WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

DATA BUOY COOPERATION PANEL

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TWENTY-EIGHTH SESSION

ITEM: 7

FREMANTLE, AUSTRALIA
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ENGLISH ONLY

REPORTS BY THE ACTION GROUPS

(Submitted by the Action Groups)

Summary and purpose of the document

This documents includes in its appendices the reports from the DBCP Action Groups on their respective activities during the last intersessional period.

ACTION PROPOSED

The Panel will review the information contained in this report and comment and make decisions or recommendations as appropriate. See part A for the details of recommended actions.

Appendices:
- A. Report by the Global Drifter Programme (GDP)
- B. Report by the Tropical Moored Buoy Implementation Panel (TIP)
- C. Report by the EUCOS Surface Marine Programme (E-SURFMAR)
- D. Report by the International Buoy Programme for the Indian Ocean (IBPIO)
- E. Report by the DBCP-PICES North Pacific Data Buoy Advisory Panel (NPDBAP)
- F. Report by the International Arctic Buoy Programme (IABP)
- G. Report by the WCRP-SCAR International Programme for Antarctic Buoys (IPAB)
- H. Report by the International South Atlantic Buoy Programme (ISABP)
- I. Report by the Ocean Sustained Interdisciplinary Timeseries Environment observation System (OceanSITES)
- J. Report by the International Tsunameter Partnership (ITP)

-A- DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

7.1 Under this agenda item, the Panel was presented with reports by its action groups, including:

(i) Surface Marine programme of the Network of European Meteorological Services, EUMETNET (E-SURFMAR) (verbal presentation by Jon Turton (United Kingdom), representing the E-SURFMAR officers);
(ii) Global Drifter Programme (GDP) (verbal presentation by Rick Lumpkin (USA) on behalf of the GDP);
(iii) International Arctic Buoy Programme (IABP) (verbal presentation by Dr. Ignatius Rigor (USA), representing IABP);
(iv) International Buoy Programme for the Indian Ocean (IBPIO) (verbal presentation by Mr Graeme Ball (Australia), Chairperson of the IBPIO);
(v) WCRP-SCAR International Programme for Antarctic Buoys (IPAB) (verbal presentation by Ignatius Rigor (USA) on behalf of the IPAB);
(vi) International South Atlantic Buoy Programme (ISABP) (verbal presentation by Mayra Pazos (USA), representing the ISABP);
(vii) DBCP-PICES North Pacific Data Buoy Advisory Panel (verbal presentation by Mr Shaun Dolk (USA), technical coordinator of the NPDBAP);
(viii) OCEAN Sustained Interdisciplinary Timeseries Environment observation System (OceanSITES) (verbal presentation by the Technical Coordinator, Ms Kelly Stroker, representing OceanSITES project office);
(ix) Tropical Moored Buoys Implementation Panel (TIP) (verbal presentation by Mr Richard Crout on behalf of the TIP);
(x) International Tsunameter Partnership (ITP) (verbal presentation by Mr Richard Crout (USA) representing the ITP).

7.2 Summaries of the presentations are reproduced in Appendices A to J. The full reports of the action groups will be reproduced in the Panel's Annual Report.

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Appendices: 10

APPENDIX A

REPORT BY THE GLOBAL DRIFTER PROGRAMME (GDP)

(Report submitted by Rick Lumpkin, NOAA/AOML, USA)

1) Summary

Name of Action Group	
Date of report	15 August 2012
Overview and main requirements addressed	Global Drifter Program (GPD). Goals: 1. Maintain a global 5x5° array of 1250 satellite-tracked surface drifting buoys to meet the need for an accurate and globally dense set of in-situ observations of mixed layer currents, sea surface temperature, atmospheric pressure, winds and salinity; and 2. Provide a data processing system for scientific use of these data. These data support short-term (seasonal to interannual) climate predictions as well as climate research and monitoring.
Area of interest	Global ocean
Type of platform and variables measured	Lagrangian drifters measuring surface velocity, SST; some drifters also measure sea level pressure, wind, salinity, and/or sub-surface temperature profiles
Targeted horizontal resolution	5 degree x 5 degree (1250 units)
Chairperson/Managers	Dr Rick Lumpkin, NOAA/AOML, USA Dr Luca Centurioni, SIO/CIMEC, USA
Coordinator	Operations Manager: Mr Shaun Dolk, NOAA/AOML, USA
Participants	Numerous national and international institutions
Data centre(s)	GDP Data Assembly Center (DAC) – Manager: Ms Mayra Pazos, NOAA/AOML, USA
Website	http://www.aoml.noaa.gov/phod/dac/gdp.html
Meetings *(meetings held in 2011/2012; and planned in 2012/2013)*	DBCP-WMO workshop on the Evaluation of the Impact of Sea Level Pressure Data Over the Ocean from Drifting Buoys on Numerical Weather Prediction, 21 May 2012, Sedona AZ USA.
Current status summary *(mid-2012)*	Annual size of array was 990. Current size as of August 6, 2012 is 1029 drifters.
Summary of plans for 2013	Restore array to ~1250 drifters; begin incorporating salinity data into data stream; conduct ADB study of SVPB drifters.

2 Deployment plans for 2013

Deployments in the period 27 July 2011 through 28 July 2012 are shown in Fig. 1. A total of 1203 drifters were deployed during this period. Some outstanding deployments include:

- 24 SVPBs in the Drake Passage (PI Christian Reiss)
- 20 SVPBs and 20 SVPGs near Falkland Islands (PI Andrew Thompson)

- 12 PG SVPBs in the east Indian Ocean (deployed by Indonesian collaborators)
- 20 SVPs in the Gulf Stream during the Latmix II experiment (PI Pascale Lelong)
- 35 SVPs during the Stratus servicing cruise in the southeast Pacific (PI Bob Weller)
- 20 SVPBs in the southern Indian Ocean (PI Isabell Ansorge)
- 20 new Scripps SVPs off the coast of California (PI Carter Olhmann)
- 16 SVPs in conjunction with Earth Day at 6 US Cities
- 10 SVPs in the Yucatan Strait (PI Estrella Malca)
- 12 SVPBs during the DART servicing cruise in the north Pacific (PI Karen Grissom)
- 35 SVPBs in the North Atlantic by the State University of New York Maritime College

In the coming year, the GDP Deployment Plan is:

Operational Buoy Deployments	800
Consortium Research Buoy Deployments	200
Total Deployments in 2011	1000

Regional deployment opportunities in 2012—2013 include 60 SVPBs in the Southern Indian Ocean, 40 SVPBs in the South Pacific, and 80 SVPBs in the South Atlantic (all south of 40S). As in previous years, cruises to service the global tropical moored array will be used opportunistically to seed drifters.

3 Data management

3.1 Distribution of the data

The drifter Data Assembly Center (DAC) assembles, quality controls and interpolates data from approximately 1300 drifters per month from all GDP national and international partners, from all oceans of the world. These data are made available through the web with a delayed time of 3—4 months. As of the time of writing this report (August 2012), data are available through March 2012. These data can be accessed at http://www.aoml.noaa.gov/phod/dac/dacdata.php.

3.1.1 Data policy

The DAC, located at NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) has access to drifters from GDP partners that have given Service Argos permission to make these data available to the DAC. In return the partners have access to all quality controlled and interpolated data available in the database via the World Wide Web. Non-interpolated quality controlled data and raw data are made available via ftp transfer upon request.

3.1.2 Real-time data exchange

All data from drifters in the GDP's programs are disseminated via GTS as soon as drifters are deployed. The GDP monitors data going out on the GTS, and transmissions of sensors producing bad data or transmissions from grounded drifters are removed from the GTS data stream.

As of 25 June 2012, there were 989 GDP drifters transmitting good quality data on the GTS. Other GDP partners are expected to distribute their drifter data on the GTS as soon as deployments have occurred. The GDP does not monitor GTS data timeliness and relies on operational centres to report on these issues.

3.1.3 Delayed mode data exchange

Drifter data (raw Argos data, edited non-interpolated and interpolated data) are archived at AOML. These datasets are also sent once or twice a year with a 6-month delay to Integrated Science Data

Management (ISDM), the RNODC for drifter data, for permanent archival and further distribution. On 22 May 2012, the DAC sent all data covering the period January through December 2011 to ISDM.

Metadata for GDP drifters are received at the DAC directly from drifter manufacturers who send standardized specification sheets for batches of identical drifters prior of delivery of the instruments. Portions of this metadata are extracted and are made available on the deployment log at the DAC web page www.aoml.noaa.gov/phod/dacdeployed.html. Specification sheets are archived at the DAC. Deployment date, date of last transmission, drogue off and cause of death metadata are determined during quality control of the dataset and are made available through the web at www.aoml.noaa.gov/phod/dac/dirall.html. These web pages are interrogated by JCOMMOPS to gather information for their metadata systems.

3.2 Data quality

As documented in last year's report, the phase-in of improved drogue detection sensors in the period 2008—2009 was associated with a sharp drop (70% to 50%) in the fraction of the global array diagnosed as "drogue off", indicating that drogue presence was not previously assessed for a significant number of drifters. Because drifters without drogues are more strongly affected by direct wind forcing, misdiagnosis has the potential to introduce bias in ocean currents derived from drifters. This bias was been documented in two publications last year, Grodsky et al. (2011) and Rio et al. (2011). At last year's DBCP meeting, M.-H. Rio presented a methodology developed to determine drogue loss from anomalous downwind motion. In response to these studies, an automatic drogue presence reassessment was led by R. Lumpkin (NOAA/AOML) in collaboration with S. Grodsky and J. Carton (Univ. Maryland), L. Centurioni and D. Lee (Scripps) and M.-H. Rio (CLS). Results and methodologies for this study have been submitted to the *Journal of Atmospheric and Oceanic Technology*, which also describes the criteria used for a full manual reevalution currently being conducted by the drifter DAC. Lumpkin et al. (2012) has demonstrated that, according to GDP metadata prior to the reanalysis, for the period 14 October 1992, 62% of the velocity measurements were collected by drogued drifters during the period 14 October 1992–30 November 2010. After the automatic reanalysis ("after"), this fraction drops to 48%. This error reached its peak in mid-2006 when the fraction of drogued drifters must be reduced from 65% to 29%. This discrepancy diminished to 37% (before reanalysis) vs. 23% (after) the end of 2010 as tether strain drifters were phased in and most of the older submergence drifters had died. Results of the manual drogue presence reanalysis are being included in updates of the QC data available from the drifter DAC and are also available at ftp://ftp.aoml.noaa.gov/phod/pub/lumpkin/droguedetect/.

On 21 May 2012, a DBCP-WMO workshop on the Evaluation of the Impact of Sea Level Pressure (SLP) Data Over the Ocean from Drifting Buoys on Numerical Weather Prediction was held in Sedona AZ USA, hosted by L. Centurioni and R. Lumpkin. The major conclusions from this one-day workshop are:

- The impact of drifters (i.e. from fraction of beneficial observations, impact per observations and many others indicators) is very high for different assimilation systems (3D-Var, 4D-Var) and different global metrics;
- The impact is large especially for open ocean, high latitudes buoys (i.e. drifters) and for explosive cyclogenesis;
- There is little redundancy in the SLP observing system (high % of beneficial observations);
- Drifter SLP is very important to anchor the SLP pressure field and is more accurate than GPSRO;
- There is the need to run routine impact studies with drifters' SLP separated from other marine network components and for latitude bands;
- Alternate metrics may also need to be introduced, albeit not optimal in a global sense, such as surface winds, of more direct impact to society;

- Future work should evaluate the need to run more focused Obsering Simulation Experiments for drifter-only data.

4) Instrument practices

During the 2011-2012 intersessional period the GDP did not deploy any new clusters of drifters for inter-comparison and evaluation due to delays in acquisition and recalls of drifters from two manufacturers. Instead the GDP has been focusing on lifetimes of drifters across the entire global array since 2005, by manufacturer and buoy type (SVP vs SVPB). In the coming year, AOML will deploy four clusters of drifters, at the same time and location, with one drifter from each active major manufacturer, in order to compare and evaluate the packaging, activation, and sensor/drogue/transmitter performance.

Technical developments related to the design of the SVP drifter are led by the Scripps component of the GDP. These developments aim to standardize and improve the drifter design. In the previous year, this has included:

- Ruggedized tether attachment for strength and water infiltration implemented across the drifter fleet;
- Recommendation for high quality batteries issued to manufacturers;
- Recommendation for more accurate SST (0.05°C) issued to manufacturers;
- Recommendation for ruggedized drogue design issued to manufacturers;
- SIO completed SVP and SVPB drifter design and started production;
- New tether material (synthetic rope) is currently under evaluation (20 SIO units).

5) Evolution of the Global Drifter array, 8 August 2011—6 August 2012

The growth of the array through 6 August 2012 is shown in Fig. 2. For the most recent 365 days, the array had an average size of 990 drifters. This period began with the array at 1048 drifters, with the number diminishing rapidly in Fall 2011 due to problems with defective (leaking) battery packs for Technocean and Clearwater drifters, as reported at DBCP-27. Subsequent to that meeting, unconventional design changes for Technocean drifters were discovered at SIO which might have also played a role in their reduced lifetimes. An additional problem was determined during the intersessional year: drifters with a PMT (Argos 3) operating in PTT (Argos 2) mode by two manufacturers (Pacific Gyre and Clearwater) experienced truncated lifetimes due to unexpectedly high power consumption. These units typically quit transmitting within 180 days of deployment. The GDP has worked actively with CLS to address this.

The array reached its minimum size of 875 drifters on 16 April 2012, and subsequently grew at a mean rate of 38.5 drifters per 30 days. On 6 August 2012 the array had reached 1029 drifters.

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Annex

Status maps and graphics

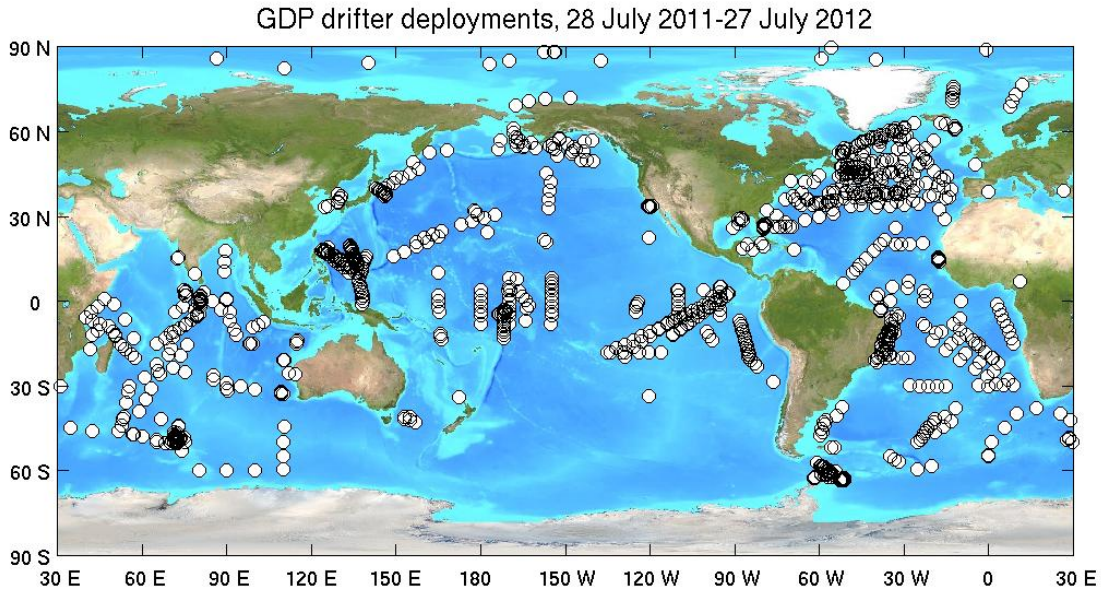

Fig. 1: Deployment locations during the year. A total of 1197 drifters were deployed.

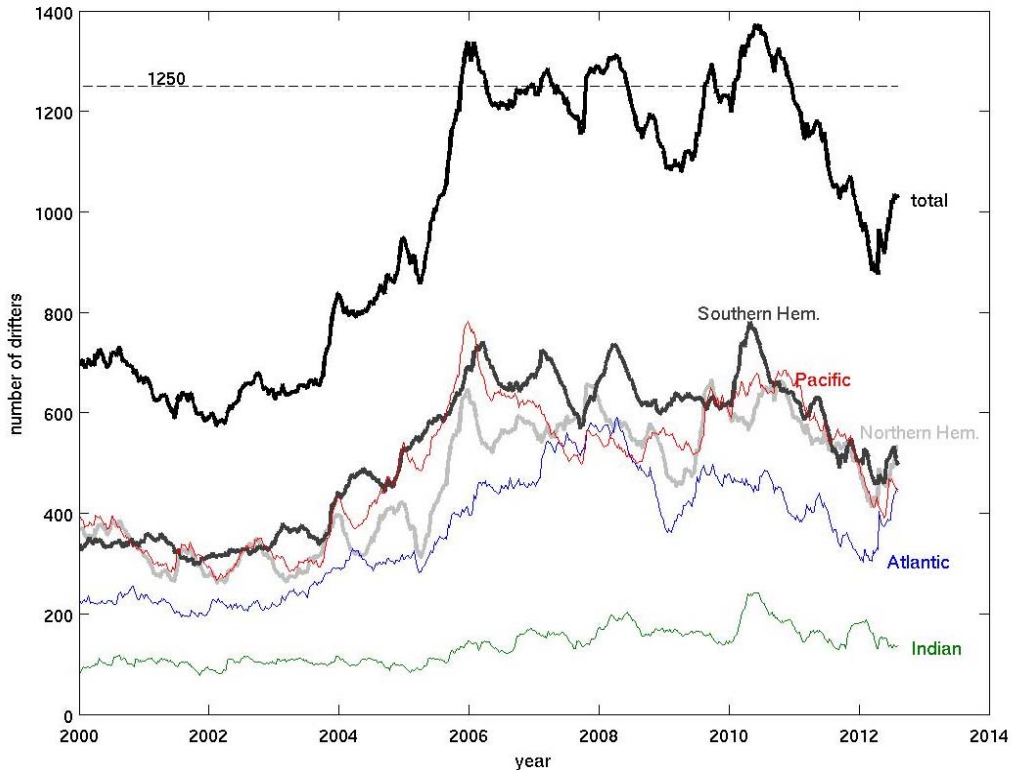

Fig. 2: Size of global drifter array in regions. Atlantic/Indian divided at 25°E in the Southern Ocean, Atlantic/Pacific at 70°W in the Southern Ocean, Indian/Pacific at 125°E south of Timor.

