# International Time Series Science Team Meeting

# San Juan, Puerto Rico, 6-9 Jan 2004

**Meeting Report**
**U. Send, R. Weller**
**May 27, 2004**

*The International Time Series Science Team*
*is organized under the*
*Ocean Observations Panel for Climate (OOPC)*
*and the*
*CLIVAR Ocean Observations Panel (COOP)*
*and enjoys the support of the*
*Partnership for Observation of Global Oceans (POGO)*

*The International Time Series Science*
*maintains the website*
*http://www.oceansites.org/OceanSITES/index.html*

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## Introduction

This was the fourth meeting of the International Time Series Science Team, with the time and location chosen to follow directly after the ORION (Ocean Research Interactive Observatories Network) workshop. The Science Team had met three times before, most recently in Hawaii after the Ocean Sciences Meeting in February 2002. Its membership is chosen to be multinational and multidisciplinary, including geological, biological, chemical, and physical scientists whose interests extend from the ocean bottom to the air-sea interface. The Science Team has developed the rationale and initial plans for time series as an element of the integrated global ocean observing system and is working on strategic plans to implement this element. More information is available at the website http://www.oceansites.org/OceanSITES/index.html.

This rationale is summarized here: The science community, policy makers, and society need an observing system for the global climate and ecosystem in order to detect changes, to describe/quantify them, to understand/explain them and to develop a capability to predict them. The overall ocean observing system should provide a 4-D description of the oceanic variables of climatic and societal relevance (global). Fixed-point time series are an essential element of the required observing system, because: 1) moorings are uniquely suited for fully sampling 2 of the 4 dimensions (depth and time), thus complementing other components of the observing system (satellites, floats, drifters, ships). 2) They resolve a wide range of temporal variability and sample the water column from the surface to the bottom. 3) Fixed-point stations are the only approach for resolving multi-disciplinary variability and processes, including CO2 uptake, biological productivity, atmospheric fluxes and oceanic response to them, ocean bottom processes (biological, geophysical). And 4) moorings are uniquely suited for sampling critical or adverse regions and periods (passages and boundary currents, under the ice, in abyssal layers, during storm seasons) and events like blooms, convection, and earthquakes.

The definition of an ocean time series site in the global system is that it has the following characteristics:

- in-situ observations of ocean/climate related quantities at a fixed geographic location/region
- sustained and continuous, contributing to a long-term record at the site.

Autonomous moored sampling should be pursued to resolve high- frequency variability, to achieve high vertical resolution, and to obtain coincident multi- disciplinary sampling. As an alternate to a mooring, shipboard observations from regular occupation of a site as at Ocean Weather Stations, historical sites or sites where moorings have not been established provide an alternate method

Site selection is determined by the value of the site as representative of one, and where possible more, of the key meteorological, physical, chemical or other disciplinary geographic locales or specific areas of high interest.

**Attendance**

R.Weller, U.Send, S.Pouliquen, H.Ridderinkhof, J.Orcutt, P.Worcester, R.Lukas, V.Murty, R.Lampitt, F.Chavez, T.Knap, T.Dickey, Y.Kuroda

**Acronym for the Ocean Time Series Effort**

Originally, the group had used the acronym, GEO, for Global Eulerian Observatories. However, GEO is now in use as the acronym for Global Earth Observations and it was decided to adopt a new algorithm. The acronym **OceanSITES** was adopted unanimously, with the meaning "OCEAN Sustained Interdisciplinary Time series Environment observation System". R.Lukas obtained the website name http://www.oceansites.org.

**Report from POGO-5 in Yokohama, Japan November 18, 2003 (T. Dickey)**

Tommy Dickey addressed the attendees of the POGO-5 meeting held at JAMSTEC in Yokohama, Japan November 18, 2003 on behalf of the GEO (OceanSITES) Science Team. The purpose of the presentation was to provide an update on OceanSITES (formerly GEO) activities and to request advocacy and support of OceanSITES.

