Industry partnering – such as mining, oil and gas
• Need to integrate and synthesize across platforms
• Missing opportunities – other networks such as OBS, DART, telcom cables, IODP boreholes
• Rethink POGO capacity building – maybe we need the capacities to:
  – Work with industry
  – Beta test, pilot study, address tech challenges such as biofouling
  – Work across disciplines
  – Do synthetic, assimilative analyses
  – To break down disciplinary barriers (stove pipes)
  – To tap into funds addressing regulatory needs
Action items

• 1. POGO to translate the DOOS vision into a position paper and to address the economic imperatives and reasons. Aimed at industry and government (not the science community)

• 2. Can POGO organize a meeting with the main offshore O&G, deep sea mining companies and national agencies to discuss ocean observations – needs and opportunities. High level engagement is needed

• 3. POGO -16 should include a session on ‘lessons learned: successes and failures’ wrt engagement with industry. We can help each other in growing this engagement and industry is very diverse.

• 4. GOOS and POGO – we need better communication, particularly as the new GOOS panels are built up and their work plans get put in place, ensure POGO is informed and consulted with. First step is to ensure POGO secretariat solicits a GOOS report regularly to POGO from GOOS secretariat.