APPENDIX B

REPORT BY THE TROPICAL MOORED BUOY IMPLEMENTATION PANEL (TIP)

(Report submitted by Paul Freitag, NOAA/PMEL, USA)

1) Summary

Name of Action Group	The Tropical Moored Buoy Implementation Panel (TIP)
Date of report	31 July 2012
Overview and main requirements addressed	The Tropical Moored Buoys Implementation Panel (TIP) oversees the d esign and implementation of the following components: • The Tropical Atmosphere Ocean / Triangle Trans-Ocean Buoy Network (TAO / TRITON), a central component of t he ENSO Observing System, deployed specifically for research and forecasting of El Niño and La Niña; • The Prediction and Research Moored Array in the Tropical Atlan tic (PIRATA) • The Research Moored Array for African-Asian-Australian Monsoon Analysis and Prediction (RAMA)
Area of interest	The tropical ocean regions as part of an integrated approach to observing the climate system to address the research needs of CLIVAR and the operational strategies of GOOS and GCOS. Pacific Ocean: 8°N to 8°S; Atlantic Ocean: 20°N to 10°S; Indian Ocean: 15°N to 25°S.
Type of platform and variables measured	Tropical moorings with surface meteorological and sub-surface oceanographic sensors measuring: Surface wind, air temperature, relative humidity, SST and SSS on all surface moorings. Air pressure, precipitation, short wave radiation, long wave radiation on some surface moorings. Sub-surface temperature profiles down to 500m-750m on all surface moorings. Salinity profiles as deep as 750m on some surface moorings. Current velocity on some moorings. Also, biogeochemical measurements, including CO_2 and O_2 on select moorings. A few moorings also have specialized instruments to measure turbulence dissipation. Subsurface ADCP moorings measuring velocity profiles in the upper few hundred meters. Some have additional single point current meters at deeper levels.
Targeted horizontal resolution	Tropical Pacific Ocean: 72 moorings ; Tropical Atlantic Ocean: 18 moorings ; Tropical Indian Ocean: 46 moorings
Chairperson/Managers	Dr. Mike McPhaden, PMEL, USA, Chairman Dr. Kentaro Ando, JAMSTEC, Japan, Vice-Chairman
Coordinator	Mr H. Paul Freitag, PMEL, USA
Participants	TAO/TRITON: NOAA National Data Buoy Center (NDBC),NOAA Pacific Marine Environmental Laboratory (PMEL), Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Agency for the Assessment and Application of Technology (BPPT) PIRATA: NOAA PMEL, NOAA Atlantic Marine Oceanographic Laboratory (AOML), L'Institut de recherche pour le développement (IRD), Meteo-France, Instituto Nacional de Pesquisas Espaciais (INPE), Diretoria de Hidrografia e Navegacao (DHN**)**

	RAMA: NOAA PMEL, JAMSTEC, Indian National Center for Ocean Information Services (INCOIS), National Institute of Oceanography (NIO), Agency for the Assessment and Application of Technology (BPPT), Ministry of Marine Affairs and Fisheries (KKP), First Institute of Oceanography (FIO), Agulhas and Somali Current Large Marine Ecosystems (ASCLME), University of Tasmania and the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia. Laboratoire d'Océanographie et du Climat: Expérimentations et approches numériques (LOCEAN)
Data centre(s)	PMEL, NDBC,JAMSTEC, NIO
Website	http://www.pmel.noaa.gov/tao/global/global.html
Meetings *(meetings held in 2011/2012; and planned in 2012/2013)*	PIRATA-16/TACE/TAV, 14-18 March 2011, Fernando de Noronha, Brazil CLIVAR/GOOS Indian Ocean Panel 8th Session 25-29 July 2011, Chennai, India PIRATA-17/TACE/TAV 10-14 September 2012, Kiel, Germany CLIVAR/GOOS Indian Ocean Panel 9th Session 15-20 October, 2012, Capetown, South Africa TIP Workshop, 23-24 October, 2012, Jakarta, Indonesia.
Current status summary *(mid-2012)*	TAO/TRITON: 57 of 67 surface moorings reporting. PIRATA: 16 of 17 surface moorings reporting. RAMA: 22 of 24 surface moorings reporting.
Summary of plans for 2013	TAO/TRITON: Maintain 72 mooring array. PIRATA: Maintain 18 mooring array RAMA: Maintain 30 implemented sites and add 2 more sites.

2 Deployment plans for 2013

TAO/TRITON: NDBC 7 cruises, JAMSTEC 2 cruises, BPPT 1 cruise
PIRATA: AOML/PMEL 1 cruise, IRD 1 cruise, INPE 1 cruise
RAMA: PMEL/INCOIS 3 cruises, JAMSTEC 1 cruise, NIO 1 cruise, PMEL/BPPT 2 cruises, FIO/BPPT 1 cruise, PMEL/ASCLME 1 cruise

3 Data management

3.1 Distribution of the data

Most surface data are telemetered in real time via the Argos system and are placed on the GTS by the French Space Agency (CLS). These real time data plus delayed-mode data (data of higher temporal resolution than are available in real time and data from subsurface moorings) are available via web based distribution from PMEL (www.pmel.noaa.gov/tao/disdel/disdel.html), NDBC (tao.noaa.gov), JAMSTEC (www.jamstec.go.jp/jamstec/TRITON/real_time/php/top.php, http://www.jamstec.go.jp/iorgc/iomics/datadisplay/buoysummary.php?LANG=0), and NIO (www.nio.org/index/option/com_nomenu/task/show/tid/2/sid/18/id/5). One surface mooring (FIO) telemeters data via Iridium which are available via the web only. During the period July 2011 through June 2012 the PMEL web pages had more than 14M hits and delivered more than 334K data files in response to more than 36K user requests.

3.1.1 Data policy

Data are freely available on the web and distributed via the GTS in real-time.

3.1.2 Real-time data exchange

Most surface moorings are Autonomous Temperature Line Acquisition System (ATLAS) moorings which place daily mean meteorological and oceanographic observations and some (about 10 per day on average) hourly meteorological observations on the GTS using Argos2 PTTs. TRITON and m-TRITON buoys submit hourly mean meteorological and oceanographic data to the GTS: TRITON via Argos2 PTTs and m-TRITON via Argos3 PMTs. Compared to the volume of ATLAS data received at PMEL, more than 90% is typically reported on the GTS by CLS. Most operational centers receive nearly all ATLAS data placed on the GTS, with the exception of the ECMWF which typically reports volumes of about 75%, presumably due to stricter latency criteria.

Daily average data return for the period 1 July 2011 through 30 June 2012 was 80% for TAO/TRITON, 90% for PIRATA and 66% for RAMA. A reduction in NOAA sea days resulted in the delay of servicing of moorings at several TAO sites in the eastern Pacific. Primary reasons for lower data return in RAMA are a higher incidence of vandalism coupled with longer mooring deployment periods. Intense fishing activity in some regions has lead to high vandalism rates. The survival rate for ATLAS moorings in RAMA since the first deployments (2004) is 79%, compared to 90% for TAO (since 1980) and 92% for PIRATA (since 1997). Cancelled and delayed RAMA cruises have resulted in deployments much longer than the 12-month design lifetime of the moorings. One new mooring site that was to be established in March 2012 could not be deployed due to a cancelled cruise. Two sites serviced in June 2012 had not been serviced for 33 months due to security issues (5.7 below).

3.1.3 Delayed mode data exchange

Delayed mode data (*i.e.,* data retrieved after mooring recovery) are archived at the web sites listed in 3.1 above. System metadata are available at the web sites listed in 3.2 and 4 below.

The TAO web site (http://www.pmel.noaa.gov/tao/), PIRATA web site (http://www.pmel.noaa.gov/pirata/), and RAMA web site (http://www.pmel.noaa.gov/tao/rama/) provide various information including scientific background, technical information, access to RAMA data and displays, present status of the array, a bibliography of refereed publications, history of cruises, and additional information.

3.2 Data quality

Data quality control procedures are described at www.pmel.noaa.gov/tao/proj_over/qc.html for ATLAS moorings and at www.jamstec.go.jp/jamstec/TRITON/real_time/overview.php/po.php for TRITON moorings.

4) Instrument practices

Sensor specifications and calibration procedures are described at www.pmel.noaa.gov/tao/proj_over/sensors.shtml for ATLAS moorings, at www.jamstec.go.jp/jamstec/TRITON/real_time/overview.php/po-t3.php for TRITON moorings, and at http://www.jamstec.go.jp/iorgc/iomics/projectoverview/1_b3_eng.html for m-TRITON moorings. RAMA mooring specifications from PMEL, JAMSTEC and NIOT are also listed in the Supplement to RAMA: The Research Moored Array for African—Asian—Australian Monsoon Analysis and Prediction (McPhaden, et al., 2009)

After testing and comparison of real-time (daily averaged) and delayed mode (10-minute) data alongside ATLAS moorings for several years, NDBC's ATLAS Refresh moorings have replaced

ATLAS Legacy moorings at 24 of 55 TAO sites. NDBC will replace up to 16 additional ATLAS legacy moorings in 2013. Refresh systems telemeter 10-min resolution data via Iridium each hour.

China's First Institute of Oceanography (FIO) has developed a new surface mooring named Bai-Long. Designed to make air and ocean measurements comparable to ATLAS moorings, FIO has maintained Bai-Long moorings in RAMA near 8°S 100°E on annual cruises since February 2010. PMEL and FIO have incorporated data from the Bai-Long mooring into PMEL's Tropical Moored Buoy web pages which display and distribute RAMA data from ATLAS and TRITON moorings.

PMEL has developed a new mooring system named T-Flex, intended to replace the legacy ATLAS moorings in tropical research arrays. T-Flex observations are essentially equivalent to ATLAS, using more commercially available components and provide higher temporal resolution data in real time. Prototype systems have been deployed for comparison within a few miles of ATLAS systems near 12°S 93°E in RAMA and near 20°N 38°W in PIRATA. Additional test deployments are planned for the coming year.

The new T-Flex and Bai-Long mooring systems telemeter data via Iridium. Methods to submit data from these systems onto the GTS have yet to be established. Data from NDBC ATLAS Refresh systems which also use Iridium are on the GTS.

5) Other issues

5.1 RAMA Implementation

As of July 2012 the number of RAMA sites implemented stands at 30 (65% complete). No new sites have been implemented in the past year due to reductions in planned sea days.

Between July 2011 and June 2012, 143 sea days were provided in support of RAMA sites: India provided 63 days for PMEL's ATLAS and ADCP moorings; Japan provided 23 days in support of their m-TRITON and ADCP moorings; Indonesia provided 42 days, 27 for PMEL's ATLAS and TFlex moorings and 15 days for FIO's surface and subsurface moorings; South Africa provided 15 days for PMEL ATLAS moorings. During this period 24 of 30 RAMA sites were serviced. As of July 17, 2012, 22 of 24 surface moorings were reporting data (18 on the GTS).

The University of Tasmania and CSIRO are conducting an investigation of transports in the subtropical Southeast Indian Ocean in August 2012, during which a RAMA mooring will be deployed near 25°S 97°E. Additional implementation in the near future will be limited due to security issues related to piracy (5.7 below)

5.2 Array enhancements

Meteo-France provides barometers maintain surface pressure measurements at 4 RAMA sites and 1 PIRATA site.

CO_2 measurements are made on several TAO moorings by PMEL (http://www.pmel.noaa.gov/co2/moorings/) and on several PIRATA buoys by LOCEAN (http://www.lodyc.jussieu.fr/CO2tropiques/). O_2 measurements are made by the Leibniz Institute of Marine Sciences at the University of Kiel (IFM-GEOMAR). The first biogeochemical instrumentation in RAMA (provided by the University of Tasmania) was placed on a mooring in May 2010. The Bai-Long mooring deployed in 2012 included CO_2 instrumentation. Plans for additional measurements on other RAMA moorings are being proposed within the context of the Sustained Indian Ocean Biogeochemical and Ecosystem Research Program (SIBER).

Oregon State University deployed a total of 14 dissipation measuring instruments (known as ChiPods) distributed on 3 RAMA moorings in May-August 2011 as part of CINDY/DYNAMO (5.4 below). One of these moorings has since been recovered and the other 2 moorings will be recovered in August, 2012.

5.3 International cooperation and capacity building

Formal bilateral agreements have either been approved or are under development among agencies of the various partner countries to help complete and sustain the array, the most recent being an Implementing Arrangement between CSIRO and NOAA which was signed in July 2012. The agreement highlights cooperation in technical support, research, technology development and maintenance of ocean observing systems, including RAMA and TAO/TRITON, for climate and marine forecasting.

To facilitate and coordinate resources that may be applied to the Indian Ocean Observing System, an IndOOS Resource Forum (IRF) was established in 2009. The Forum held its second meeting on July 29, 2011, in Chennai, India. Discussion topics included better coordination and integration by agencies planning cruises, and the formulation of security measures in response to piracy threats and the commitment of resources to implement such measures. A third IRD meeting is planned for October 2012 in Capetown, South Africa,

JAMSTEC is conducting capacity building for the transfer of surface buoy technology within the Japanese-Indonesian Science and Technology Research Partnership for Sustainable Development (SATREPS) project. A capacity building cruise for field operational training was conducted in May 2011 during which a surface buoy was deployed and recovered. Capacity building for buoy data quality control is also underway. Indonesia will deploy an m-TRITON mooring near an existing TRITON mooring in September 2012 and will assume responsibility for maintaining this site after confirmation of data quality.

JAMSTEC and FIO concluded a Collaborative research Arrangement (CRA) for Indo-Pacific Tropical Ocean and Climate Observational Research in May 2012.

A drifting TRITON buoy from 0° 156°E was recovered by the Korean R/V Onnur in July 2012, as part of collaborative activities between JAMSTEC and the Korea Institute of Ocean Science & Technology (KIOST).

PMEL conducted a technical training session on mooring systems for 3 Indian scientists on September 6-9, 2011, to expand support of RAMA moorings within India. JAMSTEC's Dr. Iwao Ueki is visiting PMEL from April, 2012, to March, 2013, strengthening the long-term ties between the 2 organizations. Mr Huiwu Wang from FIO will visit PMEL for 3 months beginning in Fall 2012 to collaborate on mooring technology and data processing procedures. PMEL will host 3 Indonesian scientists on a cruise on NOAA Ship RON BROWN in September, 2012 for shipboard technical training. NOAA hosts annual capacity building workshops in Indonesia (October 22-24, 2012) and also site visits in the US by Indonesian scientists to the National Coastal Data Development Center (NCDDC) and NDBC (September 17-25, 2012.)

5.4 TAO Transition

Management of the TAO portion of TAO/TRITON officially transferred from PMEL to NDBC in October 2004. PMEL's data processing, quality control and distribution systems were installed at NDBC and parallel testing was conducted from October 2005 to September, 2006. NDBC assumed responsibility for TAO field operations in January 2007 while ATLAS instrument preparation remained at PMEL. NDBC developed a Refresh ATLAS system comprised of more "off-the-shelf" components, which began field testing in 2007 and which now comprise 44% of the array. Conversion of all TAO sites to Refresh ATLAS systems is expected in 2015.

5.5 Research experiments

The US is conducting a multi-year (2008-2014) process study within RAMA with the addition of 9 subsurface ADCP moorings in the region spanning 2.5°N to 4°S and 78°E to 83°E.

The Cooperative Indian Ocean experiment on intraseasonal variability (CINDY) is a multi-national field and modeling study of the oceanic and atmospheric processes responsible for the initiation of the Madden-Julian Oscillation (MJO). US participation in CINDY is coordinated through Dynamics of the MJO (DYNAMO). The field campaign of DYNAMO/CINDY (October 2011 through January 2012) consisted mainly of a sounding-radar array formed by research vessels and island sites, enhanced moorings inside the array maintained by the University of Washington, and enhanced RAMA moorings near the array.

The Monsoon Onset Monitoring and its Social and Ecosystem Impacts (MOMSEI) is a Southeast Asia GOOS (SEAGOOS) pilot project under IOC-WESTPAC. MOMSEI aims at observing boreal summer monsoon onset and understanding the role of ocean in this process. It typically consists of field surveys over the eastern equatorial Indian Ocean and the Bay of Bengal.

As part of the CLIVAR Northwestern Pacific Ocean Circulation and Climate Experiment (NPOCE), JAMSTEC deployed two subsurface ADCP moorings near 8°N, 127°E and 128°E in Aug 2011 to capture variability of Mindanao Undercurrent.

JAMSTEC deployed a surface mooring at 5°S, 97°E in June 2012 as a process study for upwelling variability associated with Indian Ocean Dipole event.

Under the CLIVAR Southwest Pacific ocean circulation and Climate Experiment (SPICE), JAMSTEC will deploy two subsurface ADCP moorings near 2°S, 153°E in July 2012 to capture variability of New Ireland Coastal Undercurrent.

5.6 Vandalism

Damage to buoys and theft of instrumentation continues to be a problem, especially at sites near areas of intense fishing activity such as the far eastern and western equatorial Pacific, the Gulf of Guinea and equatorial Indian Ocean. In response, some TRITON sites which have been vandalized heavily are now deployed without meteorological sensors.

5.7 Piracy

In addition to vandalism, well-publicized piracy events have resulted in the suspension of RAMA implementation off Africa and in the Arabian Sea. Lloyds of London defines an Exclusion Zone north of 12°S and west of 78°E in which additional premiums apply to insure commercial vessels. Previously set at 70°E, the eastern border of the zone was extended in 2011 in response to piracy incidences farther from the coast of Africa. Due to lack of adequate security measures a RAMA mooring south of the Seychelles was not scheduled to be maintained in 2012, but fortuitously was visited due to bad weather. While servicing other RAMA moorings outside of the Exclusion Zone, a tropical cyclone forced the South African RV Algoa to seek shelter in Port Victoria, Seychelles. After the storm had passed the mooring was maintained as the ship returned southward. INCOIS contracted Sea Marshalls to be stationed aboard SAGAR NIDHI for a June – July 2012 cruise so that two sites previously implemented in the Exclusion Zone along 67°E could be serviced after a 33 month hiatus.

