OceanSITES updates:
- General Overview
- Specific Thrusts, including Deep T/S
- Project Office Support
- Interoperability Workshops

Bob Weller
Woods Hole Oceanographic Institution

OceanSITES Overview

- International network of independent ocean time series
- Time series must be long-term, research-quality
- Part of Global Ocean Observing System (GOOS)
- Funding of sites by individual investigator(s)
- Project office at JCOMM under the (Observations Program Area)
- The growing network now consists of over 150 OceanSITES monitoring the global ocean
Value of OceanSITES (examples)

- Provides reference stations, “Keeling curves” of the ocean, takes the “pulse of the ocean”, in representative provinces and in hotspots (physical, biogeochemical, ecosystem)
- A coordinated network can close gaps in global system
- Single data system & format assures a wide range of users
- Single website will demonstrate products and value
- A network of sites which provides reference/background information to the community to plan focused research/field work/process studies around them
- Provides calibration information for the distributed networks and satellites
- Coordinates calibration methods and standards (see later for an example)
- International exchange of technical expertise and ideas
- Coordination of logistics – opportunities and risks (safe operations near existing sites)

OceanSITES: now part of the international observing framework and JCOMM, co-sponsored by POGO

- Over 100 sustained sites (200 platforms) and fully established data system
- Approx. 1/3 of platforms measure biogeochem data
- With work-in-progress, 60-70 platforms will be delivering data, but mainly physical so far
- Project office re-started after 1-1/2 year vacuum, Kelly Stroker, 30% plus IT support
- Re-invigorated and active teams: Data Management Team (new chairing committee, monthly WebEx calls), Steering Committee (numerous active new participants), Executive Committee (2-monthly WebEx calls), joint meeting approx. every year
OceanSITES JCOMM/DBCP

OceanSITES Structure

• Organizational structure:
  – Executive Committee
  – Science Team
  – Data Management Team
• Data flow structure (cf. Argo):
  – Principal Investigator (PI)
  – Data Assembly Center (DAC)
  – 2 Global Data Assembly Centers (GDACs: NDBC/Ifremer)
OceanSITES Status

Green circles – real-time data
Blue squares – delayed mode data
Green line – transit sites

Real-Time Data

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Maturation and Evolution of OceanSITES

- Project has gone beyond point where “more is better”, now close the gaps (disciplinary, geographic, vertical coverage)
- Build on existing datasets/infrastructure (preserve investment) but also start new time series in key regions to collect long-term records for the first time (Keeling curves)
- Decision to tighten requirements and focus on unique contribution
  - Provide high temporal resolution (diurnal cycle) to directly observe processes/interactions and events (the “pulse”)
  - Provide the long climate timescale with high accuracy to recognize slow global change (don’t even know whether productivity is increasing or decreasing...)
  - Global scales, i.e. open ocean, not coastal sites
  - Sites which do not yet satisfy all requirements are expected to work towards them
  - Contribute to requirements being defined by other groups, e.g. biodiversity framework
- Now working towards making existing platforms (moorings) available for additional sensors from other OceanSITES members (including tsunami moorings)
- Adapt core network/backbone plan (see next slide) to new OceanObs09 framework needs
- Demonstrate ability to quickly respond to emerging needs (see deep observing plan)
- New website which will explain mission statement, value and requirements, show products and iconic results, give network and data system status/metrics

Recent meeting at Scripps Institution: outcomes

- Both Steering Committee and Data Management Team met, over 40 participants from 14 countries and 2 agencies (NOAA, NASA) (POGO supported one participant)
- Many teams/institutions represented for the first time, increased participation and many commitments to add to data flow/holdings, e.g.
  - All Australian IMOS sites (SOTS, EAC, Indonesian Throughflow)
  - All AWI/Bremerhaven sustained time series (Hausgarten, Fram Strait, Weddell Sea)
  - Lamont (A. Gordon) Indonesian Throughflow and Weddell Sea sites
  - All Indian subsurface time series outside EEZ (equatorial, Bay of Bengal)
  - Brazilian PIRATA data (existing and new sites)
  - Korean sustained time series (e.g. EC1)
  - Extensive new French time series in the western Med (MOOSE)
- Will increase non-physical data holdings (looking forward to work more with JAMSTEC)
- OceanSITES is well positioned to contribute to challenges and new framework resulting from OceanObs09: a merged and more complete physical, biogeochemical and ecosystem observing system
- Will quantify “scale of representativeness” especially for ecosystem variables
- New initiatives to focus on products of societal relevance, and to define the required time series observing system by discipline (how many sites needed where for air-sea fluxes, for carbon, for circulation, for ecosystem, etc). This will lead to metrics.
OceanSITES Achievements