As background, the Partnership for Observation of the Global Ocean (POGO) was established in 1991. Major POGO goals are 1) to promote long-term cooperation in understanding the oceans and 2) to implement comprehensive systems for observing oceans on the global scale. POGO membership includes 26 international ocean institutions from ~20 countries and 12 participating organizations including the Ocean Observations Panel for Climate (OOPC). The present executive committee is composed of Howard Roe (Chair, SOC), Tukaya Hirano (JAMSTEC), Jan de Leeuw (NIOZ), Charles Kennel (SIO), and Tony Haymet (CSIRO). The POGO website is http://ocean-partners.org. Observing system elements of interest for POGO include moorings (i.e., OceanSITES, formerly GEO), profiling floats (i.e., Argo), and satellites (includes Argo, OceanSITES, satellites, …).

The first formal presentation of POGO-5 in Yokohama was given by Ed Harrison (PMEL), who is the chair of OOPC. Ed discussed several observing issues and provided overall context for the OceanSITES presentation. Tommy Dickey (UCSB) followed Ed with the OceanSITES presentation. Tommy provided an introduction to OceanSITES indicating that there is broad representation among the 20 committee members in terms of scientific disciplines, expertise by ocean regions, and national representation. He outlined the progression of OceanSITES including a listing of

meetings that have been held in Woods Hole (2001), Honolulu (2002), and Villefranche (2003) with the latest meeting to be held in Puerto Rico (January 2004) in conjunction with the ORION Workshop. The overall goal of OceanSITES was presented as the establishment of a global network of time series observatories to monitor, understand, and predict changes in multi-disciplinary oceanographic variables on time scales from hours to decades. OceanSITES was portrayed as the continuity module of GOOS.

Dickey explained that OceanSITES builds on the legacy of Ocean Weather Stations (OWS's) and is capitalizing on new technologies including those related to ocean sampling via platforms and sensors enabling autonomous, interdisciplinary time series observations globally. He stated that several time series programs are already underway as indicated in the OceanSITES (GEO) White Paper that was made available at the meeting. Examples of program sites mentioned in the presentation included Bermuda (BATS/BTM), Hawaii (HOT), several in eastern North Atlantic (EU), PIRATA trop. Atlantic, EqPac (TAO/TRITON), western North Pacific (JAMSTEC), eastern North Pacific ( CalCOFI; Papa), HiLaTS off Japan (Mutsu), CARIACO off Venezuela, CATS/Caribbean, off New Zealand, several in Mediterranean, Monterey Bay, LEO-15, several coastal sites, …).

The drivers for OceanSITES were explained to include topics such as: air-sea interaction and mixed layer dynamics, rapid, episodic, and extreme events, ecosystem dynamics, health of the ocean, transport and current variability, ENSO/PDO/NAO and global teleconnections in general, water mass formation and changes, deep convection and salinity anomalies, variability of properties of ocean interior, carbon cycling and biogeochemistry, global change including climate and feedbacks, and geophysics including plate dynamics and seismology. Several examples of compelling data sets relevant to a variety of ocean problems were presented with explanation of the uniqueness and requirements for long-term, high frequency interdisciplinary data that can only be provided using Eulerian observations advocated by Ocean SITES.

Other OceanSITES-relevant presentations given at POGO-5 in Yokohama were given by Ed Harrison (OOPC), Shubha Sathyendranath (OOPC, IOCCG), Maria Hood (Carbon Programs), Bruce Howe (NEPTUNE), John Gould (Argo), Nick Owens (CPR, AMT), and Rick Spinrad and Stan Wilson (Group on Earth Observations).

As a call to action, it was suggested that POGO can be instrumental in making GEO a reality via promotion, coordination, and implementation. POGO can play key roles in 1) advocacy with governmental and intergovernmental organizations and 2) long-term support for: a) moorings, ships, autonomous platforms, and sensors b) sites in remote regions (i.e., Southern Ocean), and c) data archiving and management activities.

A summary of the presentation emphasized that some time series programs are already in place, providing good starting points for OceanSITES and that OceanSITES time series observations will complement other elements of the global observing system (satellites, floats, VOS, sea level, coastal buoy networks), thus filling a gap in the time domain that no other system can provide. In addition, OceanSITES were promoted for

providing many value-added aspects (e.g., for science programs like SOLAS, CLIVAR, IMBER, ... ).

It was indicated that there is also a convergence of planning through several varied planning activities: GOOS (OOPC/COOP/GEO), CLIVAR, International Carbon programs, U.S. NSF OOI/ORION, Indian Ocean initiatives, and others. Many synergies were made evident. Finally, it was concluded that OceanSITES is timely and the next logical element of global ocean observing system.