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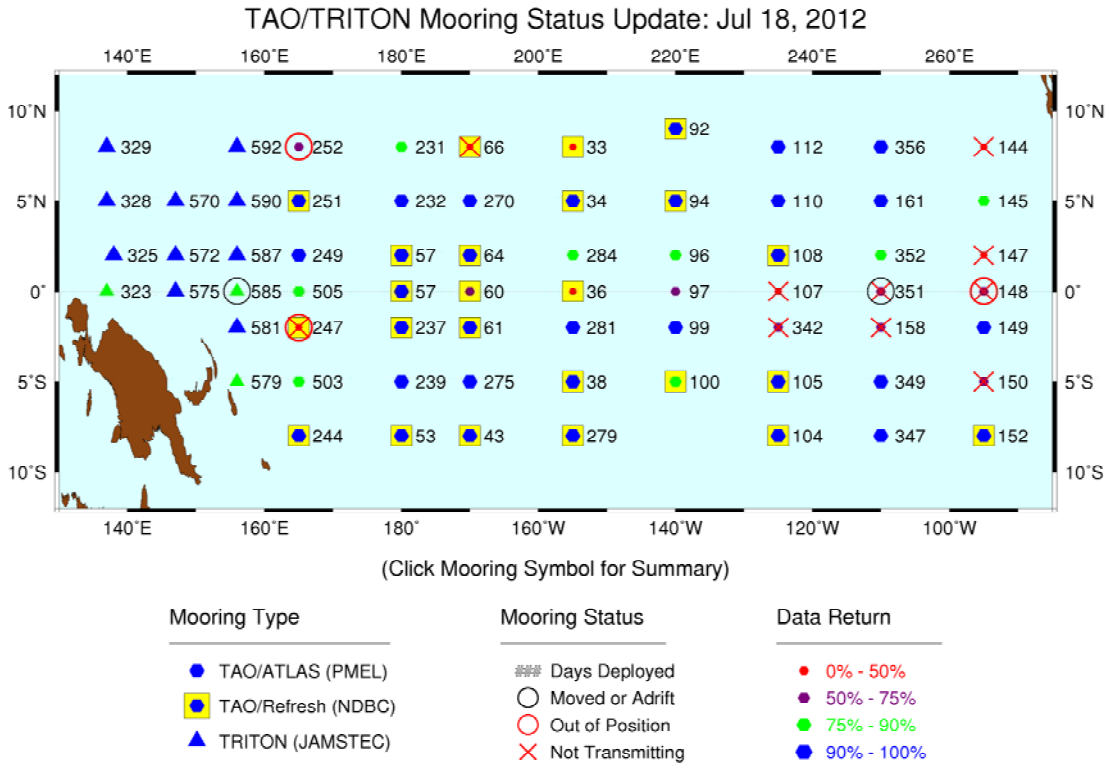
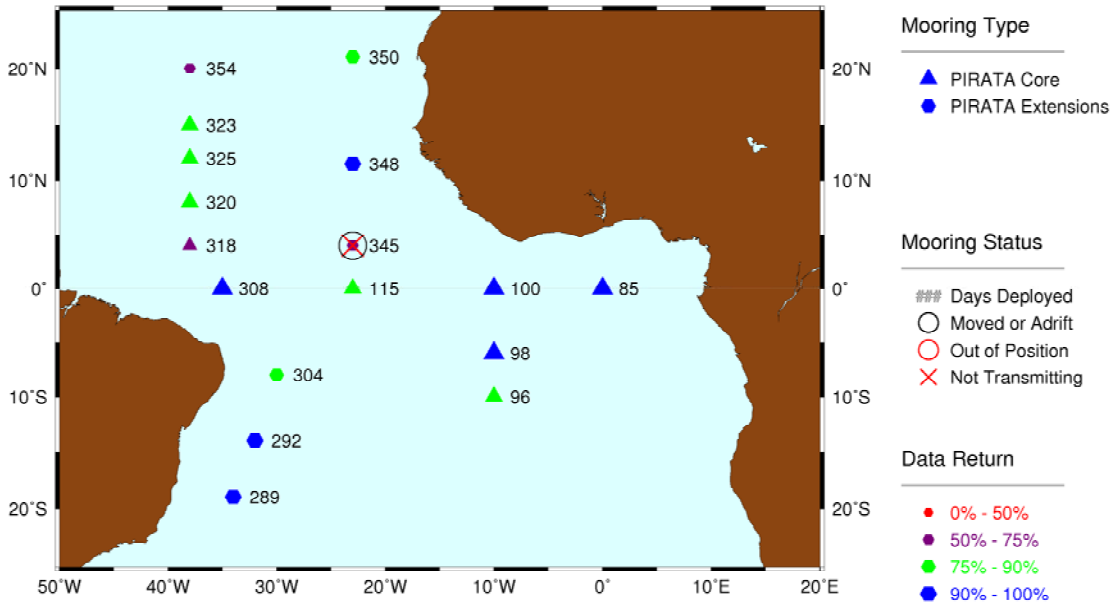
ANNEX

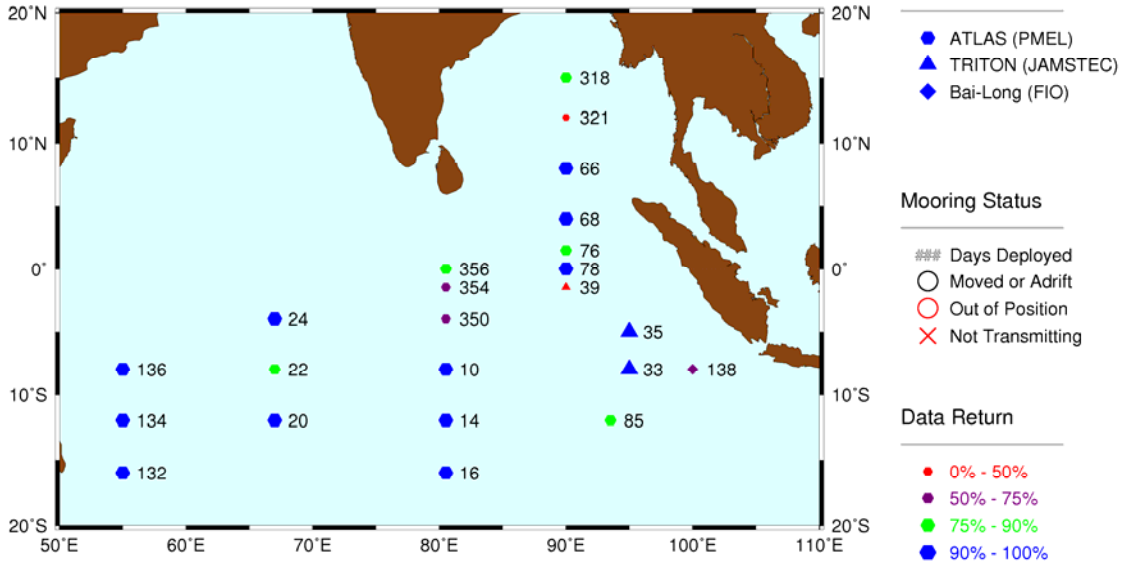
Status maps and graphics



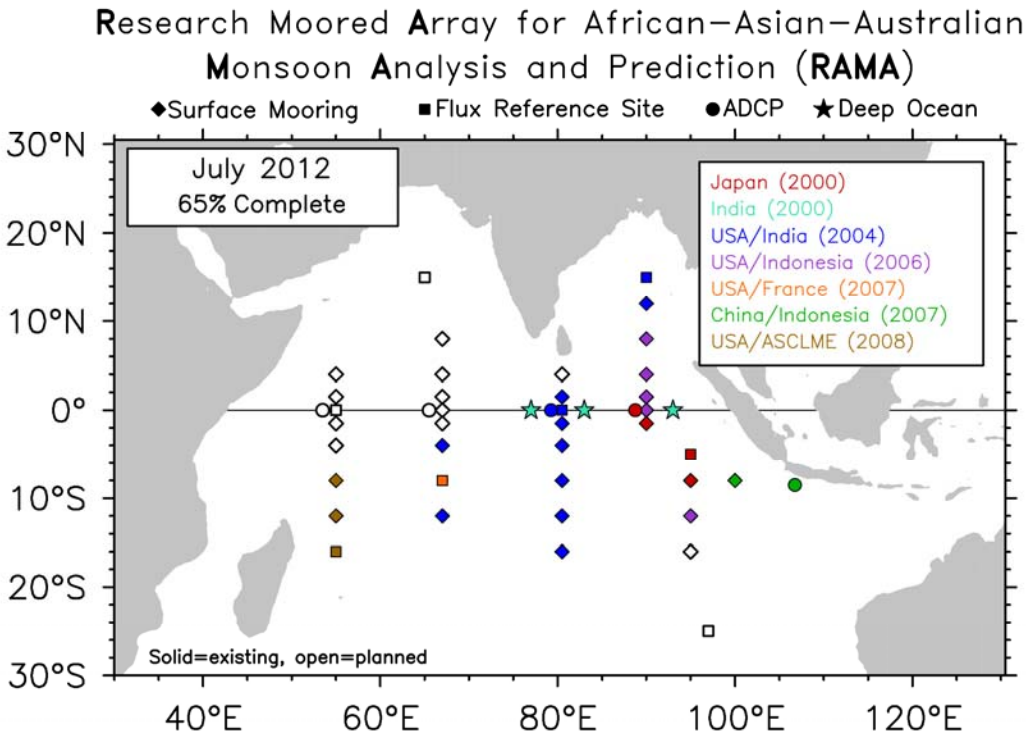
PIRATA Mooring Status Update: Jul 18, 2012

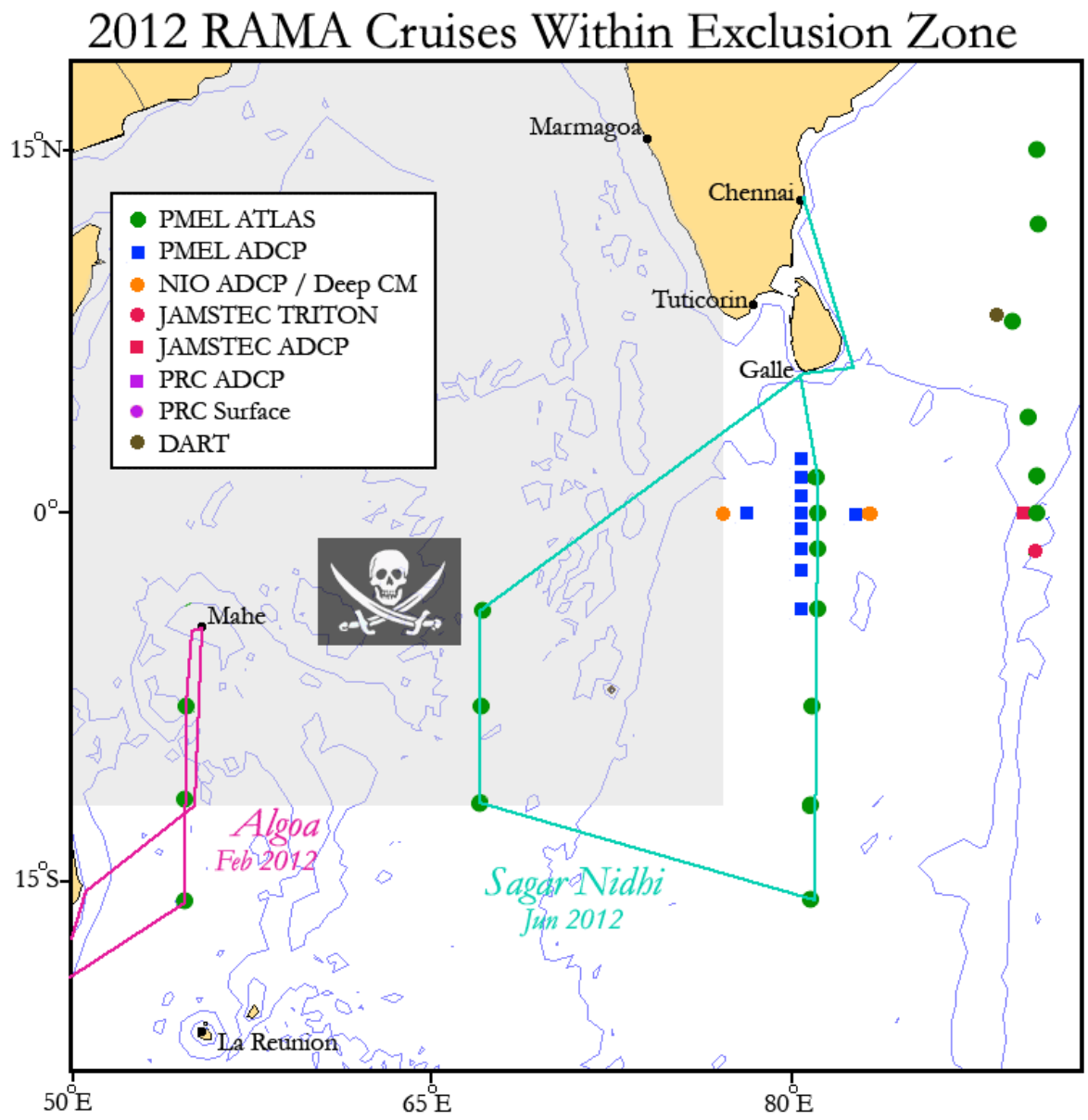


Indian Ocean Mooring Status Update: Jul 18, 2012



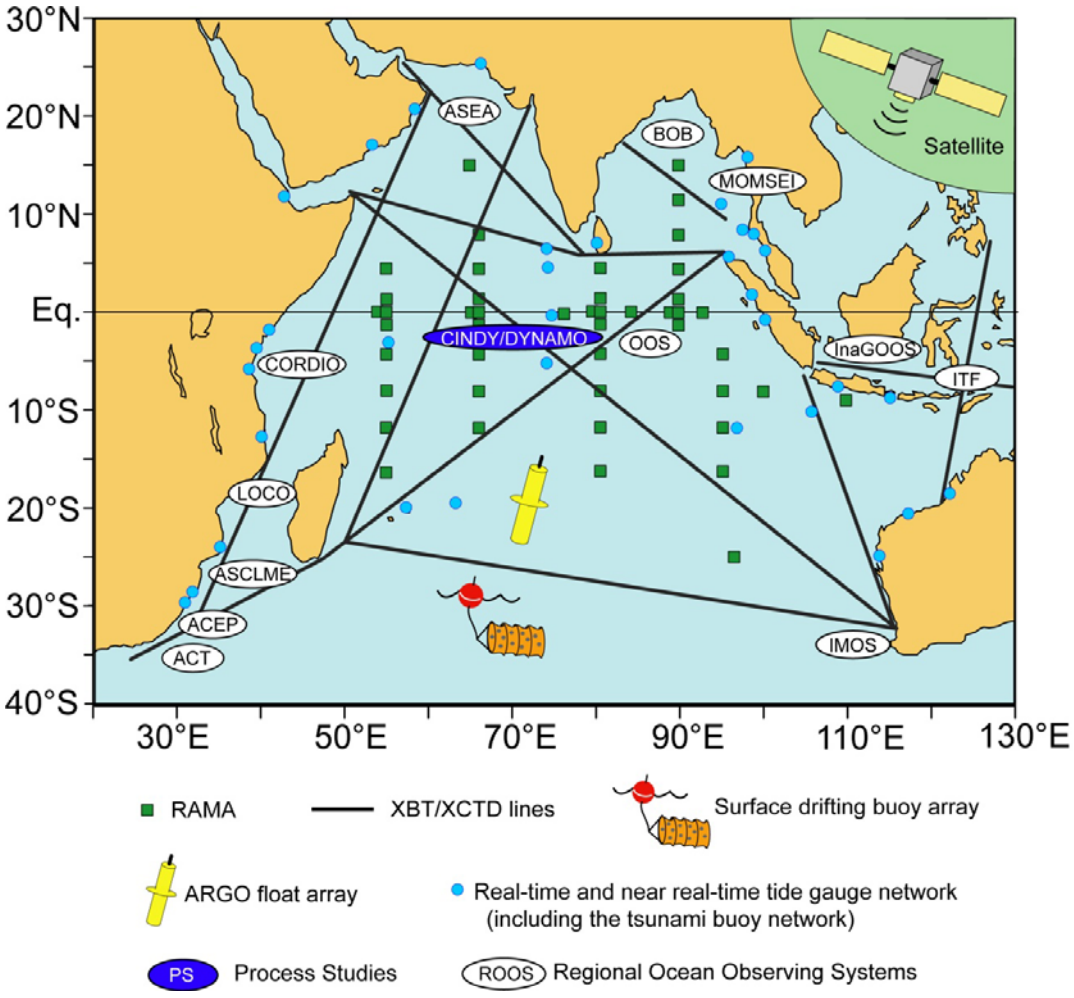
RAMA Implementation Status





2012 RAMA cruises within the Lloyds of London Piracy Exclusion Zone (shaded area). Magenta line is the track of RV Algoa in February 2012, during which the ship entered the Zone to avoid a tropical cyclone. Sea Marshals were aboard the RV Sagar Nidhi in June 2012 (blue line).

Indian Ocean Observing System (IndOOS)



APPENDIX C

REPORT BY THE EUCOS SURFACE MARINE PROGRAMME (E-SURFMAR)

(Report submitted by Jean Rolland, Météo France)

1) Summary

Name of Action Group	Surface Marine programme of the Network of European Meteorological Services, EUMETNET (E-SURFMAR)
Date of report	31 July 2012
Overview and main requirements addressed	The EUMETNET Composite Observing System (EUCOS) surface marine (E-SURFMAR) programme is an optional programme involving 17 out of the 29 EUMETNET members, who fund the activity on a GNI basis. Its main objectives are to coordinate, optimise and progressively integrate the European meteorological services activities for surface observations over the sea – including drifting and moored buoys, and voluntary observing ships. E-SURFMAR is responsible for coordination of buoy activities carried out by the European meteorological services, and the programme supports a Data Buoy Manager (DBM) to manage these activities. The DBM is supported and advised by the E-SURFMAR Data Buoy Technical Advisory Group (DB-TAG) which is an action group of the DBCP.
Area of interest	Ocean areas potentially affecting NWP over European countries. This covers the North Atlantic Ocean North of 10°N and the Mediterranean Sea (90°N-10°N; 70°W - 40°E).
Type of platform and variables measured	Drifting buoys: air pressure, SST, (wind) Moored buoys: air pressure, wind, air temperature, SST, waves (directional spectra), relative humidity.
Targeted horizontal resolution	250 km x 250 km, >150 drifting buoys, 4 moored buoys for satellite calibration/validation.
Chairperson/Managers	Manager E-SURFMAR: Mr Pierre Blouch, Météo-France Chairperson, Data Buoy Technical Advisory Group (DB-TAG): Mr Jon Turton, UK Met Office
Coordinator	Data buoy Manager: Mr Jean Rolland, Météo-France
Participants	Belgium, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, and the United Kingdom
Data centre(s)	Météo-France as SOC ISDM (Canada) as RNODC/DB
Website	http://www.eucos.net, under the heading “EUCOS Public” in “EUCOS networks” http://esurfmar.meteo.fr (restricted working area web site for E-SURFMAR participants)
Meetings	DB-TAG meets once a year. DB-TAG9 Las Palmas 3-4 May 2012
Current status (mid-2012)	77 E-SURFMAR drifting buoys in operation (68 Iridium, 9 Argos)+ 39 others reporting AP. 4 E-SURFMAR supported moored buoys in operation, plus a further 40 others operated by members and partners.
Summary of plans for 2013	Maintain a network of 100 operating drifting buoys, and to support the 4 reference moored buoys in operation.

2 Deployment plans for 2013

The drifting buoys will be deployed from various locations (Canada, Iceland, France, Norway, UK, USA, ...) in the Atlantic Ocean. Drifters from GDP are regularly upgraded with barometers and deployed in the North Atlantic Ocean by vessels plying from North America to Iceland, from North America to Europe and from Europe to North America. Within the allocated budget more than 100 buoys (including 30 upgrades (Iridium)) will deployed in the E-SURFMAR area of interest in the coming twelve months. New deployment routes will be investigated.