- Data format well-defined
- Site nomenclature with unique identifiers
- Sophisticated data format description
- Strong emphasis on metadata

- Data distribution system fully operational
  - GDACs synchronized since late 2010 / early 2011
  - > 1500 files online at GDACs

OceanSITES Data Example I

OceanSITES Top Level Directory (e.g. ftp://data.ndbc.noaa.gov/data/oceansites)

oceansites_index.txt
DATA Directory:

Platform Directory:
LINE-W
MBARI
NTAS
Stratus
T0N140W
TR0N156E
WHOTS

File Naming Convention 1.2:
OS_PlatformCode_DeploymentCode_DataMode_Opt
ionalParam.wcs, e.g.:
OS_T0N140W_DM011A_R_AIRT.wcs
OS_T0N140W_DM011A_R_TEMP.wcs
OS_T0N140W_DM011A_R_PSTN.wcs
OS_T0N140W_DM011A_R_OCUR.wcs
OS_T0N140W_DM011A_R_FLUX.wcs
OS_T0N140W_DM011A_R_WIND.wcs

OceanSITES have designated site codes and platform codes for each of DACs and deployment codes are determined by corresponding DACs.
OceanSITES Data Example II

All NetCDF data files follow CF 1.x standards and OceanSITES User Manual 1.2 requirements at http://www.oceansites.org. The following are some of global attributes from OceanSITES NetCDF data files. Parameter variables have standard names, units, valid_min/valid_max, accuracy, sensor names and serial numbers, cell methods, ancillary variables etc.

```
data_type: OceanSITES time-series data
format_version: 1.3
platform_code: T0N140W
site_code: T0N140W
data_update: 2010-11-09T12:10:02Z
wmo_platform_code: S1350Q
source: Mooring Observation
history: Where original data came from
data_mode: R
Conventions: CF 1.5, OceanSITES 1.3
title: TAO Refresh Mooring Data
summary: Real-time transmitted data
unique_file_id: unique file identification
update_interval: D

area: North Atlantic Ocean
geospatial_lat_min: 0.0
geospatial_lat_max: 0.0
geospatial_lon_min: -140.0
geospatial_lon_max: -140.0
geospatial_vertical_min: -4.0
geospatial_vertical_max: 500.0
time_coverage_start: 2010-04-11T02:22:00Z
time_coverage_end: 2010-11-05T00:04:02Z
institution_references: http://www.ndbc.noaa.gov
data_assembly_center: NDBC
contact: Bill.Burnett@noaa.gov
pi_name: Bill Burnett
distribution_statement: Follows CLIVAR ...
citation: These data were collected and made Freely available by the OceanSITES project and The national programs that contribute to it.
```

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**Deep Ocean Observing Challenge**

- OceanObs09: critical gap in global ocean observations exists below 2000m
  → new framework under development for a Deep Ocean Observing Strategy (e.g. Paris workshop, 2011)
- OceanSITES can make “instant” contribution, since 100 sites exist already with deep-reaching platforms
- Approximately 50 sites already carry deep T/S sensors, but uneven geographic coverage
- **GOAL:** try to add deep T/S observations at 50 more sites, within the next deployment cycle.
- Challenged PIs/operators to add 1 deep microcat* (US$5000) to existing moorings, and get 1 matched microcat for free from a pool of donated microcats.
- Got 12 instant pledges at the meeting, plus another 11 after the meeting.
- Need to build pool of 50 donated microcats for matching, SIO director started with 3.

* or equivalent other high-accuracy and high-stability sensor

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**OceanSITES “rapid response” to Deep Ocean Observing gap**

**The Challenge**

We want to deploy another 50 within a year, which requires 50 sensors for the initial deployments and another 50 for swapping out and calibrations. OceanSITES PIs are pledging to add such sensors to their existing moorings, in addition we are also seeking to fill a pool of 50 matching sensor for the swap-outs via donations from institutions, agencies, companies - the right bar shows that status of that matching pool.
OceanSITES “rapid response” to Deep Ocean Observing gap

(status resulting from OceanSITES meeting in Dec’11)

- New/Pledged Deep Microcats (23)
- Existing Deep Microcats (79)

(NOAA PMEL and NOAA NDBC unable to add microcats this year)

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Deep Ocean Observing Strategy

The approximate cost for each high-accuracy T/S instrument with an incorporated pressure sensor is US$5000. OceanSITES will coordinate the pool of sensors, e.g., by agreeing on locations where the sensors will be used, and by rotating sensors between sites and PI groups for intercalibrations. OceanSITES will also establish guidelines and best practices for calibration procedures. Sea-Bird Inc is contributing free calibrations and will work with OceanSITES on sensor performance, stability, and improved technologies for this deep observing challenge.