Some of the reactions and outcomes of the OceanSITES presentation include:
1) From the POGO-5 press release: "Another type of observation envisaged is a network of observatories situated at critical points around the world oceans, which measure a comprehensive suite of physical, chemical, biological, and geological properties of the water at the bottom of the water column and within the entire water column.
2) From the POGO-5 Yokohama Declaration: "The primary objective of the next decade should be the completion and sustained operation of a global observing system creating improved ocean products and forecasts that address societal needs. Other key statements from the Declaration include: a) "Multi-disciplinary observations from a global array of time-series stations to provide base-line data to evaluate long-term changes," b) "Development and deployment of chemical and biological sensors and novel platforms for evaluation of biological diversity, chemical cycles and global change," and c) "Greater effort in critical under-sampled areas, …, to achieve the coverage necessary to quantify the global carbon, freshwater, and heat budgets." The net effect of the OceanSITES presentation to the Yokohama POGO-5 conference was quite positive and should be useful in maintaining OceanSITES as a priority activity well into the future.

R.Lampitt noted that there appear to be intentions to provide a roving ambassador from POGO for timeseries. He will check with H.Roe to find out more about this.

**Relation to OOI/ORION**

The relation with and differences from the OOI (Ocean Observatories Initiative, an ocean observatory infrastructure proposal by the U.S. National Science Foundation) were discussed. Items that were voiced included:

- We are trying to pull things together, to continue and integrate those sites that exist already, and expand the network; but remind OOI to include existing sites in planning
- We can provide advice to the OOI and take our results to the OOI planning meetings and workshops
- We can be the vehicle (and reminder) for the international cooperation and coordination, including the opportunities
- We can benefit from the hardware capabilities that could result from the OOI to make things possible which are not possible now
- OOI is only hardware, not funding for sustained operation
- We are trying to harmonize international efforts

- Our sites are only longterm, at least as intended and we map well onto the GEO/Earth Observation Summit. OOI allows both relocatable and sustained sites. We have to try to advocate sustained sites in the OOI as our focus.
- But we do "allow" shorter intensive/process studies associated with/anchored around our long-term sites
- We represent a portion of the international framework
- NSF is worried about getting too much involved with International programs that have too much beaureaucracy
- Make clear that scientific insight/progress will come out of sustained measurements
- We should make clear to the NSF OOI the science value of our sites
- We are planning (we are "responsible" for) the global sustained array
- An ORION relocatable array could be regionally more intensive to fill in the gaps in the sparse spatial sampling of our array, one region at a time
- Our mission is the long-term, sustained array, but in order to define the best locations and sampling one might want to be more intensive initially for a limited period
- NSF wants the data from any time series array they fund to be public and internationally available

ORION will have a Steering Committee for which nominations are sought. It was decided that we will nominate R.Weller, T.Dickey, D.Luther.

**LOCO (NIOZ) presentation: Long-term Ocean Climate Observations**

There was a presentation by H. Ridderinkhof about observations of Irminger Sea Water Mass Formation, Mozambique Channel for inter-ocean exchange, Indonesian Throughflow as part of INSTANT. The following summary is copied and adapted from a report submitted after the meeting by H. Ridderinkhof on behalf of himself and H. M. van Aken, J. J. M. van Haren, and L. R. M. Maas at the Royal Netherlands Institute for Sea Research (NIOZ), W. P. M. de Rujiter and P.J. van Leeuwen at the Institute for Marine and Atmospheric Resesearch Utrecht (IMAU),and G. Burgers, S.S. Drijfhout, and W. Hazeleger at the Royal Netherlands Meteorological Institute (KNMI).

A consortium of physical oceanographers from different institutes in the Netherlands recently started a program to obtain long-term (5 years) observations on some aspects of the temporal variability in the global overturning ocean circulation. At some critical locations measurements on inter-seasonal and inter-annual variability in ocean currents, convection and internal waves are carried out using sub-surface moorings. The program is embedded in the WCRP - CLIVAR programme and is funded by the Netherlands Organisation for Scientific Research (NWO).