E-SURFMAR will continue to be actively involved in the GHRSST/DBCP Pilot Project in which the DBCP collaborates with the Group on High Resolution Sea Surface Temperature (GHRSST) to make measurements of 0.01°C precision from drifters.

E-SURFMAR will continue to deploy buoys in the Arctic Ocean through IABP. The main challenge with the ice buoys is their ability to survive after being released from frozen ice.

The four EUCOS supported moored buoys are Cabo Silleiro (Spain), K5 (UK), Lion (France) and M6 (Ireland). At present, Cabo Silleiro (transmission through Inmarsat) and K5 (with an autonomous Triaxys sensor transmitting through Iridium) are the only E-SURFMAR-supported moored buoys which report directional wave spectra onto the GTS. The Lion moored buoy (transmission through Meteosat) reports omni-directional spectra and M6 (transmission through Meteosat) is only reporting mean wave height and period. It is expected that a version of the system developed by the Met Office on K5 will be also installed on the Lion buoy with similar capability on M6 in due course. Spectral data area also available from other Spanish buoys and an autonomous Triaxys on the Brittany buoy.

3 Data management

3.1 Distribution of the data

3.1.1 Data policy

ESURFMAR encourages free and open access to data, in the spirit of WMO data exchange policy defined in WMO Congress Resolution 40 (Cg-XII). All basic meteorological and oceanographic data are coded in the appropriate WMO code form and disseminated on the WMO Global Telecommunication System (GTS)

3.1.2 Real-time data exchange

All the data are put on the GTS as quickly as possible.

The developments on a processing chain at Météo-France for drifter data producing GTS reports from Iridium SBD data were consolidated. The chain is able to produce FM13-SHIP, FM18-BUOY or FM94-BUFR messages. The distribution of BUFR messages allows to transmit the data of the first drifters having a resolution of 0.01K for SST.

Eighty percent of drifters operating are now using Iridium. This improves the data timeliness (see Annex). Between 1,500 to 2,000 daily observations are disseminated on to the GTS. The target (90%) of the percentage of data received within 50 minutes was reached. This results from efforts made during several years to have all buoys reporting through Iridium.

The mean lifetime (for Air Pressure) of the SVP-B drifters decreased to 273 days (344 days last year). One hundred and sixty one buoys failed to report air pressure measurements. This is the reason more buoys had to be deployed to maintain the network.

The availability of moored buoy data depends on the number of buoys operating. More than 90 hourly observations per day have been reported from E-SURFMAR buoys to the GTS, except in March where Lion buoy was out of order.

Since buoy Cabo Silleiro was taken into account in the performance computations, the percentage of EUCOS moored buoys data available within 50 minutes dropped from 100% to 75% i.e. below the target of 90%.

3.1.3 Delayed mode data exchange

The raw data from drifters (Argos and Iridium) are archived at “Centre de Meteorologie Marine” (CMM) at Meteo-France.
Data inserted onto the GTS are routinely archived by various centres (for drifting buoys ISDM, GDP, Coriolis…, Meteorological Services for drifting and moored buoys).
Archived data from drifters are also used to produce surface currents deduced from the buoys movement on a weekly basis
The metadata collection system at JCOMMOPS is used for drifting buoys.
E-SURFMAR members will compile DBCP Moored Buoy Metadata, once a standard template is published.

3.2 Data quality

The web page giving access to the Quality Control (QC) tools was maintained. The transmission delays onto the GTS is now monitored. (see http://www.meteo.shom.fr/qctools). Monthly statistics and 14-day graphs are available for all surface marine observations through the same interface. Buoys reporting in BUFR are monitored as those reporting through BUOY or SHIP alphanumeric messages. The blacklists, automatically issued for air pressure every day, are used to identify and correct potential problems.

For drifters the Air Pressure (AP) differences from the French model outputs the target of 1% of Gross Errors was achieved excepted by the end of 2011 and the beginning of 2012. The RMS of AP differences still has a seasonal variation, being higher in winter (0.8 to 1.0 hPa) than in summer (0.4 to 0.6 hPa).

For moored buoys the Air Pressure (AP) differences with the French the target of 0.5% of Gross Errors was achieved. The RMS of AP differences are about 0.5 hPa.

4) Instrument practices

ESURFMAR drifting buoys uses recommended DBCP formats (DBCP-M2 for Argos, formats published on Iridium PP website for Iridium).

A technical document on E-SURFMAR moored buoys was reviewed at DBTAG meeting in May 2012.

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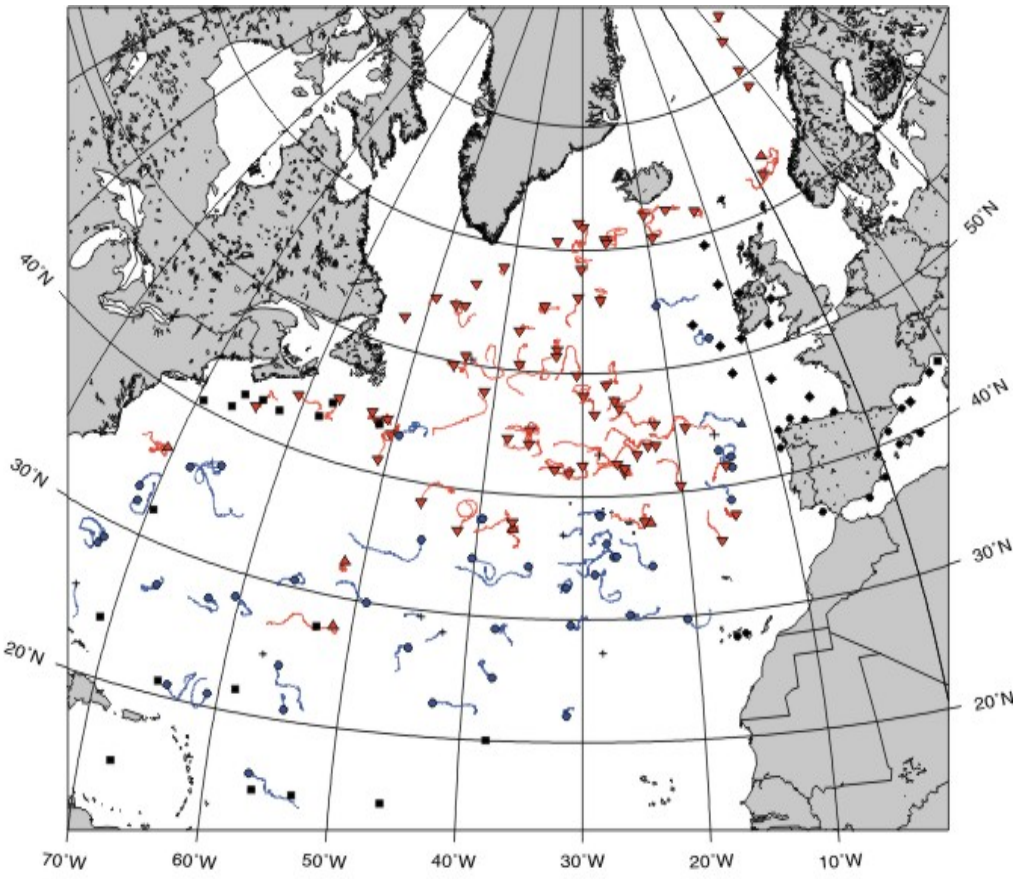
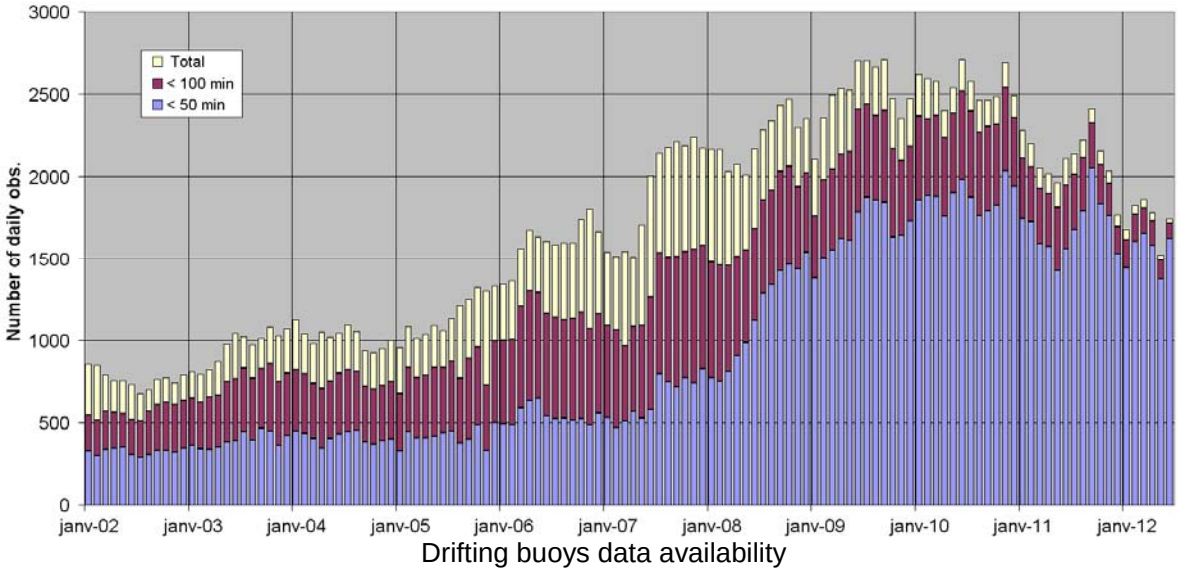
ANNEX



Drifting buoy trajectories and moored buoy positions
(June 2012)



Drifting buoys data availability

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APPENDIX D

REPORT BY THE INTERNATIONAL BUOY PROGRAMME FOR THE INDIAN OCEAN (IBPIO)

(Report submitted by Jean Rolland, Météo France)

1) Summary

Name of Action Group	International Buoy Programme for the Indian Ocean (IBPIO)
Date of report	31 July 2012
Overview and main requirements addressed	The International Buoy Programme for the Indian Ocean (IBPIO) was formally established at a meeting in La Reunion in 1996. The primary objective of the IBPIO is to establish and maintain a network of platforms in the Indian Ocean to provide meteorological and oceanographic data for both real time and research purposes. More specifically, the IBPIO supports the World Weather Watch Programme (WWW); the Global Climate Observing System (GCOS); the World Climate Research Programme (WCRP); the Global Ocean Observing System (GOOS); tropical cyclone forecast and monitoring; as well as the research activities of the participating institutions. The programme is self-sustaining, supported by voluntary contributions from the participants in the form of equipment and services (such as communications, deployment, storage, archiving, co-ordination...).
Area of interest	Indian Ocean North of 55°S and between 25°E and 120°E
Type of platform and variables measured	Drifting buoys: Air pressure, SST, (wind) Moorings: air pressure, wind, air temperature, SST, waves, relative humidity, SSS, current…
Targeted horizontal resolution	500 km x 500 km
Chairperson/Managers	Mr Graeme Ball, BoM, Australia
Coordinator	Mr Jean Rolland, Météo-France
Participants	Australia (ABOM), France (Météo-France), India (NIO, NIOT, INCOIS), Kenya (KMD), South Africa (SAWS), Mozambique (EMU); USA (GDP, Navoceano), TIP (Tropical Moored Buoy Implementation Panel).
Data centre(s)	ISDM (Canada) as RNODC/DB, Météo-France as SOC AOML, NOAA/PMEL
Website	http://www.shom.fr/meteo/ibpio
Meetings	Annual meetings in conjunction with DBCP meetings. IBPIO 15 in Fremantle (Australia) in October 2012
Current status (mid-2012)	129 drifters (107 with Air Pressure) 44 moored buoys (30 for RAMA 65% of the planned 46 site array)

Summary of plans for 2013	Maintain a network of 150 drifters. Maintain the moored buoy arrays.

2 Deployment plans for 2013

IBPIO participants are regularly encouraged to maintain their contributions of buoys, or to fund barometers to equip SVP drifters provided by GDP. Météo-France, ABOM and SAWS, regularly, fund barometer upgrades in the Indian Ocean. About 150 drifters are planned to be deployed during the next intersessional period, of which 1/3 will be equipped to transmit through Iridium (Action by ABOM, GDP, Météo-France).

Efforts are aimed at filling data gaps in the tropical regions, primarily during the Tropical Cyclone season. In the southern tropical area the buoys are provided by NOAA/GDP and will include about 10 (Iridium) barometer upgrades funded by Météo-France. The ABOM plans to deploy 9 drifting buoys between the central Indian Ocean and the Australian coast. NIO plans to continue to provide and deploy drifters in the Arabian Sea and in the Bay of Bengal (about 20 in 2012-2013).

RAMA maintenance will continue in the coming year. MOUs between the US and India, Indonesia and the Agulhas and Somali Current Large Marine Ecosystems (ASCLME) Project will provide 100 or more sea days annually, which will be used to maintain 21 PMEL ATLAS and ADCP sites. The Bay of Bengal Large Marine Ecosystem Project has funds to purchase a CO2 system like those PMEL deploys in the Pacific for enhancement of the 15°N - 90°E RAMA. JAMSTEC maintained 4 RAMA sites on a cruise in June 2012 and will revisit their sites in November 2013. China's First Institute of Oceanography (FIO) maintains their Bai-Long surface and subsurface mooring with annual cruises of about 15 days from Indonesian research vessels. The CLIVAR/GOOS Indian Ocean Panel and the IndOOS Resource Forum will conduct meetings during the week of October 15-20, 2012 in Capetown, South Africa. Among the topics of discussion will be security plans for cruises within the Exclusion Zone, and coordination of cruise resources among agencies. With adequate security measures, RAMA implementation into regions of piracy will proceed. PMEL will host a technical training session on mooring systems on a NOAA Ship Ronald H.Brown cruise for 3 Indonesian scientists in September 2012.

NIOT will maintain a network of 14 deep sea buoys (Ocean Observation Systems, OOS), in the Arabian Sea and in the Bay of Bengal and 4 coastal buoys system.

In the Southern part of the Indian Ocean (South of 35S), the deployment of SVP-B drifters provided by GDC and upgraded by Météo-France (about 30 Iridium units) should continue. The ABOM plans to deploy 13 SVP-B drifters in this area over the next 12 months including 8 upgrades. These deployments will be supported by the RV Marion Dufresne during her rotations between La Reunion, Crozet, Kerguelen and Amsterdam Islands.

In addition to the drifters upgraded by Météo-France and ABOM, GDC plans to provide SVP-B drifters for deployment in the Southern Indian Ocean.

In the sub-tropics (between the Tropic of Capricorn and 35S) the ABOM will deploy 6 SVP-B, including 2 near the Indian Ocean Gyre.

The SAWS, through the PMO in Cape Town, will continue to coordinate the deployment of drifters on behalf of GDP, ABOM and Météo-France from voyages to Marion Island (4 voyages every year, March, April, August and November). The ABOM plans to provide 2 SVP-B buoys for deployment from the scheduled voyages in 2013.

As in previous years, the GDP remains the biggest contributor to the IBPIO, with more than 100 planned drifters deployments.

3 Data management

3.1 Distribution of the data

3.1.1 Data policy

IBPIO encourages free and open access to data, in the spirit of WMO data exchange policy defined in WMO Congress Resolution (Cg-XII). All basic meteorological and oceanographic data are coded in the appropriate WMO code form and inserted to the Global Telecommunication System (GTS)

3.1.2 Real-time data exchange

All the data are placed on the GTS as quickly as possible.

The developments on a processing chain at Météo-France producing GTS reports from Iridium SBD data were consolidated. The chain is able to produce FM13-SHIP, FM18-BUOY or FM94-BUFR messages. The first drifters with a resolution of 0,01K for SST were distributed in BUFR in early 2011.

The evaluation of the Iridium communication system continued as a contribution to the DBCP drifter Iridium Pilot Project. Fourty five drifters using Iridium were deployed (35 last year). This improves the data timeliness. Two hundred and thirty three drifting buoys were deployed of which about 97% measured air pressure (SVP-B). More than 2500 daily observations were carried out on to the GTS all along the intersessional period with a maximum of 3600 by the end of 2011 and beginning of 2012 (see Annex). The percentage of data received within 50 minutes increased to 55% (June 2011) (20% in 2009) due the use of Iridium system and the improvment of the Argos system in respect of timeliness.

FIO presently maintains 2 RAMA sites. A subsurface ADCP mooring near 8°S 107°E was first deployed in November 2007. In February 2010 China deployed a surface mooring named Bai-Long near 8°S 100°E (transmission through Iridium). The Bai-Long mooring was designed to make air and ocean measurements comparable to ATLAS moorings and also measures CO2. Both FIO moorings were last serviced in February/March 2012. PMEL and FIO have incorporated data from the Bai-Long mooring into PMEL's Tropical Moored Buoy web pages.

PMEL has developed a new mooring system named TFlex (transmission through Iridium). The first prototype system deployed in March 2011 within a few miles of the ATLAS system at 12°S - 93° E was recovered in April 2012. The TFlex system performance and data quality are under analysis. Another TFlex system is being tested in the Atlantic PIRATA array and others will be deployed in 2012 and 2013.

By mid-2012, 18 of 24 RAMA moorings were reporting on the GTS (WMO ID's 14040, 14041, 14042, 14043, 14046, 23001, 23003, 23004, 23005, 23006, 23007, 23008, 23009, 23010, 53005, 53006, 53009, 53053), 10 of the 14 deep sea NIOT moored buoys too (WMO ID's 23091, 23093, 23095, 23097, 23100, 23171, 23459, 23494, 23495, 23496)

3.1.3 Delayed mode data exchange

Data are routinely archived by various centres (for drifting buoys ISDM, GDP, Coriolis…, Meteorological Services for drifting and moored buoys).

Archived data from drifters are also used to produce surface currents deduced from the buoys movement on a weekly basis

The metadata collection system at JCOMMOPS is used for drifting buoys.

PMEL's Tropical Moored Buoy website displays and distributes the RAMA data (http://www.pmel.noaa.gov/tao/rama/).

3.2 Data quality

The web page giving access to the Quality Control (QC) tools was enhanced. The transmission delays onto the GTS is now monitored. (see http://www.meteo.shom.fr/qctools). Monthly statistics and 14-day graphs are available for all surface marine observations through the same interface. Buoys reporting in BUFR are monitored as those reporting through BUOY or SHIP alphanumeric messages. The blacklists, automatically issued for air pressure every day, are used to identify and correct potential problems.

For drifters the Air Pressure (AP) differences from the French model outputs were generally lower than 2% of Gross Errors (excepted in March and April 2012). The RMS of AP differences decreased a little bit being between 0.6 - 0.8 hPa.