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POGO and Seabird

Matching Contributions

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<th>Institution</th>
<th>Country</th>
<th>Donor</th>
<th>Matching</th>
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<tr>
<td>AWI</td>
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<td>U. Schauer</td>
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<tr>
<td>Gap to Goal</td>
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</tbody>
</table>

Seabird – calibration support
Seabird – technical support

OceanSITES will facilitate deep T/S implementation

OceanSITES will

- coordinate the pool of matched and pledged microcats, and choose highest-impact locations
- organize bulk purchase for 100 units with volume discount
- define uniform calibration procedures to assure climate-quality data
- assist with/train for calibration procedures
- coordinate rotation of instruments among users to compare calibrations
- work towards sponsoring for occasional factory calibrations

- Excellent example of capabilities and value of OceanSITES.
- A very small one-time addition by members and sponsors can make a huge highly-visible impact.
- No transfer of funds, just buy some sensors.
Core/backbone network of identical multi-disciplinary sites (MOIN)

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.

Global Backbone Network

Minimum set of sensors to have global impact for all disciplines:
1. met sensors
2. Surface T/S and thermistors for mixed-layer depth resolution
3. 0-1500m T/S sensors for dynamic height → transport estimates
4. Near-surface currents, minimum one at 15m
5. Surface pCO₂ for flux calculations
6. Dissolved O₂ at 5 depths for productivity and gas exchange estimates (with PCO₂)
7. Nitrate at 2 depths for mechanisms of forcing/limitation
8. Downwelling radiometer at 20-30m and at surface for total biomass estimates

Choose 10-20 sites that can be enhanced by adding some/all above sensors.

Typical cost: 200k$ per site...
need about 2Mio$ to make (initial) quantum leap
Potential Ocean Acidification observing system, building on OceanSITES

Interaction with global Ocean Acidification community

- Endorsed OceanSITES deep-water reference stations network (~30 OA sites — roughly 13 already have OA sensors, another 5 are expected, another 12 are recommended for global and regime coverage)
- Existing gaps: high latitudes, Labrador Sea, BATS, South Pacific gyre (e.g. near New Caledonia), need to keep Japanese site at 60S operational
- High vulnerability areas with insufficient coverage:
  - Arctic (esp. under or through ice), Southern Ocean, Coral Triangle, off Peru
  - Try to collaborate with international Antarctic vessels to operate a Pacific Southern Ocean site

Requires buy-in and participation/funding/sharing from the OA community
Project Office Funding

Project office critical for OceanSITES activities. Kelly Stroker is already doing great work, but only 30%.

Need at least 60k$/yr
- currently annually $30K from NOAA, $5K from Australia BOM, 5KEu from Ifremer
- POGO contribution of $5K, with funds for 2011 and 2012 coming in in 2012 ($10K)
- one-time SIO matching of 5K if someone follows,
- one-time from WHOI $5K
- Australia IMOS $5K

Affirmation of the need/Generation of pull

- Recent WCRP and GSOP workshop at WHOI looking at air-sea fluxes and ocean reanalyses
- In contrast to atmosphere, in the ocean there is a greater dependence on models, due in large part to lack of data
- Ocean models need accurate surface forcing; coupled models or coupled model/data syntheses techniques should have their derived fluxes validated
- Pressing need for community to access high quality, air-sea flux time series. OceanSITES will work to serve at its GDACS the air-sea fluxes from the surface mooring time series.
- Use the website to highlight relevant results and findings
Comments on Capacity Building for Sustained Ocean Observations

Bob Weller, OceanSITES
Sid Thurston, NOAA CPO

POGO 12

• Action Items
  – International Cooperation:
  – 3. Ocean observatories: organize an international workshop of system engineers involved in ocean observatories to promote interoperability. Action: Bob Weller, Kiyoshi Suyehiro and Secretariat (see notes).
POGO 12

• it is recognized that substantial benefit could result from increased co-ordination and co-operation between and amongst the lead system engineers and technical teams that are responsible for these operations. The long-term goal of such co-ordination should be the design of systems that share common components and

• data protocols that enable degrees of interoperability, .... more effective international co-operation in the maintenance and operation of the deployed systems.