In 2003-2004 long-term sub-surface moorings have been deployed in three areas: the Irminger Sea (convection and deep water formation), the Mozambique Channel (tropical-subtropical connection and control of inter-ocean exchange) and east Indonesia (part of the INSTANT program on the Indonesian Trough-flow). The observations from these moored systems will be used also to study spatial and temporal variability in the internal wave field. Additionally an array of 'internal wave moorings' is deployed for periods of 1-1.5 years at different locations in the North Atlantic ocean to study variability in internal wave climatology.

Moored observations in the Mozambique Channel
PI's: Herman Ridderinkhof and Will de Ruijter

A pilot-project with an array of current meter moorings in 2000-2001 showed that the meridional mass transport through the Mozambique Channel fluctuates remarkably regularly with values between 20 Sv northwards and 60 Sv southwards. The mean value for this one year of observations is some 15 Sv southwards. The spatial structure of the current field suggests that during the periods with a strong southward flow a current jet seperates from the African coast and forms a large anti-cyclonic eddy. These eddies migrate southward, interact with the Agulhas current and seem to initialize the meandering of the Agulhas current, thereby influence the formation of Agulhas rings. Thus the flow in Mozambique Channel is of importance not only for the tropical-subtropical transport in the Indian Ocean but also for the Indian-Atlantic ocean exchange.

At intermediate and deep levels against the African continental slope a northward flowing Mozambique Undercurrent was observed with a mean northward speed of 4.6 $cms^{-1}$ (1500 m) and 4.5 $cms^{-1}$ (2500 m). Hydrographic observations showed that the deepest flow consists of North Atlantic Deep Water.

As part of the LOCO program a new array of moorings, with much more current meters, ADCP's and T-S sensors, was deployed at the narrowest section in the Mozambique Channel in November 2003. These sub-surface moorings will be serviced each 1.5 years and the observations will continue till 2008. The observations will be used mainly to quantify the variability of the meridional mass and heat transport, to relate this variability to Indian Ocean (or El Nino) climate modes and to study the relation between this variability and the 'downstream' formation of Agulhas Rings.

Moored observations in Lifamatola Strait as part of the INSTANT program
PI: Hendrik van Aken

Through the Indonesian seas exchange of water takes place between the Tropical Pacific Ocean and the Indian Ocean. In the upper 800 m the main path of this inter-ocean exchange is situated in Makassar Strait between the Islands of Sulawesi and Kalimantan. In the Lifamatola Passage east of Sulawesi deep Pacific water enters the Indonesian seas over a sill of about 2000 m depth. The Indonesian Through-Flow (ITF) Water leaves the Indonesian seas towards the Indian Ocean through passages between the islands of the Sunda Island Arc of the Banda Sea.
Model experiments have shown that the ITF has a strong influence on the hydrography and climate of Indonesia and the tropical Indian Ocean. It probably contributes the global overturning or thermohaline circulation. However, long term measurements of the Indonesian through-flow are scarce and hardly cover a single year. They mainly concern the inflow through Makassar Strait. Scientists from 5 countries (Indonesia, U.S., Australia, the Netherlands and France) have initiated the INSTANT research program to monitor simultaneously the inflow in the Makassar strait and Lifamatola Passage and the outflow through Lombok Strait, Ombai Strait and the Timor Passage. In December 2003 and January 2004 instrumented moorings were deployed in these passages.

Moored profiling observations in the Irminger Sea

PI: Hendrik van Aken

From the Gulfstream system warm and saline water enters the sub-arctic North Atlantic Ocean. There its properties change due to air-sea interaction. In the cyclonic gyre of the North Atlantic Ocean Sub-Arctic Mode Water (SAMW) is progressively formed by convective mixing in successive winter. One of the last stages of SAMW is found in the centre of the cyclonic sub-gyre in Irminger Sea. Evidence is growing that in this ocean region occasionally deep convection occurs which homogenizes the water column to a depth of nearly 2000 m. The heat, released to the atmosphere during the transformation of Gulfstream water to the much cooler SAMW is an important factor for the North Atlantic climate.