4) Instrument practices

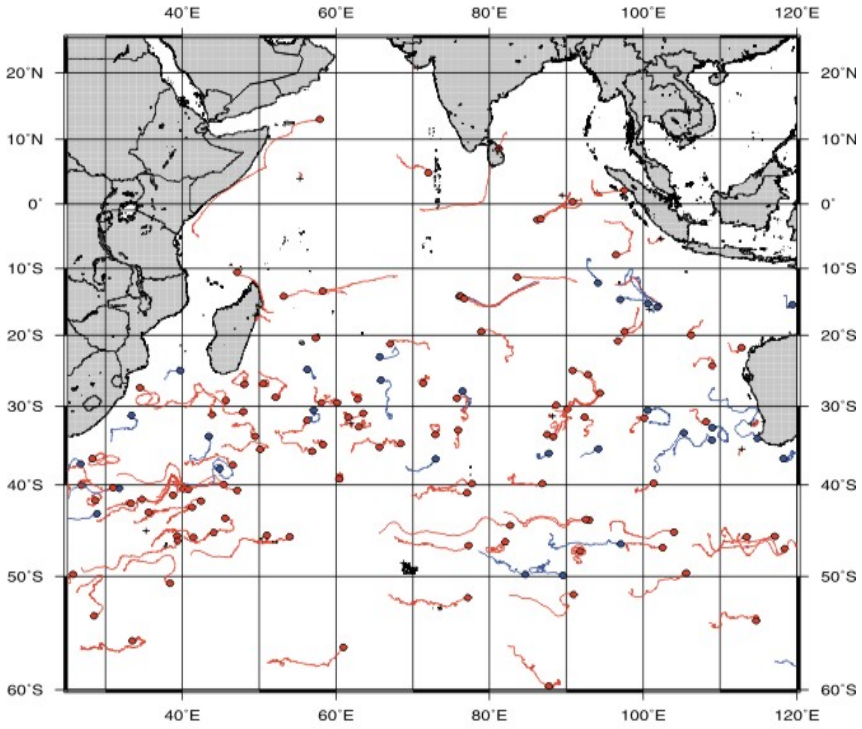
IBPIO drifting buoys uses recommended DBCP formats (DBCP-M2 for Argos, formats published on Iridium PP website for Iridium).

5) Issues: maintenance of RAMA moored buoys

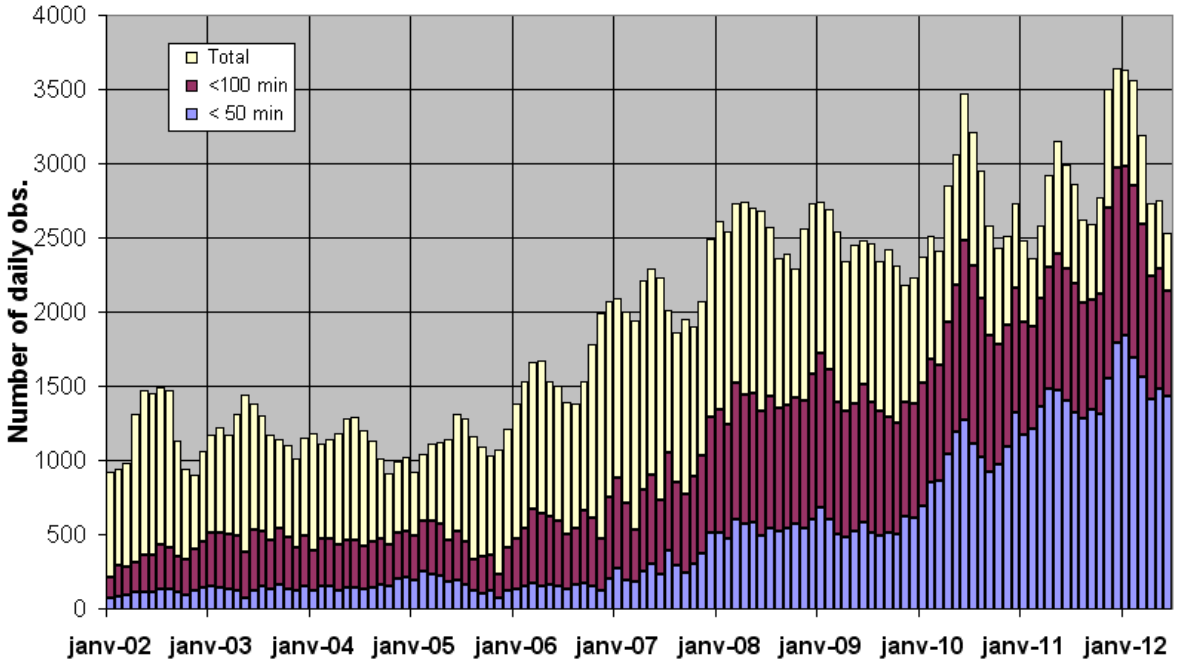
Between July 2011 and June 2012, 143 sea days were provided in support of RAMA sites: India provided 63 days for PMEL's ATLAS and ADCP moorings; Japan provided 23 days in support of their m-TRITON and ADCP moorings; Indonesia provided 42 days, 27 for PMEL's ATLAS and TFlex moorings and 15 days for FIO's surface and subsurface moorings. During this period 24 of 30 RAMA sites were serviced.

Damage to buoys and theft of instrumentation continues to be a problem, especially at sites near areas of intense fishing activity. In addition to vandalism, well-publicized piracy events have resulted in the suspension of RAMA implementation off Africa and in the Arabian Sea. Lloyds of London defines an Exclusion Zone north of 12°S and west of 78°E in which additional premiums apply to insure commercial vessels. Due to lack of adequate security measures a RAMA mooring south of the Sychelles was not scheduled to be maintained en 2012, but fortuitously was visited due to bad weather. While servicing other RAMA moorings outside of the Exclusion Zone, the South African RV Algoa was forced to seek shelter from Tropical Cyclone Giovanna in Port Victoria, Seychelles. After the storm had passed the mooring was maintained as the ship returned southward. Two sited implemented in the Exclusion Zone along 67°E in 2009 were not serviced in 2010 or 2011 due to lack of security measures. India placed security guards on their RV Sagar Nidhi in 2012 so that these sites could be maintained.

ANNEX



Drifting buoys trajectories (June 2012)



Drifting buoys data availability

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APPENDIX E

REPORT BY THE DBCP-PICES NORTH PACIFIC DATA BUOY ADVISORY PANEL (NPDBAP)

(Report submitted by Shaun Dolk, NOAA/AOML, USA)

1) Summary

Name of Action Group	DBCP-PICES North Pacific Data Buoy Advisory Panel (NPDBAP)
Date of report	31 July 2012
Overview and main requirements addressed	The goals of the NPDBAP are to deploy 60 SVPB drifters a year, and maintain 75 active buoys in the region.
Area of interest	North Pacific Ocean and marginal seas generally north of 30°N
Type of platform and variables measured	Lagrangian drifters measuring sea level pressure, SST, and sea-surface velocity
Targeted horizontal resolution	5° x 5°
Chairperson/Managers	Co-Chairperson for the NE Pacific: Al Wallace, MSC, Canada Co-Chairperson for the NW Pacific: Position vacant and to be proposed by PICES
Coordinator	Mr Shaun Dolk, NOAA / AOML
Participants	Al Wallace, Chris Marshall, Joe Linguanti, Ignatius Rigor, and Shaun Dolk
Data centre(s)	Global Drifter Assembly Centre (DAC) Integrated Science Data Management (ISDM), Canada
Website	http://npdbap.noaa.gov/
Meetings *(meetings held in 2011/2012; and planned in 2012/2013)*	Yearly meetings usually held in conjunction with DBCP meetings. Next meeting planned 02 October, 2012 in Fremantle, Australia
Current status summary *(mid-2012)*	From 01 August 2011 to 27 July 2012, 90 drifters were deployed in the North Pacific Ocean. Of the 90 drifter deployments, 58 units were equipped with barometer sensors and the remaining 32 drifters were standard SVP type drifters.
Summary of plans for 2013	The goal for 2013 is to reach 100 drifter deployments, for which 60 drifters will be equipped with barometer sensors.

2 Deployment plans for 2013

Both the GDP and Environment Canada will continue to utilize ships of opportunity for drifter deployments, while also looking for new possibilities within the Canadian and United States Coast Guards.

3 Data management

3.1 Distribution of the data

The drifter Data Assembly Center (DAC) assembles, quality controls and interpolates data from approximately 1300 drifters per month from all GDP national and international partners, from all oceans of the world. These data are made available through the web with a delayed time of 3—4 months. As of the time of writing this report (July 2011), data are available through March 2011. These data can be accessed at http://www.aoml.noaa.gov/phod/dac/dacdata.php.

3.1.1 Data policy

The DAC, located at NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) has access to drifters from GDP partners that have given Service Argos permission to make these data available to the DAC. In return the partners have access to all quality controlled and interpolated data available in the database via the World Wide Web. Non-interpolated quality controlled data and raw data are made available via ftp transfer upon request.

3.1.2 Real-time data exchange

All data from drifters in the GDP's programs are disseminated via GTS as soon as drifters are deployed. The GDP monitors data going out on the GTS, and transmissions of sensors producing bad data or transmissions from grounded drifters are removed from the GTS data stream.

The GDP does not monitor GTS data timeliness and relies on operational centres to report on these issues.

3.1.3 Delayed mode data exchange

Drifter data (raw Argos data, edited non-interpolated and interpolated data) are archived at AOML. These datasets are also sent once or twice a year with a 6-month delay to Integrated Science Data Management (ISDM), the RNODC for drifter data, for permanent archival and further distribution. The DAC is currently preparing to send data through Dec 2009 to ISDM.

Metadata for GDP drifters are received at the DAC directly from drifter manufacturers who send standardized specification sheets for batches of identical drifters prior of delivery of the instruments. Portions of this metadata are extracted and are made available on the deployment log at the DAC web page www.aoml.noaa.gov/phod/dacdeployed.html. Specification sheets are archived at the DAC. Deployment date, date of last transmission, drogue off and cause of death metadata are determined during quality control of the dataset and are made available through the web at www.aoml.noaa.gov/phod/dac/dirall.html. These web pages are interrogated by JCOMMOPS to gather information for their metadata systems.

3.2 Data quality

4) Instrument practices

See the report of the Global Drifter Programme (GDP) in Appendix A.

5) Other issues as needed

No specific issue to report.

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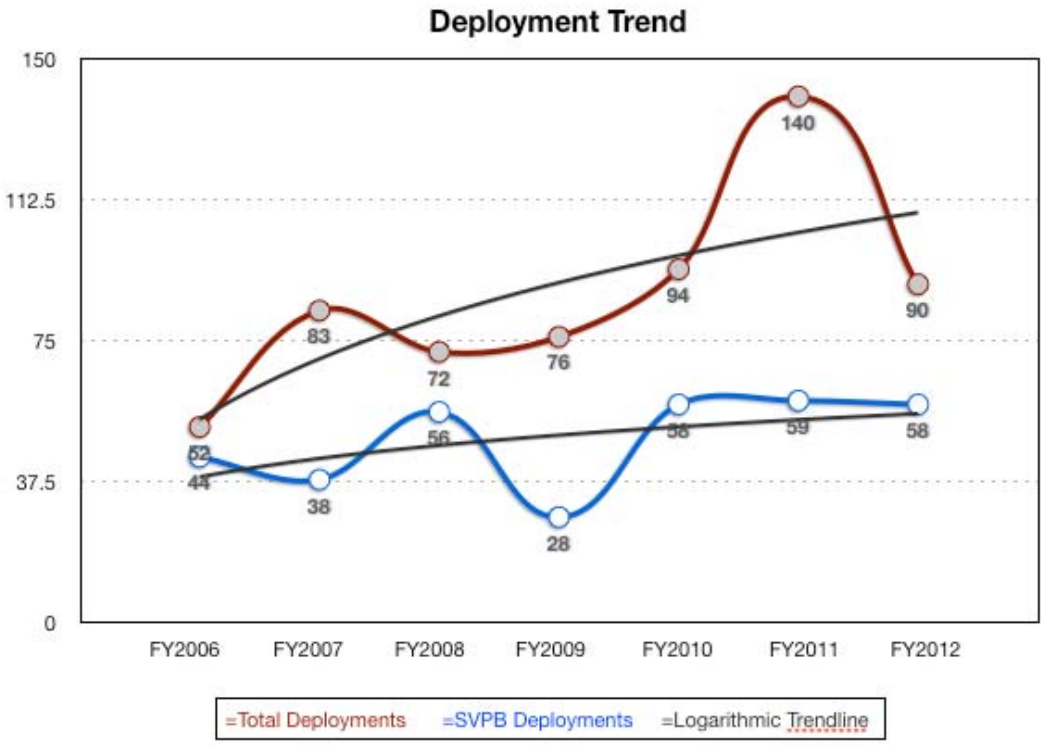
Annex
Status maps and graphics

Deployment Trend

	Total	SVPB	SVP	SVPW	SVPBW	SVPG
FY2006	52	44	6	0	2	0
FY2007	83	38	44	1	0	0
FY2008	72	56	16	0	0	0
FY2009	76	28	35	0	0	13
FY2010	94	58	13	1	0	22
FY2011	140	59	81	0	0	0
FY2012	90	58	32	0	0	0



APPENDIX F

REPORT BY THE INTERNATIONAL ARCTIC BUOY PROGRAMME (IABP)

1) Summary

Name of Action Group	
Date of report	17 September 2012
Overview and main requirements addressed	Participants of the IABP continue to work together to maintain a network of drifting buoys on the ice of the Arctic Basin to provide meteorological and oceanographic data for real-time operational requirements and research purposes including support to the World Climate Research Programme (WCRP) and the World Weather Watch (WWW) Programme.
Area of interest	Central Arctic Ocean and its marginal seas, excepting Exclusive Economic Zones, where agreements of the Coastal States have not been obtained
Type of platform and variables measured	Buoys on ice and/or in water measuring: Basic meteorological variables such as atmospheric air pressure and air temperature. Other variables such as: atmospheric pressure tendency, air chemistry (e.g. ozone), snow and sea-ice properties, as well as sub-surface oceanographic characteristics (e.g. temperature and salinity)
Targeted horizontal resolution	250 km x 250 km
Chairperson/Managers	Chairperson: Christine Best, Meteorological Service Canada
Coordinator	Ignatius Rigor, Polar Science Center, University of Washington, USA
Participants	Participants range from Science Institutions to Universities to Government Agencies. http://iabp.apl.washington.edu/overview_participants.html Participant contributions are shown on this site http://iabp.apl.washington.edu/overview_contributions.html
Data centre(s)	
Website	http://iabp.apl.washington.edu/
Meetings *(meetings held in 2011/2012; and planned in 2012/2013)*	Annual meetings spring or early summer in the Northern Hemisphere. 22nd Annual Meeting of the International Arctic Buoy Programme [IABP], hosted by the World Climate Research Program, World Meteorological Organization, was held in Geneva, Switzerland, 5 – 7 June 2012

Current status summary *(mid-2012)*	As of June 2012, 73 buoys were reporting. Most of these buoys used Iridium (51), rather than Argos (22).
Summary of plans for 2013	Summer is the primary deployment season in the Arctic. Participants will deploy 50+ buoys ranging from: SVP's providing surface air pressure, buoys providing air pressure and air temperature, Ice Mass Balance buoys, Oceanographic Profiling buoys measuring temperature and salinity to great depths and buoys that measure atmospheric air components such as ozone. Plans for future years will be similar.

2 Deployment plans for 2013

Deployment plans for 2013 will be posted on the IABP web page http://iabp.apl.washington.edu/overview_deploymentplans.html. As plans and opportunities for deployments become known, Participants are encouraged to DBCP-27/Doc. 7 Rev. 1, Appendix F, p. 2 *make then known to the IABP Coordinator Ignatius Rigor Ignatius@uw.edu.*

3 Data management

3.1 Distribution of the data

Most of the meteorological and oceanographic data is posted on the GTS. Much of the ice data and atmospheric chemistry data are available from Participants' web pages. Efforts continue to have those using Iridium communication to find means to post data to the GTS.

3.1.1 Data policy

Data exchange policies of the Participants for that data not getting onto the GTS has not been catalogued. However, most Participants have web sites that display data and/or graphs of the data.

3.1.2 Real-time data exchange

Details on percentage of data distributed on GTS.
Details on data timeliness (i.e. reception time at operational meteorological services minus observation time), including known problems, possible solutions, statistics, etc.

3.1.3 Delayed mode data exchange

Data are available from http://iabp.apl.washington.edu as well as ISDM. Data are also archived at the World Data Center for Glaciology (www.nsidc.org), the U.S. National Science Foundation's Cooperative Arctic Data and Information Service (www.AONCADIS.org).
Collection of and distribution of metadata is an ongoing task of the Coordinator. We plan to provide metadata through the IABP web server (iabp.apl.washington.edu), and produce netCDF data files containing the metadata information.

Details on the provision of discovery metadata about available data-sets using ISO 19115 standard.

This issue needs to be researched.

3.2 Data quality

Feedback is ad hoc. Data is suppressed when noted to be questionable. *The IABP Coordinator participates in the buoy QC forums of the DBCP and JCOMM, and performs day-to-day QC of the data. More thorough QC of the data is performed during the analysis and production of the research data bases.*

4) Instrument practices

Data analyses procedures for the Arctic are documented in journal papers. As part of our efforts to collect and provide the metadata, details on instruments and other procedures will be provided through our web pages.

5) Other issues as needed

5.1 Challenges to sustain IABP network
Areas of First-Year Ice and Open Water during summer
Deploying buoys in the Eurasian Arctic

5.2 Buoy data not getting onto GTS
5.2.1 Argos Buoys – There are some active Argos platforms in the IABP area north of 66N not yet being processed by Service Argos for the GTS. The IABP Coordinator will contact them to promote sharing via having data posted to the GTS.
5.2.2 Iridium Buoys - Many researchers are using Iridium rather than Argos to get their data and that data is being posted to ftp sites and no further. Efforts continue to have data flipped to the GTS. For example, Joubeh, Scotia Weather, and Environment Canada have collaborated for posting Iridium data on the GTS.