• As a first step ..., POGO undertakes to initiate an annual program of focused workshops ... bring together the lead system engineers.... Each workshop will have a well-defined theme and a rigorous agenda that is directed towards maximizing the tangible and practical outcomes.

• A small ad hoc group ... to develop a plan for the inaugural workshop .... planning should proceed in conjunction with relevant JCOMM Ops action groups. The plan will be reviewed and approved by the POGO Executive Committee, with the goal of scheduling the first workshop for Fall 2011, a report from which will be provided to the 2012 annual meeting.

Rethinking

• Considering this task, and noting
  – US-EU efforts (Coopeus)
  – OceanSITES efforts
  – JCOMM DBCP efforts
  – MTS/IEEE/GEO Oceans Community of Practice
  – Potential new GEO efforts

• Let’s discuss having POGO organize a new set of workshops
Proposal
Submitted to the EC
On Nov 22, 2011
Christoph Waldmann
Bremen University, MARUM

Project Precincts
Partnership

1 Bremen University/Marum  Germany
2 Istituto Nazionale di geofisica e Vulcanologia  Italy
3 EISCAT Scientific Association  Sweden
4 Laboratoire des Sciences du Climat et de L´Environnement  France
5 CSIC Spanish Council for Scientific Research  Spain
6 Royal Netherlands Meterological Institut  The Netherlands
7 Finnish Meteorological Institute  Finland
8 University of Tuscia  Italy
9 University of Washington  USA
10 Woods Hole Oceanographic Institution  USA
11 Irish Marine Institute  Ireland
12 Scripps Institution of Oceanography  USA
13 National Ecological Observatory Network  USA
14 Incorporated Research Institutions for Seismology  USA
15 UNAVCO  USA

C. Waldmann

Objectives

Act as a pivotal element for the US-EC cooperation in the field of environmental research infrastructures

- Central information hub (Projects, Workshops, relevant calls)
- Facilitate data harmonisation, curation, and interoperability
- Design a new generation of interconnected infrastructures and determine working principles to provide a sustainable platform for data, information, and knowledge sharing
- Articulate overall goals for 10 year EU-US collaboration on environmental infrastructures and e-infrastructures

C. Waldmann
Conceptual ideas for the cooperation project

• Building on pioneering efforts like e-infrastructures such as AMISR MADRIGAL, PANGAEA, OOI CI etc…

• Promote shared use of infrastructures

• Identifying needs for “interworkability”

OceanSITES and capacity building

• Initiatives such as the common backbone and Ocean Acidification are accepted by OceanSITES member with the condition that there be mentoring of the use of ‘new’ instruments

• OceanSITES, with JCOMM staff support, will move toward documentation and sharing of best practices

• OceanSITES forward trajectory is linked to growing capacity, capacity building, and, in effect, greater interoperability
JCOMM Data Buoy Cooperation Panel (DBCP)

- The objectives of the DBCP are to:
  - Review and analyze requirements for buoy data
  - Coordinate and facilitate deployment programmes to meet network requirements
  - Support information exchange and technology development
  - Improve quantity and quality of buoy data distributed on the Global Telecommunication System (GTS)
  - Initiate and support action groups and
  - Liaise with relevant international/national bodies and programmes.
**JCOMM DBCP Capacity Building**

- Bringing observing practitioners together with industry and instrumentation experts

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**Regional Workshop on Best Practices for Instruments and Methods of Ocean Observation**

19-21 November 2012, Chennai, India

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**JCOMM DBCP Capacity Building**

Third In-Region Capacity Building Workshop of the Data Buoy Cooperation Panel for countries of the Western Indian Ocean 16 - 20 April 2012, Mombasa, Kenya (WIO-3)

- 1 Review Workshop Agenda, Objectives and Regional Deployment Goals for 2012
- 2 Session 1: Lead Presentations by Kenyan Institutions on the Use of Climate, Weather and Oceanographic Data and Knowledge In—Country
- 3 Session 2: Regional Context & Review from the 2nd DBCP Workshop in Mauritius (Including Country Requirement Updates)
- 4 National Reports
- 5 Session 3: Delivering the Data to the End—User and Enhancing Regional and National Capacity to Deliver Results from Ocean Observations
- 6 Session 4: Improving and Sustaining Coordination and Cooperation for Regional Ocean Observations, Forecasting and Associated Governance Decision-making
- 7 Session 5: Formulation and Promotion of a Long-term Scientific Work Programme and Associated Capacity-building and Training (CB&T) Road-map as part of the DBCP and WIO Sustainable Ecosystem Alliance
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A JCOMM PANGEA Workshop
www.jcomm.info/pangea-concept
www.jcomm.info/wio-dbcp
www.jcomm.info/wio-dbcp2
www.jcomm.info/wio-dbcp3