Annual hydrographic surveys during the WOCE and CLIVAR programmes as well as satellite altimetry have shown that the inter-annual and seasonal variability of the hydrography in the Irminger Sea are of the same order of magnitude. Eddy variability is definitely smaller. How these different types of variability interact, and how convective mixing in winter depends on this variability is not well known. Therefore Royal NIOZ has started a monitoring programme with moored sensors in the summer of 2003. At three positions in the Irminger Sea near the annual WOCE-CLIVAR section (eastern boundary, centre, and western boundary) moorings fitted with a profiling CTD and ADCPs will monitor the varying hydrographic structure from 2003 until at least 2008. Together with two profiling moorings from Woods Hole and a European ANIMATE mooring the LOCO moorings contribute to a pre-operational monitoring programme in the Irminger Sea.

Near the central mooring site a sediment trap mooring has also been deployed to monitor for 5 years the downward particle flux. This will allow us to determine the relation between climatic variability of the hydrography and the near bottom particle flux to the sediment. from 2003 to 2004 additionally a internal wave array was deployed in the Irminger Sea.

<u>Internal wave climatology at different locations in the North Atlantic ocean</u>
PI's: Hans van Haren and Leo Maas

The large-scale meridional overturning circulation in the ocean cannot exist without small-scale mixing that redistributes heat. In the ocean interior, the key mechanism for this mixing seems the breaking of small-scale internal waves. As this is induced by large-scale internal wave shear, dominated at tidal and inertial frequencies, study of large-scale changes of these internal waves is a prerequisite to study variability in ocean mixing and, thus, in the large scale circulation.
Internal tides have well-known frequencies, but may vary as supporting background stratification varies (in the vicinity of topographic features). More unknown, and therefore specific subject of our studies, is the climatology of deep (near-)inertial motions. Inertial waves are generated near the ocean surface by passages of atmospheric disturbances. Unknown to-date are the precise transport of inertial energy from their source to greater depths and different latitudes and the precise mechanism of energy redistribution within the internal wave band.

Despite many observations on inertial motions systematic and long-term studies were scarce previously. By modelling of inertial motions in the deep ocean, by reanalysis of existing data sets (e.g. from OSU database) and by means of new data from presently

deployed dedicated LOCO-IW moorings (Fig. 2), we want to establish, (1) inertial wave spatial large and small scale variability, (2) their temporal (climatic) variability, (3) their sources and sinks, and their vertical and meridional propagation direction in varying stratification, (4) general internal wave band modifications related to inertial wave variability. The two presently occupied LOCO-IW sites are above strongly varying topography and in deep-ocean basins at different latitudes (around 30° N and near 60° N).

**Indian moored arrays**

Dr. V. S. N. Murty from NIO, India attended the Puerto Rico meeting with travel support from POGO and is a new member of the Time-series Science Team.

Murty presented a power point presentation of the on-going Indian efforts on the long-term time series measurements under the Ocean Observing System (OOS) Programme. The OOS programme was launched in 1997 by Department of Ocean Development (DOD), Government of India. Initially, the time-series programme started at the National Institute of Ocean Technology (NIOT), Chennai as a part of National Data Buoy Programme (NDBP). NIOT deployed six shallow water moored buoys and 5 deep-sea moored buoys since 1998 and were being maintained since then. Additional 40 moored surface buoys were planned by the NIOT in the coming years. Twelve buoys out of 40 were classified as ocean buoys which measure the basic atmospheric parameters and sea temperature, salinity, currents at 3 m below the surface, wave spectrum at sea surface and subsurface temperature profiles using Thermistor chains. Another 12 buoys are the meteorological buoys and only measure air temperature, pressure, winds, relative humidity and Sea Surface Temperature. Remaining 16 buoys were classified as coastal and environmental buoys and form an extension of the present deep-sea and shallow-water type buoys near the Indian coast.

Another important component of the OOS programme was the time-series of current measurements along the equator and being executed at the National Institute of Oceanography (NIO), Goa. Under this project, 3 current meter moorings were deployed at 93°E, 83°E and 76°E since February, 2000. In all the moorings, 6 self-recording current meters (Aanderaa type) were placed at 6 depths covering the upper thermocline, lower thermocline, intermediate, deeper and near-bottom depth regimes. The present status of time-series data and results of the preliminary analysis of the data were presented at the meeting. Highlighted the presence of 10-20 day intraseasonal variability in the measured currents and the good comparison between the observations and the OGCM results, while the latter was forced by the daily averaged QUIKSCAT surface winds.