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Annex

Status maps and graphics

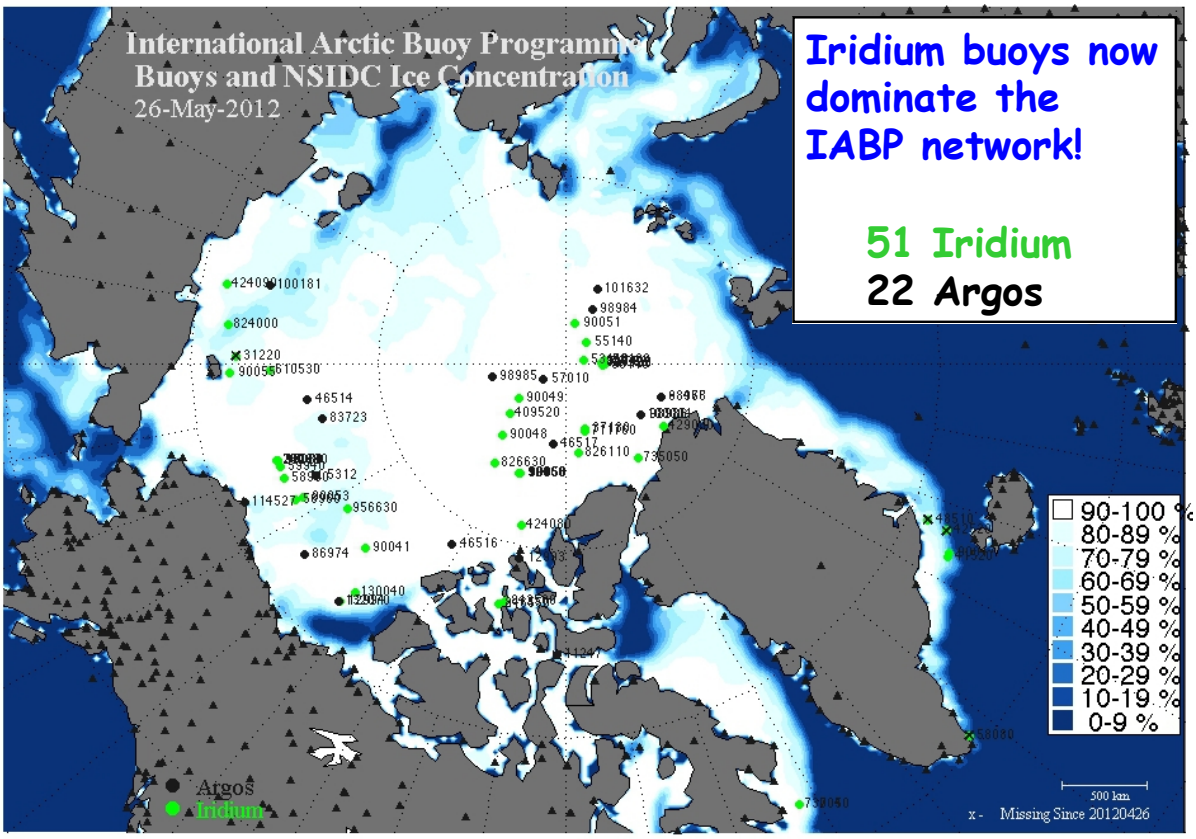

Figure 1. Status of IABP Observing System as of May 2012. Iridium buoys are shown in green, Argos in black.

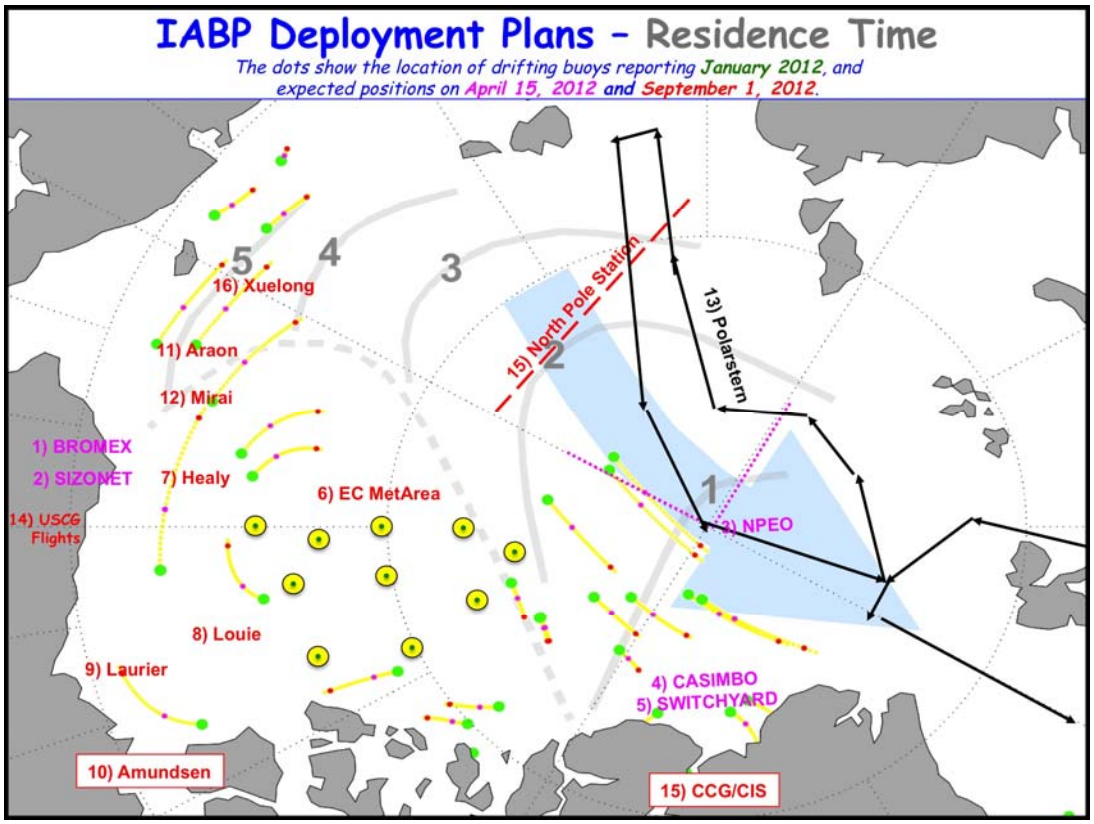

Figure 2. IABP Deployment plans for the spring and summer of 2012.

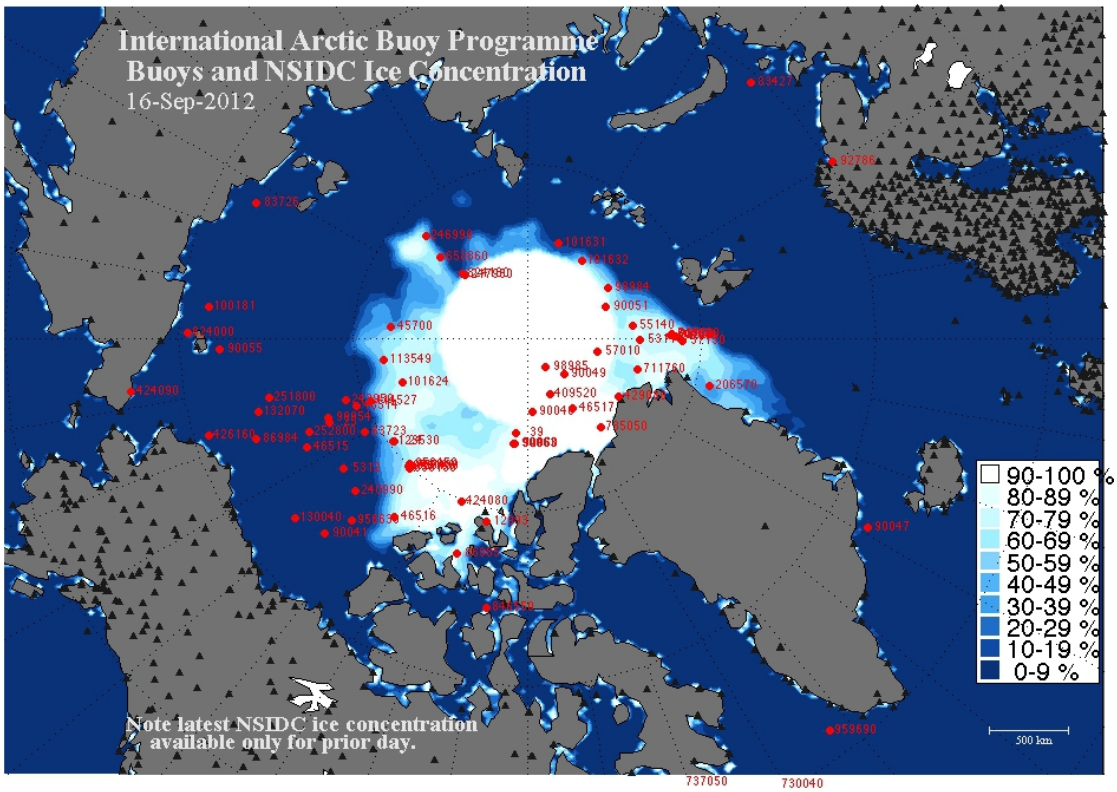

Figure 3. Status of IABP Array as of Sept. 16, 2012. There are 79 buoys reporting as we near the end of our spring and summer deployment season.

APPENDIX G

REPORT BY THE WCRP-SCAR INTERNATIONAL PROGRAMME FOR ANTARCTIC BUOYS (IPAB)

(Report submitted by Christian Haas, Canada)

1) Summary

Name of Action Group	WCRP-SCAR International Programme for Antarctic Buoys (IPAB)
Date of report	Sept. 2012
Overview and main requirements addressed	The Participants of the WCRP/SCAR International Programme for Antarctic Buoys (IPAB) work together to maintain a network of drifting buoys in the Southern Ocean, in particular over sea ice, to provide meteorological and oceanographic data for real-time operational requirements and research purposes. The IPAB was established in 1994 became an Action Group of the Panel in October 1994.
Area of interest	South of 55°S and that region of the Southern Ocean and Antarctic marginal seas within the maximum seasonal sea-ice extent.
Type of platform and variables measured	Ice buoys measuring the following: Basic variables: Buoy position, atmospheric pressure and SST Other variables: Air temperature, ice and / or snow temperature, atmospheric pressure tendency, wind, snow and sea-ice properties and oceanographic variables
Targeted horizontal resolution	500 km x 500 km
Chairperson/Managers	Dr Petra Heil, AAD and ACE CRC, Hobart, Australia
Coordinator	Dr Christian Haas, York University, Toronto, Canada
Participants	- Alfred Wegener Institut, Germany - Australian Antarctic Division, Australia - Bureau of Meteorology, Australia - British Antarctic Survey, UK - Finnish Institute for Marine Research, Finland - GI, University of Alaska Fairbanks, USA - IARC, University of Alaska Fairbanks, USA - National Ice Center, USA - National Snow and Ice Data Center NSIDC, USA - Meteorological Service NZ LTD, New Zealand - Norwegian Polar Institute, Norway - Polar Science Center, Univ. of Washington, USA - National Institute of Polar Research, Japan - JAMSTEC, Japan - Programma Nazionale di Ricerche in Antartide, Italy - DAMTP, UK - SAMS, UK - York University, Toronto, Canada - CLS/Service Argos, France - South African Weather Service, South Africa - Meteorological Office, UK - CRREL, USA

Data centre(s)	Alfred Wegener Institute for Polar and Marine Research, Germany: http://www.pangaea.de/search?q=ipab National Snow and Ice Data Center NSIDC, USA: http://nsidc.org/data/docs/daac/nsidc0084_ipab_antarctic_buoys.gd.html
Website	http://www.ipab.aq/
Meetings *(meetings held in 2011/2012; and planned in 2012/2013)*	The 6th IPAB Participant Meeting was held on June 4 and 5, 2012, at WCRP/WMO in Geneva Switzerland, in conjunction with the International Arctic Buoy Programme IABP Meeting. The next meeting is planned to coincide with the IGS sea ice symposium in Hobart, Tasmania, in 2014.
Current status summary *(mid-2012)*	IPAB activities have significantly increased recently, with the deployment of 16 buoys in the Bellingshausen and Amundsen Seas in November/December 2010, including mostly new technology developed for acquisition of additional atmospheric, ice, and ocean data. In addition, the University of Washington, and National Ice Center have received seed funding for the deployment of 20 and more buoys each year from 2012 to 2013 primarily in the Ross and Amundsen seas. 18 of these were deployed between December 2011 and February 2012. The Meteorological Services of South Africa, Australia, and New Zealand continue to operationally deploy numerous SVP's in the Southern Ocean, primarily north of the sea ice edge.
Summary of plans for 2012/13	Main deployments will be during the Australian SIPEX 2012 cruise in September/October 2012 in East Antarctica (40+ buoys, mostly without GTS), and during USIPAB cruise to Ross/Amundsen Sea in January/February 2013 (26+ buoys). ANTXXIX/6 (AWI's Polarstern cruise into the Weddell Sea) will provide deployment opportunities for June to August 2013.

2 Deployment plans for 2013

The SIPEX 2012 cruise of the Aurora Australis (Australia; PI: Petra Heil) will deploy the following buoys off East Antarctica between 112 and 120 East and 64 and 67 South during September – October 2012:

- 4 AAD Stress-gauge buoys (GPS, Tair, Tice, Tsnow, Pair, 3D strain)
- 2 MetOcean buoys (GPS, Tair, Pair)
- Up to 15 Clearwater ice drifters (GPS, Tair)
- Up to 8 Clearwater ice drifters (GPS, Tair, Pair, Tice)
- 2 SAMS sea-ice mass-balance buoys (GPS, vertical Tice)
- 1 CanaTec ice buoy (GPS)
- (3 SAMS plus 3 x 2 GPS etc buoys =) Ted Maksym, WHOI)
- (8 Wave buoys plus 1[TBC] open-water buoy =) Alison Kahout, NIWA)

The wave buoys will be deployed in the MIZ, with the remainder in one or two meso-scale arrays of 100 km width. Only the 4 AAD, 2 Metocean and some of the Clearwater buoys will measure SLP.

USIPAB (PI: Ignatius Rigor) will deploy in the Ross, Amundsen, and Bellingshausen seas from the US icebreaker NB Palmer in January and February 2013:

1 SVP-BC for Piers (@McMurdo)
3 Ice Canisters (@UW)
6 + 4 AXIBs (6@LBI ready to ship)
2 UpTempO/ADOS buoys
10+ SVP-B buoys

Further buoys will be deployed by Alfred Wegener Institute's Polarstern (Germany; PI: Marcel Nicolaus) winter cruise in June-August 2013 to the Weddell Sea.

Please contact PIs for further deployment opportunities during these projects.

3 Data management

3.1 Distribution of the data

3.1.1 Data policy

Data are generally freely distributed among IPAB participants as part of general scientific collaboration. Participants are encouraged to submit their data to the IPAB coordinator upon completion of their own scientific analyses.

3.1.2 Real-time data exchange

Participants are encouraged to transmit their data to the GTS. However, unfortunately only few data are actually being transmitted (10-20%). Many participants are overwhelmed by new requirements due to increased usage of Iridium transmission.

3.1.3 Delayed mode data exchange

We work closely with the Integrated Science Data Management Service (ISDM) of the Department of Fisheries and Ocean (DFO), Canada on the reception, archiving, and posting of IPAB GTS data.

3.2 Data quality

Data quality is an ongoing issue. QC is performed by the individual science groups, or by some national data centres and the DBCP when data are transmitted to the GTS.

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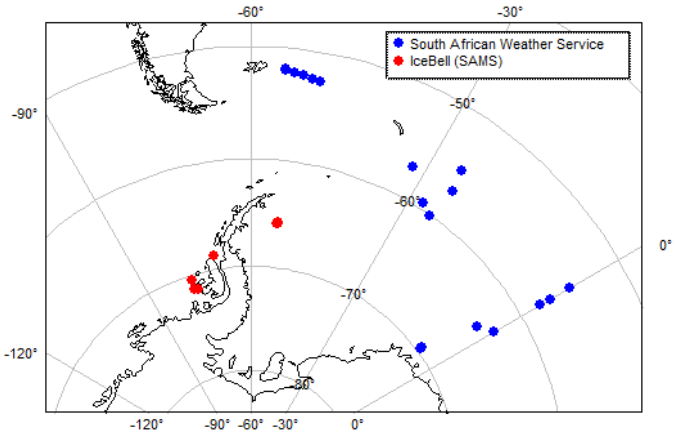
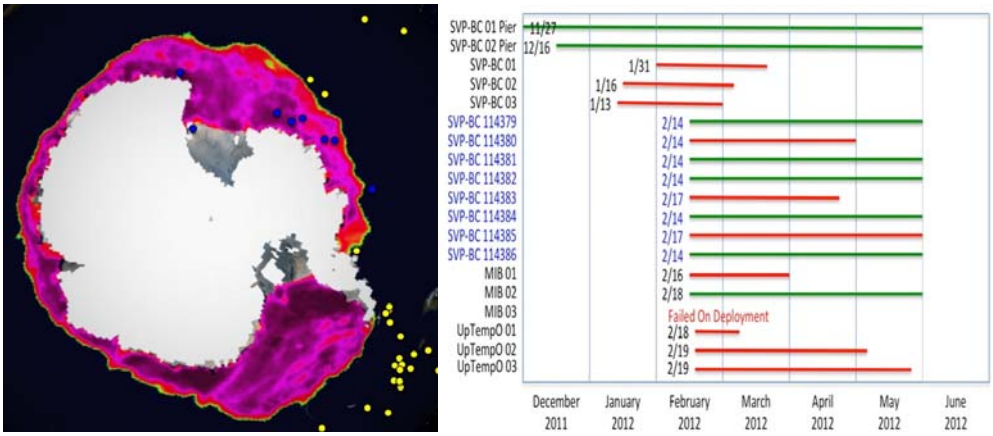
Annex (optional)

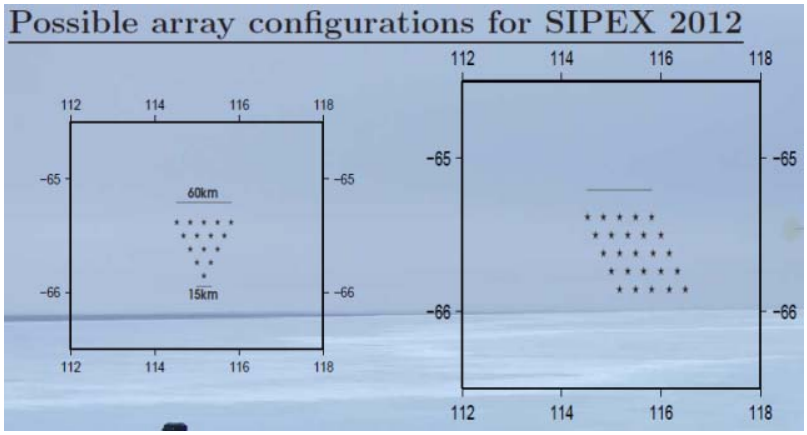
Status maps and graphics



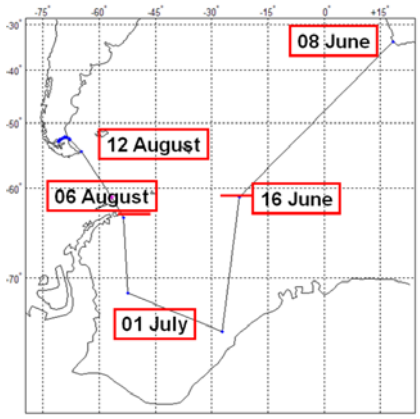
2011/12 deployments in the Southern Ocean by UK Icebell project and South African Weather Service)



Deployments of USIPAB in the Ross, Amundsen, and Bellingshausen seas in 2011/12. Green bars show buoys still operational in May 2012, red show failed buoys.



Deployment plans during Australian SIPEX 2012 in the Southern Ocean (axis ticks represent Eastern Longitures and Southern Latitudes, respectively).



Planed cruise track during German Weddell Climate and Ecosystem Study in June-August 2013, during which numerous buoys will be deployed.