From WIO-3

Physical Oceanographic Instrumentation:
The benefits of using the simplest of methods to build extremely useful long-term monitoring networks

Tammy Morris
Bayworld Centre for Research and Education, Cape Town, South Africa

DBCP WIO-4 scheduled fro Tanzania 29 April – May 3 2013
JCOMM DBCP Capacity Building  
DBCP-CB-Asia1  
In-Region Capacity Building Workshop for Asian countries  
19 - 21 November 2012, Chennai, India

- Regional Workshop on Best Practices for Instruments and Methods of Ocean Observation
- Build Capacity for Asian developing countries
- Designed for Scientists, Researchers, engineers and managers of Asian Countries
- Receive information on current Best Practices regarding calibration and testing instruments for ocean observation systems.

The 1st Data Buoy Cooperation Panel (DBCP) Capacity Building for the North Pacific Ocean and Its Marginal Seas (NPOMS)
The 2nd Data Buoy Cooperation Panel (DBCP) Capacity Building for the North Pacific Ocean and Its Marginal Seas (NPOMS-2)

Applying Ocean Observations to Improve Typhoon Forecasts

The Second Workshop of DBCP Capacity Building for the North Pacific Ocean and Its Marginal Seas (NPOMS-2) with a Focus on Typhoon

The 2nd JCOMM Regional Marine Instrumentation Workshop will be held in Tianjin China 22-25 July to "piggyback" our NPOMS-2 Typhoon workshop 15-19 July in Hangzhou. Local colleagues say the Hangzhou-Tianjin commute facilitates participation in both workshops if desired.

Advocated by and under discussion at JCOMM

• From Sid Thurston and his discussion with Johan Stander, JCOMM Co-President: “As Dr. Weidong Yu suggested we will also explore possible follow-up in-depth training and longer Scholarship (for up to 3-months) visits to advanced ocean/met Institutes for several of the selected Trainees. This opportunity was kindly offered to two Trainees last year by China's First Institute of Oceanography (FIO) in Qingdao as follow-up to WIO-3 in Mombasa. I welcome your thoughts and comments on this nice idea.”
Oceans Community of Practice

MTS/IEEE/GEO – promoting the idea of an Ocean Community of Practice (J. Pearlman, A. Fischer, R. Houtman)

2012 EGU – “GEO Ocean Community of Practice – addressing the future of ocean observations”

1. Facilitate international implementation and coordination of ... observatories and observing programs and partnerships...

2. Support implementation of GEOSS principles to improve stability ... enables continuity and sustainability... open exchange of data

3. Stimulate capacity building ....

4. Report on progress and give advice to GEO ....

5. Disseminate this information to relevant communities concerned with and reliant upon global observing systems...

Discussion

Instead of organizing workshops per POGO 12, might not POGO help develop a fabric that brings together activities?

Is there a path to integrate the Center of Excellence training and POGO/SCOR fellowships into this fabric?

The fabric is built from POGO, OceanSITES and the POGO support of OceanSITES and other sustained observing efforts, DBCP, Coopeus, growing international collaborations (e.g., India-US), GEO Blue Planet .......
Discussion

COOPEUS – EU/US initial emphases on data interoperability, ocean kick off March at NOC

OceanSITES – need for practical coordination apparent/works with/under DBCP

DBCP – international capacity building workshops, desire to follow workshops up with fellowship support, broad international reach

POGO – SCOR Fellowships, Center of Excellence training, capacity building

GEO – community of practice, information exchange and flow

Discussion

Could POGO

• Follow the COOPEUS-EU effort to look at broader interoperability and data sharing, going forward from OceanSITES data management successes

• Coordinate with DBCP on workshops and fellowships that keep the workshop investments vital

• Insert into the mix greater cross-linking of practices, procedures from key POGO institutions and allow POGO system and lead engineers to participate in DBCP workshops

• Coordinate the path forward, include the GEO umbrella
Guiding Principles

- Capacity building
- Growing the homogeneity and interoperability of ocean observing
- Open documentation of best practices and procedures
- Interweaving the practices and practitioners of ongoing sustained efforts with capacity building and training
- Advocacy for the global ocean observing system as essential element of the forward path