The data were deposited with the Indian National Oceanographic Data Center (INODC) located in NIO and also to the Indian National Center for Ocean Information and System (INCOIS) located in Hyderabad. As a member of the science team, Murty informed the members that efforts would be made for making available the data to the international community after obtaining all necessary governmental clearances. However, exact time frame was not fixed.

**Discussion of the Time Series White paper**

A draft version was distributed for discussion before the meeting. Main points:

- add executive summary
- the ideas in previous papers about water mass transformation, transports, provinces, episodic events, etc are not visible anymore and have to be worked in better/again (stay closer to previous texts we had)
- make clearer why it is unique and a complement to other IOOS elements
- instead of “Where have we come since OceanObs” which was more targeted at POGO, should call this section e.g. “Progress in last 5 years”; this section should also cite the progress in data management
- improve figures
- remove the Florida Current figure/example
- make the examples more similar in length and size
- If the OOI is mentioned, then similar efforts in other countries should appear, like GMES in Europe.

**NSF views on data management**

Steve Meacham (NSF) discussed data management. NSF has an interest in standardizing the description of data (meta data), not necessarily the data format itself. NSF has an interest to facilitate the process, also internationally, and would be willing to provide some funding, at least to help the many groups involved in such efforts to meet and talk to each other.

The Marine Metadata Group in the US is also addressing time series data, but more coastal and no deep-ocean input yet (one of our MBARI data representatives is also on that group). The NVODS and Ocean.US groups also have an interest in mooring data (P.Hamilton and S.Hankin from our data team liaise with that group).
The OOI will set up a “Data Steering Committee”, we and our data team should link up with them.

**Data management**

S. Pouliquen reported on the progress made on data management aspects since the last meeting 8 months ago.

First a data management working group has been set up with representatives of the institutes that will made their time series data available freely but also with representatives of other programs such as CLIVAR, Ocean.US, Carbon program, etc. This group is mandated by the science team to define proposals for OceanSites data management that will be then approved by the science team before implementation. It was agreed that no reaction from a member of the data management group to a proposal meant that this member agrees with the proposal and will implement it went approved by science team. This group will be first in charge of defining the common data format in which the time series data will be exchanged among the different data providers. She will be then in charge to set up the OceanSites data network according to the recommendation made by the science team.

The current composition of the data management group is:

- Coriolis /France :S.Pouliquen sylvie.pouliquen@ifremer.fr
  T.Carval Thierry.carval@ifremer.fr

- BODC/UK: Lesley Rickards LJR@wpo.nerc.ac.uk
- ANIMATE: Maureen Edwards, mred@soc.soton.ac.uk
- Carbon Community : Maria Hood m.hood@unesco.org
- CLIVAR Data Management : Katy Hill klh@soc.soton.ac.uk (to be aware of the discussion)
- JAMSTEC/Japan Jun NAOI naoij@jamstec.go.jp
- UCSB/USA: Songnian Jiang , songnian.jiang@opl.ucsb.edu
- BERMUDA/USA: Rod Johnson rod@bbsr.edu
- SIO/USA: Andrew Dickson adickson@ucsd.edu
- PMEL/USA: Paul Freitag Paul.Freitag@noaa.gov
- WHOI/USA : Steve Manganini (sediment trap) smanganini@whoi.edu
  Nan Galbraith ngalbraith@whoi.edu
- MBARI/USA Reiko Michisaki, reiko@mbari.org
- SOEST/USA: Sharon Decarlo: decarlo@hawaii.edu
- US. DMAC /USA: Steve Hankin/PMEL , Steven.C.Hankin@noaa.gov .
- COADS /USA: Scott D Woodruff Scott.D.Woodruff@noaa.gov
- WOCE center (Scripps): Steve Diggs, sdiggs@ucsd.edu
  Jim Swift, jswift@ucsd.edu
- NVODS /USA: Peter Hamilton PETER.HAMILTON@saic.com
- NIOZ/Netherlands: Taco de Bruin bruin@nioz.nl

Netherlands will provide a person to participate in this data management working group.