APPENDIX H

REPORT BY THE INTERNATIONAL SOUTH ATLANTIC BUOY PROGRAMME (ISABP)

(report submitted by Mayra Pazos, NOAA/AOML, USA)

1) Summary

Name of Action Group	International South Atlantic Buoy Program
Date of report	31 July 2012
Overview and main requirements addressed	The main objective of ISABP is to establish and maintain a network of platforms in the Tropical and South Atlantic Ocean in order to provide meteorological and oceanographic data for both real-time and research purposes. The task includes support to the World Weather Watch Programme (WWW), the Global Climate Observing System (GCOS), the World Climate Research Programme (WCRP), and the Global Ocean Observing System (GOOS), as well as to the research activities of participating institutions.
Area of interest	South Atlantic Ocean north of 55S plus Tropical Atlantic Ocean up to 20N
Type of platform and variables measured	Lagrangian drifters measuring sea level pressure, SST, salinity and sea-surface velocity Moored Buoys measuring winds, sea level pressure, humidity, radiation, fluorimeter, currents, waves, SST . Wave sensors
Targeted horizontal resolution	5 degrees x 5 degrees
Chairperson/Managers	Mr Ariel Troisi, SHN, Argentina
Coordinator	Mayra Pazos, AOML-NOAA, USA Johan Stander, SAWS, South Africa
Participants	Dr Sonia Cavalcante, Brazil
Data centre(s)	Historical drifter data are assembled, quality controlled at AOML, Miami, then sent to ISDM for archival and further distribution. Real time data is also archived at ISDM Data from moored buoys is available at GOOS Brasil home page: http://www.goosbrasil.org.br.
Website	http://www.jcommops.org/dbcp/isabp/index.html http://www.oceatlan.org/isabp/en/index.html http://www.goosbrasil.org.br
Meetings *(meetings held in 2011/2012; and planned in 2012/2013)*	Meetings are hold every odd year, normally in May-July. Last meeting, ISABP- 13 took place in Buenos Aires, Argentina, on

	April 19, 2010 Next meeting planned by Videoconference in October/2012
Current status summary *(mid-2012)*	As of August 20, 2012, there were a total of 140 drifters in the South Atlantic region, (56 SVP, 84 SVPB), six operational moored buoys and one wave sensor..
Summary of plans for 2013	Continue to address observational gap areas specially, in the Gulf of Guinea and Angola Basin; pursue recommendation of conducting studies and evaluate the impact of drifter pressure data and SST on the skills of numerical weather forecasting models for the region; increase number of SVPB in the region. Beginning a contribution of ARGO Drifter deployments and revising a strategy of launching.

2 Deployment plans for 2013

Deployments during the last year (July 2011 through June 2012) are shown in Figure 1.
There were a total of 191 drifters deployed in the region, 109 SVP, 74 SVPB 7 with salinity and 1 with wind sensors. A total of 9 failed on deployment. Efforts to populate hard to reach areas (i.e. Gulf of Guinea and Angola Basin) continued during the intersessional period. Deployments were carried out by US vessels, the Brazilian Navy, South Africa Weather Service (SAWS), the Falkland Islands, Tristan da Cunha, South Thule fishing vessels and several others.

There were 72 drifters (43 SVP and 28 SVPB) deployed between 55^0 S and 65^0 S in the South Atlantic that were part of a regional study from Christian Reiss from NOAA Fisheries, California, and Andrew Thompson, California Institute of Technology, California, most of which made it to the ISABP region soon after deployment. Figure 2 shows these deployments.

The GDP deployment plans from June 1, 2012 – May 31, 2013 are as follows:

Tropical Atlantic (20^0S – 30^0N):	SVP=250	SVPB=50	(upgraded by AOML or Meteo-France)
Extra Tropical Atlantic (40^0S – 20^0S):	SVP=20	SVPB=55	(upgraded by Brazil, AOML, SAWS)
Southern Atlantic (60^0S – 40^0S):	SVP=0	SVPB=115	(upgraded by AOML)

Moored buoys - Brazilian Buoy Program plans to maintain 6 moored buoys from along Brazilian littoral, from south to northeast. Two more are being acquiring to be deployed in the North as in Figure 4.

3 Data management

3.1 Distribution of the data

These data are assembled and quality controlled at the GDP Drifter Data Assembly Center, and available through the DAC web page (http://www.aoml.noaa.gov/phod/dac/dacdata.php) and from ISDM web (http://www.meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/drib-bder/index-eng.htm)
Brazilian Buoy Program has its data available into GTS as well as at webpage http://www.goosbrasil.org/pnboia/index.php for moored and drifting buoys.

3.1.1 Data policy

Following current standards, ISABP promotes timely, free and open data exchange.

3.1.2 Real-time data exchange

All data from drifters are disseminated via GTS as soon as drifters are deployed. These data are monitored and taken off GTS when sensors stop giving good quality data. As of August 20, there were 140 surface drifters in the South Atlantic region transmitting good quality data on the GTS. (South Atlantic Region defined to be 20^0N to 55^0S). Last year there were 147 around the same time of the year.
Moored buoys have their data disseminated by GTS, all of them with ARGOS transmission and Immarsat.

3.1.3 Delayed mode data exchange

Updates of the raw, quality controlled and interpolated data sets are sent to ISDM, the RNODC for drifter data, twice a year, for further archival and distribution. As of July 2012, AOML has sent data to ISDM through December 2011.

Metadata from GDP drifters are collected at the DAC directly from the manufacturers, archived and made available on the deployment log at the DAC web page
www.aoml.noaa.gov/phod/dac/deployed.html

Moored buoys data on delayed mode are made available at
https://www.mar.mil.br/dhn/chm/meteo/prev/dados/dados.htm and into Brazilian National Data Bank (BNDO) under request.

3.2 Data quality

4) Instrument practices

The Instruments procedures are following fabric requirements, a PNBOIA documents is being prepared to set standards for moored buoys maintenance and instruments calibration.

5) Status of the South Atlantic Drifter array

Figure 3 shows the status of the drifter array in the region. As of August 20, 2012 there were a total of 140 drifters actively reporting, 56 SVP and 84 SVPBs.

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Annex 1

Status maps and graphics

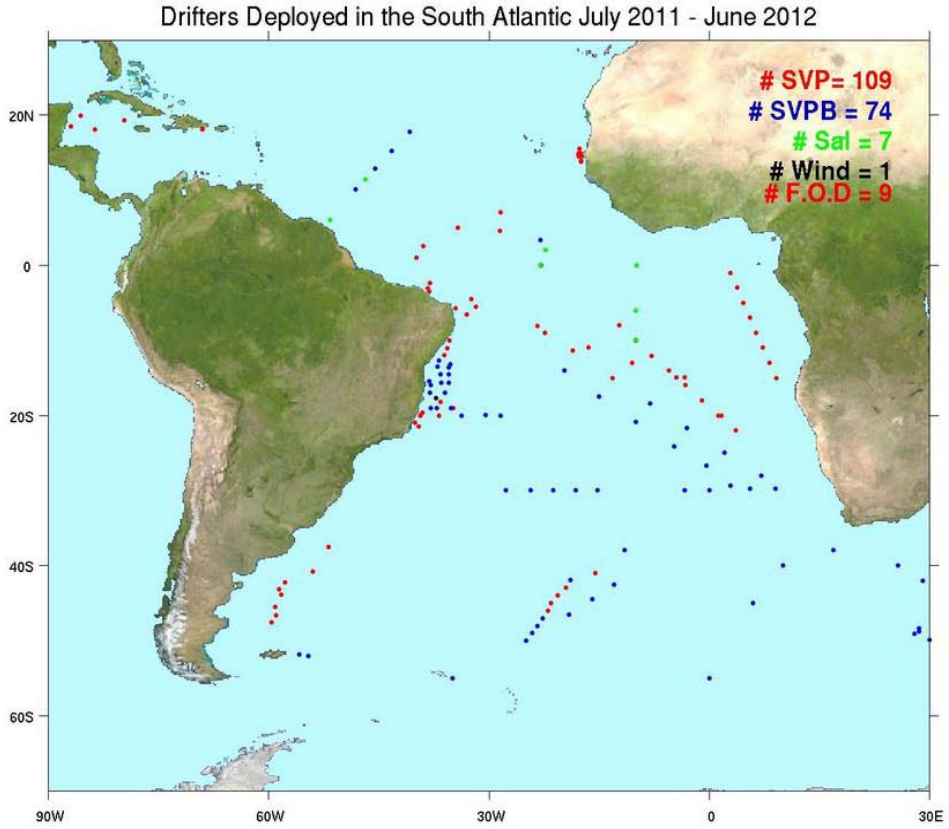

Figure 1: Deployment locations. A total of 191 drifters were deployed.

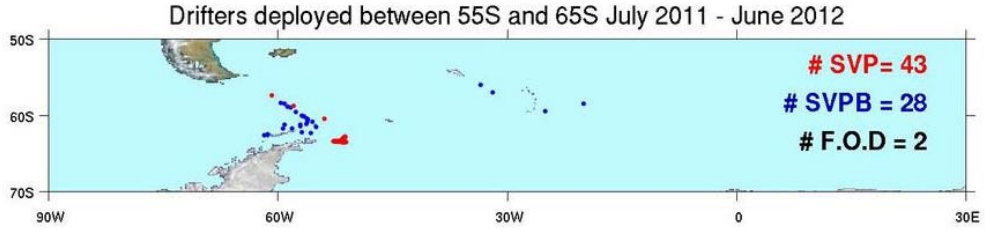

Figure 2: Deployment locations between 55^0S and 65^0S. A total of 71 drifters were deployed.

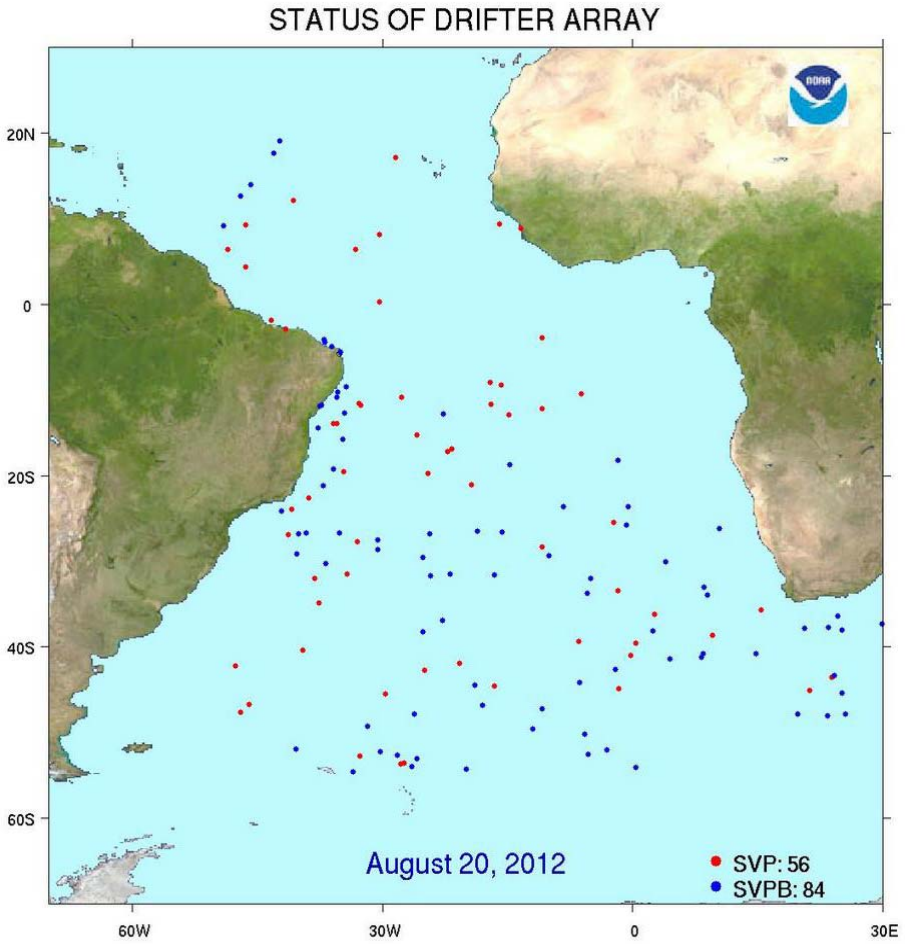

Figure 3: Status of the South Atlantic Array. A total of 140 drifters in the region

Figure 4: Status of the South Atlantic Moored Buoy Array. A total of 6 operational buoys in the region measuring winds, sea level pressure, SST, currents, waves,

Annex2

Report on the South African 2012 National Drifting Weather Buoy Programme
(Compiled by S.Marais and S. du Toit and approved by Johan Stander for the ISABP, June 2012)

The following report details progress of the South African National Drifting Weather Buoy Programme for the International South Atlantic Buoy Programme for the intersessional period 2011/2012, up to 30 June 2012. A total of 18 drifters were deployed.

Drifting Weather Buoy Deployments

Deployments 2011/2012

Argos ID	Date of deployment	Latitude	Longitude
71494*	2011-09-14	37.1°S	012.3°W
90159	2011-09-17	38.0°S	011.5°W
60353	2011-09-22	41.0°S	015.6°W
60360	2011-09-23	43.0°S	019.6°W
71481	2011-09-23	42.0°S	018.9°W
60333	2011-09-24	44.0°S	020.7°W
60335	2011-09-25	46.0°S	022.0°W
60346	2011-09-25	45.0°S	021.1°W
75294	2011-09-25	47.0°S	022.6°W
75287	2011-09-26	50.0°S	025.0°W
75290	2011-09-26	48.1°S	023.4°W
75292	2011-09-26	49.0°S	024.1°W
75289	2011-09-27	46.6°S	019.2°W
90156	2011-12-10	40.0°S	010.0E
40295	2011-12-12	45.0°S	005.9E
40296	2011-12-15	55.0°S	000.0E
40301	2012-01-14	55.0°S	035.0°W
40310	2012-01-14	55.0°S	035.0°W

* Fixed at Tristan da Cunha

We had a good mix of manufacturers this season. Buoys were manufactured by Clearwater, Technocean and Pacific Gyre. No failures on deployment were reported.

Partnerships
The South African Weather Service continues its partnerships with Tristan da Cunha and South Georgia as well as a local fishing company, Ovenstone, for the use of their fishing vessel, Edinburgh to deploy drifters. These countries deploy buoys handed to them in support of the ISABP and we are truly grateful for that. They also allow us to fix a buoy on both Tristan da Cunha and South Thule.

Challenges
The failure on deployment experienced last year seems to be resolved.

Future Plans:
We will deploy 8 buoys on the yearly Gough Island Cruise in September/October of 2012. The Falklands Fisheries Department will deploy buoys from July 2012 onwards and the Tristan da Cunha vessel, *Edinburgh*, will also deploy during 2012.

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APPENDIX I

REPORT BY THE OCEAN SUSTAINED INTERDISCIPLINARY TIMESERIES ENVIRONMENT OBSERVATION SYSTEM (OCEANSITES)

(Report submitted by Ms Kelly Stroker, OceanSITEs Coordinator, JCOMMOPS)

1) Summary

Name of Action Group	**OceanSITES**
Date of report	31 August 2012
Overview and main requirements addressed	OceanSITES is a worldwide system of long-term, deepwater reference stations measuring dozens of variables and monitoring the full depth of the ocean, from air-sea interactions down to 5,000 meters.
Area of interest	Global
Type of platform and variables measured	Deep-water reference stations
Targeted horizontal resolution	
Chairperson/Managers	Uwe Send, SIO Bob Weller, WHOI
Coordinator	Kelly Stroker, Project Office
Participants	Executive Committee, Steering Team Members, and Data Management Team Members
Data centre(s)	2 Global Data Assembly Centers IFREMER Coriolis (FTP). ftp://ftp.ifremer.fr/ifremer/oceansites/ US NDBC (FTP). ftp://data.ndbc.noaa.gov/data/oceansites/
Website	www.oceansites.org
Meetings *(meetings held in 2011/2012; and planned in 2012/2013)*	**2011** 8th Steering Committee Meeting, La Jolla, CA Dec, 2011 5th Data Management Team Meeting, La Jolla, CA Nov 2011 **2013** 9th Steering Committee and 6th Data Management Team Meetings will be held in Spring, 2013 in Seoul, Korea.
Current status summary *(August-2012)*	The OceanSITES Network consists of over 100 reference sites with over ½ of the network transmitting data in real-time and submitting data to one of the Global Data Assembly Centers (GDAC). At the December, 2011 La Jolla OceanSITES meeting, it was decided to make use of the many existing OceanSITES platforms in deep water to make an "instant" contribution towards the gap in deep-ocean observations as identified at OceanObs09.

	OceanSITES moorings at 20 regions around the world already carry deep temperature/salinity (T/S) sensors. OceanSITES members 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, and the left bar shows how already pledged. 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 the status of that matching pool
Summary of plans for 2013	In 2013, OceanSITES plans to have its next face-to-face meeting in Seoul, Korea. The OceanSITES Executive Committee will continue to meet regularly as will the Data Management Team. The station catalog will be ingested fully into the JCOMMOPS database and the website and project office tasks will be continued.

2 Deployment plans for 2013

No details to report at this time.

3 Data management

3.1 Distribution of the data

3.1.1 Data policy

The data flow within OceanSITES continues to be carried out through three organizational units: PIs, DACs, and the GDACs. The Principal Investigator (PI), typically a scientist at a research institution, maintains the observing platform and the sensors that deliver the data. He or she is responsible for providing the data and all auxiliary information to a Data Assembly Center (DAC). The DAC assembles OceanSITES-compliant files from this information and delivers these to the two Global Data Assembly Centers (GDACs), where they are made publicly available. The GDAC distributes the best copy of the data files. When a higher quality data file (e.g. calibrated data) is available, it replaces the previous version of the data file. The user can access the data at either GDAC, cf. section “GDAC organization”. Archive of preliminary or real-time data is currently under discussion with NOAA’s National Oceanographic Data Center and World Data Center (NODC-WDC) for Oceanography.

3.1.2 Real-time data exchange

Approximately 25% of the OceanSITES array is exchanging data in real-time on the GTS.

3.1.3 Delayed mode data exchange

All OceanSITES members exchange delayed mode data free and openly. The goal is to make all data available in the standard OceanSITES NetCDF format on one of the 2 GDAC centers. At present around ½ of the members are providing data in this format and of the remaining ½ are working on the details.

Metadata is distributed through the NetCDF files and the OceanSITES Data Management Team has been working with NOAA’s National Geophysical Data Center (NGDC) on the distribution on

ISO 19115 metadata files as found in this example.

3.2 Data quality

OceanSITES data are partially transmitted in real-time and relayed to regional or national Data Assembly Centers (DACs). The DACS are responsible for applying automated real-time quality control tests to identify and flag grossly bad data. Data that pass the automated QC tests are broadcast on the GTS, apart from those purposely withheld for validation purposes. All data, with flags, are relayed to Global Data Assembly Centers (GDACs) in Brest, France, and at NDBC/USA. The GDACs maintain complete (mirror) datasets, and make all data available from one place in a unified format, initially via ftp directories, later through user-friendly interfaces.

4) Instrument practices

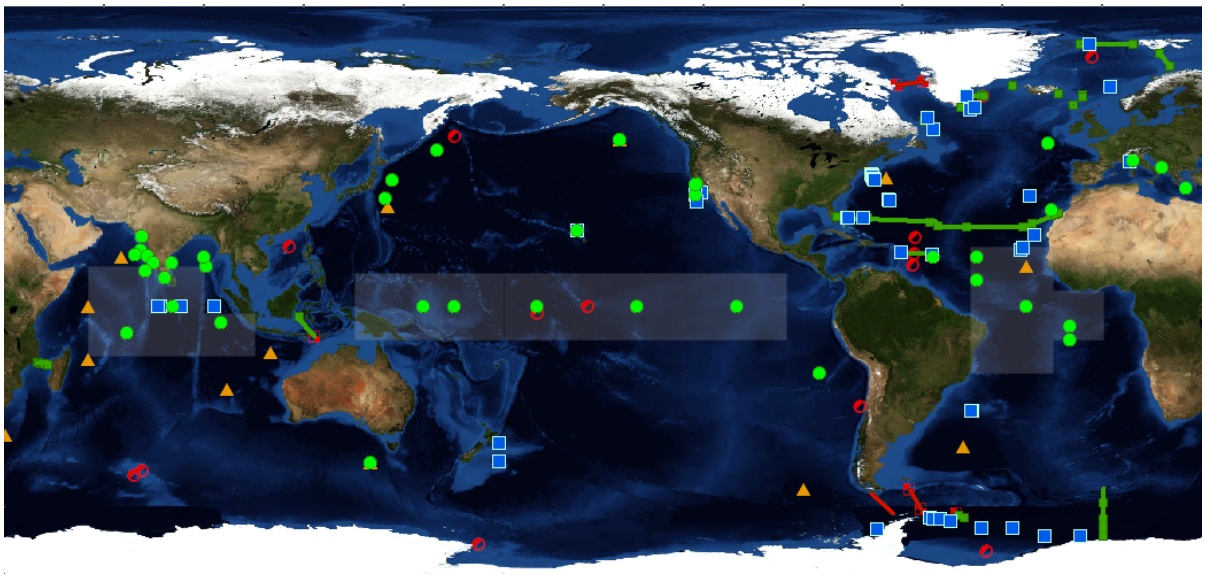
OceanSITES does not have a set of instrument handling standards and best practices of its own, but OceanSITES has an expectation that the PI-provided data have been collected according to such community-approved standards.

OceanSITES provides the following capabilities to this effect:

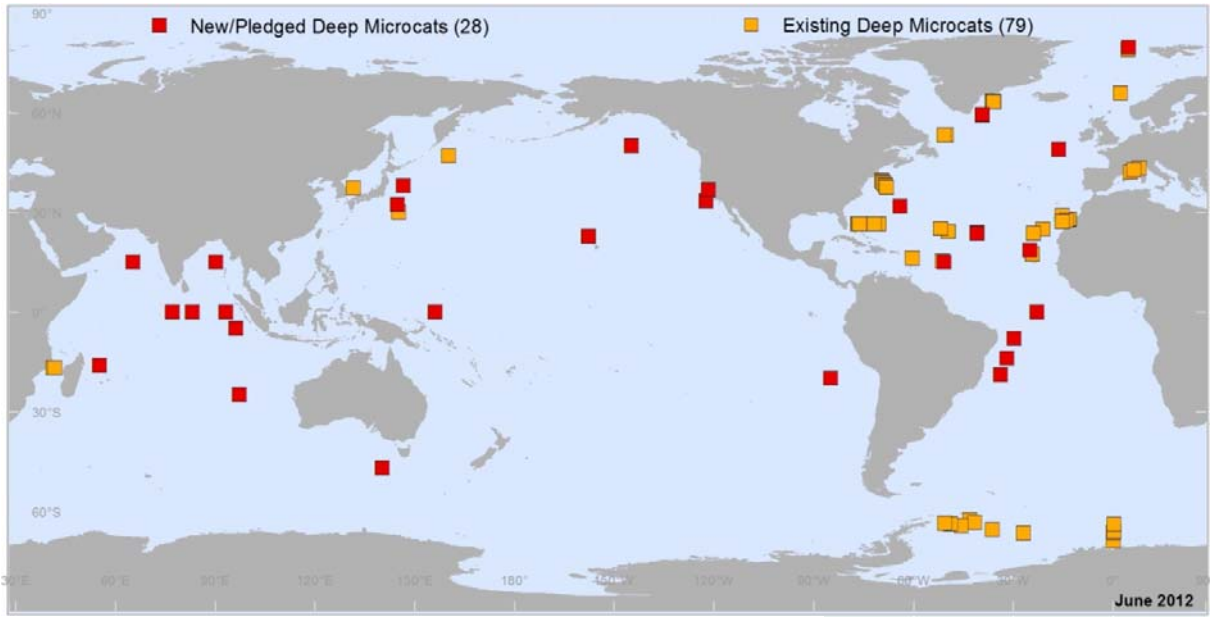
- OceanSITES science meetings serve as discussion forums where PIs can (and have done in the past) discuss such standards and practices.
- The OceanSITES data format requires the data provider to quantify uncertainty in the metadata, with optional information on instrument accuracy and precision.
- The OceanSITES data format provides a metadata field that can hold optional calibration information.
- The OceanSITES data format provides metadata fields that link to external documentation, meant among other things for documentation of instrument handling and practices, as well as institutional websites and science publications.
- OceanSITES efforts would benefit from a community-supported set of documents on instrument handling and best practices, a vision for which would be:
    - one document per instrument type and method
    - each document citable, e.g. via DOI
    - documents to be under version control

ANNEX

Status maps and graphics



OceanSITES stations on standard JCOMM Cartesian Geographic Coordinate Map with additional layer of land detail.



OceanSITES Deep-ocean T/S Sensor Map showing existing and pledged sensors.

REPORT BY THE INTERNATIONAL TSUNAMETER PARTNERSHIP (ITP)
(Report submitted by Richard Crout, NOAA/NDBC, USA)

1) Summary

Name of Action Group	**International Tsunameter Partnership**
Date of report	31 July 2012
Overview and main requirements addressed	The International Tsunameter Partnership (ITP) was established under the auspices of the IOC International Cooperation Group for the Indian Ocean Tsunami Warning and Mitigation System (IGC/IOTWS). Its purpose is to support the establishment, effectiveness and on-going viability and enhancement of tsunami detection and warning systems using deep ocean monitoring stations (tsunameters). The ITP has since become an Action Group of the Data Buoy Cooperation Panel (DBCP), which is a subsidiary body of the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM). Main requirements met; 1. An exchange of information on new technologies and products and platform applications, including non-buoy-based tsunameter systems (cabled and glider), multi-role tsunameter platforms, 2. Shared experiences and lessons learned on operational practices for tsunameter systems qualification, deployment, maintenance and operational monitoring. Evolution of sensor technology is challenging maintenance, and fault analysis reveals a number of issues to be addressed in the future. 3. Determined the status of real-time Tsunameter data exchange for all buoy types across all networks. 4. Reiterated challenges of vandalism and potential hostile action agains tsunameter systems (especially in the Indian Ocean). 5. From a Workshop at the OCEANS'11 Kona Conference, identified issues and identified emerging technologies (including cabled networks, nano-BPRs, and HF radar) that could address the near-field tsunami warning problem. 6. Updated information on evolving tsunameter systems. The ITP Action Group wishes to acknowledge the many contributions made by the outgoing Chairperson, Ross Hibbens.
Area of interest	Tsunami Detection
Type of platform and variables measured	Deep ocean tsunameter consisting of a moored surface buoy or shore to sea cable system and a bottom pressure recorder measure absolute sea level height with time
Targeted horizontal resolution	Along tsunamigenic zones based on national warning center requirements.
Co-Chairperson/Managers	Dr. R. Venkatesan – India – NIOT Dr. R. Crout – USA – NDBC (temporary)

Coordinator	N/A
Participants	Eddie Bernard – US – PMEL Richard Crout – US - NDBC Hamed Al Gheilani – Oman – Ministry & Fisheries Djoko Hartoyo – Indonesia – BPPT Donna Kocak – US - Csnet Robert Lawson – US – SAIC David McGilvray – Australia – Australian Maritime Systems Christian Meinig – US – PMEL David Murphy – US – SeaBird Electronics K. Premkumar - India – Win Marine Consultancy Nick Street - UK – Sonardyne Ken du Vall – US – Lighthouse R&D Dr. R. Venkatesan – India – NIOT
Data centre(s)	There is currently no international data center that archives the high resolution data for tsunameters. Tsunami Watch Centers manage the real-time tsunameter data they receive based on operational needs.
Website	
Meetings *(meetings held in 2011/2012; and planned in 2012/2013)*	Meeting #7 of the International Tsunameter Partnership (ITP), Geneva, Switzerland, 1 Oct 2011. Meeting #8 of the International Tsunameter Partnership (ITP), Fremantle, Australia, 2 October 2012
Current status summary *(mid-2012)*	Refer to Annex-1
Summary of plans for 2013	Refer to Annex-1

2 Deployment plans for 2013

See Annex-1

3 Data management

3.1 Distribution of the data

Tsunameter data are distributed to the Tsunami Watch/Warning Centers via the GTS or FTP. The US is also providing data via the NDBC OPeNDAP server and through an RSS feed.

3.1.1 Data policy

The ITP-initiated BUFR/CREX templates for GTS transmission of tsunameter sea level data are now in the operational WMO Manual on Codes 15 Sep 2010 and have been adopted by Australia and India. Australia has been transmitting data in the BUFR code form for preoperational trial since March 2009 and in 2010, India began coding their tsunameter data in BUFR/CREX format. The US should join soon, but Global dissemination should be in 2012.

3.1.2 Real-time data exchange

There are two modes by which tsunameter data is exchanged in real-time, GTS an FTP. Australia, Chile, Russia, Thailand, India, and the US tsunameters report real-time data on the GTS. Chile, Russia and the US make tsunameter data available via FTP.
Details on data timeliness (i.e. reception time at operational meteorological services minus observation time), including known problems, possible solutions, statistics, etc.

3.1.3 Delayed mode data exchange

The exchange of delayed mode data has not been determined. The item was discussed at ITP-7 in Geneva.

3.2 Data quality

Data quality standards, quality control procedures, and fault detection are the responsibility of the national tsunameter operators. There is a need to qualify the tsunameter instruments to characterise data quality from different manufactured tsunameters and the issue was discussed at ITP-7 in Geneva.

4) Instrument practices

Draft instrument standards were developed by the ITP under the ICG-IOTWS. These standards were reviewed at the ITP -7 in Geneva.

5) Other issues as needed

The ITP requires tsunameter requirements from the International Governmental Coordination Group, because it is not clear under the DBCP.

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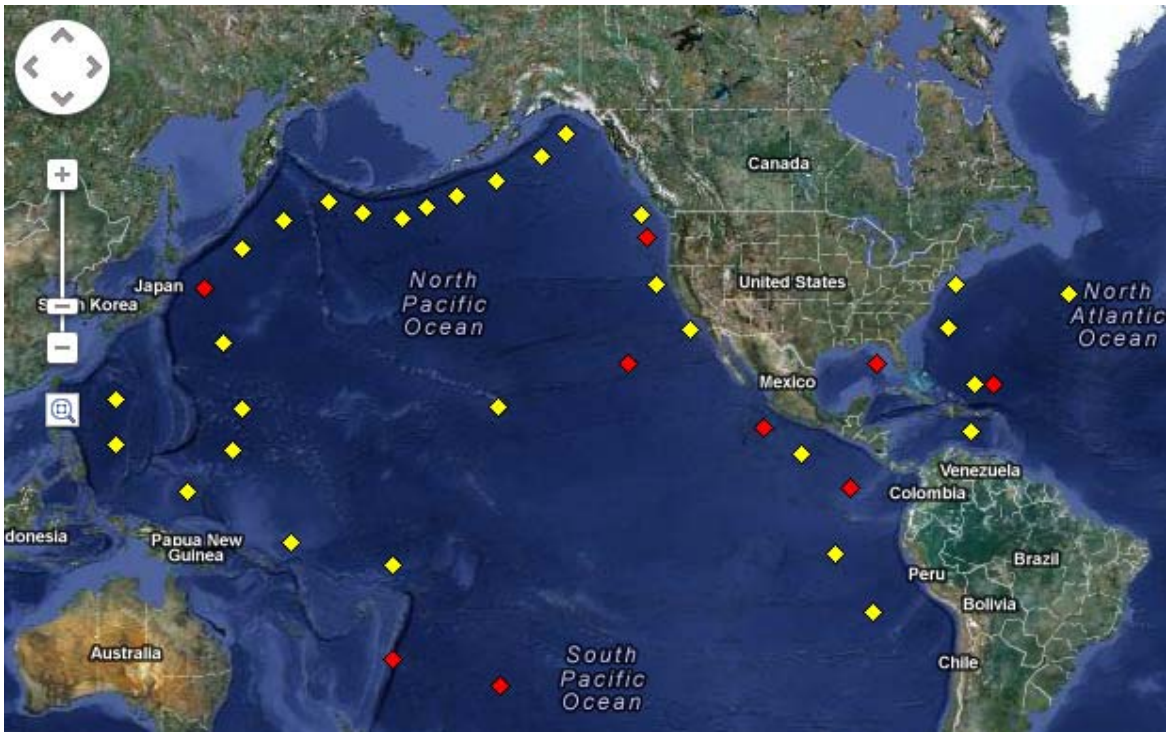
ANNEX 1

Network Status

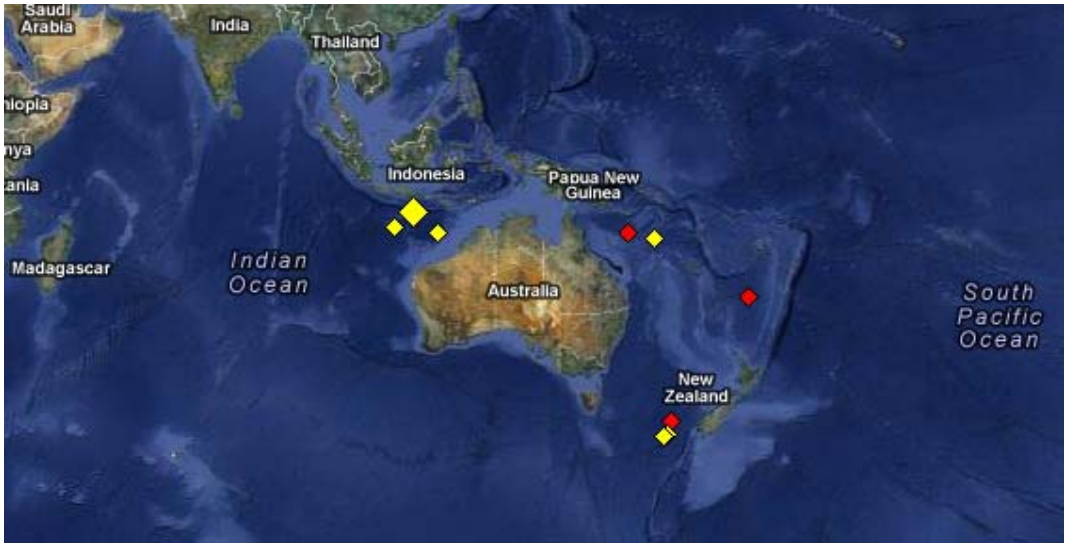
GLOBAL TSUNAMETER NETWORK								
Country	***Planned Network***	***Currently Operational***	***Tsunameter Types***	***Local Reception***	***Data to GTS***	***Data to FTP***	***Data Formats***	***Vandalized Stations***
Australia	6	6	DART-II DART-ETD SAIC-DART-II SAIC-STB SAIC-ETD	Yes	Yes	No	NOAA-DART BUFR/CREX	0
Chile	3	2	SAIC-DART-II	Yes	Yes	Yes	NOAA-DART	0
China	2	1	DART-STB	Yes	No	No	NOAA-DART BUFR	1
Ecuador	2	1	Sonardyne	Yes	Yes	Yes	NOAA-DART	0
India	7	6	DART-STB IndianBuoy- Sonardyne	Yes	Yes INCOIS	No	BUFR/CREX	1
Indonesia	14	2	InaBuoy SAIC-ETD	Yes	No	No	Local Format NOAA-DART	9
Japan	6	3	SAIC-STB	Yes	Yes	No	CREX	0
Malaysia	3	2	-	Yes	No	No	-	0

Republic of Korea	2	-	-	-	-	-	-	-
Russia	3	2	SAIC-STB SAIC-ETD	No	Yes	Yes	NOAA-DART	0
Thailand	3	1	SAIC-STB	No	Yes	Yes	NOAA-DART	0
USA	39	32	DART-II	Yes	Yes	Yes	NOAA-DART	0

Status maps and graphics

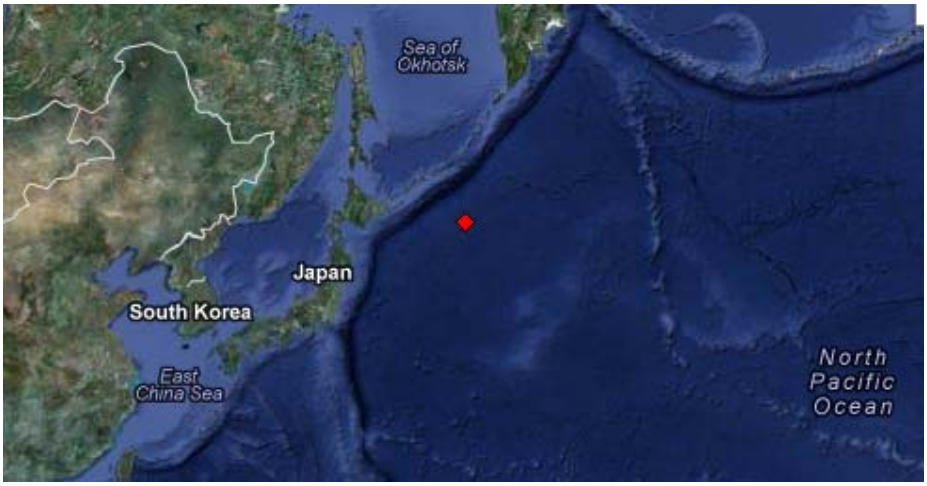


US (National Data Buoy Center) Tsunameter Network



Australian (Bureau of Meteorology) Tsunameter Network

Chile (Hydrographic and Oceanographic Service of the Chilean Navy) Tsunameter



Russia (Russian Far Eastern Regional Hydrometeorological Research institute) Hydromet Tsunameter

Equador (Instituto Oceanographico de la Armada) Tsunameter

Thailand (Thailand Meteorological Department and the National Disaster Warning Center of the Kingdom of Thailand) Tsunameter

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