A draft version of a format for OceanSites data has been drafted by T Carval and proposed by email to the rest of the group. It is a Netcdf format, which has been built by adapting to mooring data the format developed for Argo and Gosud (Global Ocean Surface Underway data). Nobody in the data management group objected to the proposal and within 2 or 3 months a first version of the format should be available. A few questions were already raised for decision by the science team:

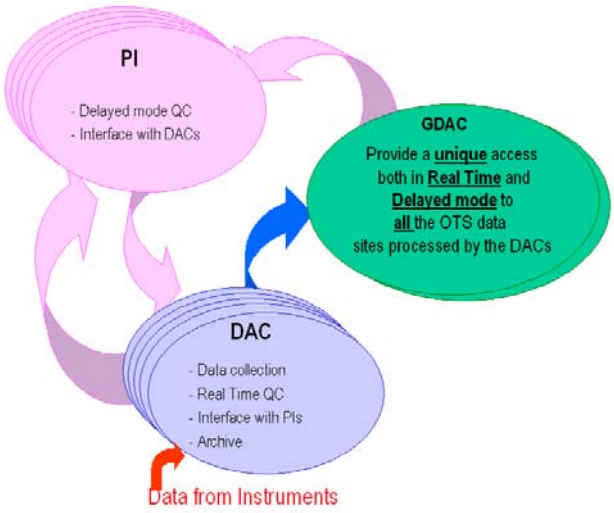
1. Choice of a unique identifier for a site: it has been decided that a site will be identified by a <User Name> <Unique ID for a platform >. We consider that the redeployment of a mooring is a different platform. The <UserName> will be attributed by the science team: examples BATS, MBARI, HOTS…. S Pouliquen will contact E Charpentier /JCOMM-OPS to see if an international body such as Jcom or DBCP could be in charge of attributing these unique ID.
2. The format has to take into account that a site may move in space.
3. The format will include Original data, the best data and the history of the correction applied
4. All the data will be provided to users and no average will be made at this state.
5. All data will use the same QC flags to qualify the data and the history section will be used to explain the QC flag positioning if necessary.

Once the format is approved two Global data centres will be set up: CORIOLIS in France, COADS in USA. The first step is to set up FTP sites at these centers. In a second step existing WWW interfaces such as LAS servers will be considered according to science team user requirements. The GDACs will be fed some of the OceanSites data providers. These institutions will put their data in the defined format and transfer the data to the two GDACs. The GDACs will synchronize periodically to be sure to provide to users access to the same datasets. The institutions that volunteered to start up the system are WHOI, SOC with Animate project, UCSB, Bermuda, SOEST, MBARI, and

NIOZ with data from the Mozambique Channel moorings. Arrangements will be made with these institutions when the format is finished.

For the time being most of the OceanSites data are handled by individual PI's. It would be probably better if at national level, data assembly centres were set up to handle a lot of the data management task necessary within the OceanSites network. In USA OOI and ORION could help to set up the American DAC.

The following scheme seems to be a reasonable goal for the future




The science team agreed that once the format and the GDAC are set up that the next step will be to define common QC procedures both in real time and delayed mode at least for the core parameters. These procedures should be coherent with what has been/is being defined by other groups when the parameters are the same (i.e., with Argo for subsurface temperature and salinity measurements…)

Sites to include in first GDAC version:

Data can only be included if operators of a site will provide data in the newly developed and agreed format. All contributors below will start by providing data starting with new data sets received after system is installed. Older data will be re-processed/formatted only on a best-effort basis. Sending the data into the GTS system is optional. Only those data need to be provided to the GDACS where some confidence exists about the data quality – experimental variables that are telemetered are optional.

- TAO/TRITON: check with McPhaden and P.Freitag if it is a problem to provide data in the new format. At present only the T-data are public, not S data.
- JAMSTEC is setting up their own data system, and a start can be made with those TRITON data that are available through PMEL
- Bermuda will provide data from station S.
- Hawaii will provide HOT data after verifying that the new format can be implemented on their system.
- WHOI, MBARI, UCSB, Animate will provide their data.

What difference does our group make, what are we trying to achieve ?

Our data management effort can set an example and possibly a standard for time series, if we liaise properly with the other concerned groups. NSF shows interest in our data management efforts.

OOPC looks at us for guidance and to talk to biogeochemical communities like SOLAS, CARBON, IMBER, etc. JCOMM is looking at us for scientific guidance. Our map and rationales have influenced planning in various communities, including ORION. We already have helped time series funding in the US and agencies there are looking for future maps. In smaller countries it is important to show that their contributions fit into a global network to sustain funding. Our data plans are countering the widespread scepticism that the mooring community does not want to share data. We can facilitate funding, from which then the growth and implementation of the network would result.

Additionally we can enhance the "feeling" of being a network/community and the impact we have by having a more effective website. Examples are to provide information and updates on sensors, telemetry, mooring design. At least links should be provided to other groups specializing on these topics. In addition, it was decided that at each science team meeting reports will be given on "sensors/technology" (T.Dickey), "data management" (S.Pouliquen), "science and products" (T.Dickey), "implementation status/plans" (U.Send). These reports will also be made available on the website. Related to this, T.Dickey offered to consider setting up and maintaining a website for sensors/technology, especially if he can get support for this (e.g. POGO fellowship). We should make sure there is a large user, supporter, and ownership group for the sites.

**Website**

W.Hunter with POGO support has been helpful and important to initiate the OceanSITES website, but now more intense and direct face-to-face interaction between the science team and the web manager is required. R.Lukas offered to take this over with S. Decarlo, and will then be under one roof with their ongoing website efforts for time series, incl. generation of products. They will also work on a new logo for OceanSITES using the new name. The web address www.oceansites.org was purchased during the meeting, and in the future this AND the old www.oceantimeseries.org will point to the same site. The newly reformatted website can be found at http://www.oceansites.org/OceanSITES/index.html.

**Rationale for Site Selection**

For any new site to be added to the pilot system, the Science Team should review the science, the data policy, and how this fits in or is coordinated with other sites (e.g. to prevent several moorings being in the same place). Sites that already exist or have got funding will be included if they satisfy our standard set of criteria. If the Team's endorsement (i.e. being in the Pilot Plan and the on the map) is needed in order to secure funding, the Science Team has to carry out a careful review, which could be done by email if time is pressing.

The procedure for becoming part of the system should be posted on the website. Each year, the Team can review one ocean region and invite experts for regional aspects. For example, we should check if Dyfamed and the MFSTEP moorings satisfy our criteria.

**OceanSITES Maps**

The need to update the current map we use for presentations, which combines the current status and the vision/plan, was identified. In addition, there is the need to adopt the common base map now being used by JCOMM so that the time series map has the same base map as used for displaying ARGO floats, drifters, and VOS tracks.

Further, displays are needed for the website that present the time series sites in "layers", including a base layer showing what is currently in the water and actively delivering data to the system. A second layer can show ALL sites in the water, even where no data received yet. A third layer should show the sites that are planned to be deployed in coming years.

The steering committee discussed the need to inform site operators of these new maps, making it clear to owners/operators of sites that only those long-term sites delivering data would be included on the base map on the website and explain the new maps and philosophy. The basis for placing sites on the various maps will be explained in the white paper under preparation and on the website (part of figure legend).

**Next Meeting**

Because the International Time Series Science Team is without explicit funding, it may be necessary to meet again in conjunction with another major meeting or workshop to which most of the team members will plan to travel to. V. Murty offered to host the next meeting in India.

**Membership**

The group will seek active participation from South American countries, including Chile and Brazil. A member from New Zealand is needed. S. Pouliquen became a full member of the Team.

## Appendix I Membership of the International Time Series Science Team

Bob Weller
WHOI, USA (Co-Chair)

Uwe Send
IfM Kiel, Germany (Co-Chair)

Ed Boyle
MIT, USA

Francisco Chavez
MBARI, USA

Tommy Dickey
UCSB, USA

Dave Karl
SOEST, USA

Tony Knap
Bermuda Station

Yoshihumi Kuroda
JAMSTEC, Japan

Richard Lampitt
SOC; UK

Roger Lukas
SOEST, USA

Mike McPhaden
PMEL,USA

Liliane Merlivat
LODYC, France

V. S. N. Murty
NIO, India

Rodrigo Nunez
SHOA, Chile

John Orcutt
SIO, USA

Svein Osterhus
Bergen Univ., Norway

Sylvie Pouliquen
IFREMER, France

Hendrik van Aken
NIOZ, Netherlands