WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

DATA BUOY COOPERATION PANEL

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TWENTY-SEVENTH SESSION

ITEM: 7

GENEVA, SWITZERLAND
26-30 SEPTEMBER 2011

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) – *Not available*
- 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 Jean Rolland (France), 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);
(vi) International South Atlantic Buoy Programme (ISABP) (verbal presentation by Johan Stander (South Africa), representing the ISABP);
(vii) DBCP-PICES North Pacific Data Buoy Advisory Panel (verbal presentation by Mr Al Wallace (Canada) and Mr Shaun Dolk (USA), Co-chairperson and technical coordinator of the NPDBAP);
(viii) OCEAN Sustained Interdisciplinary Timeseries Environment observation System (OceanSITES) (verbal presentation by Uwe Send (USA), representing OceanSITES project office);
(ix) Tropical Moored Buoys Implementation Panel (TIP) (verbal presentation by Paul Freitag (USA), representing the TIP)
(x) International Tsunameter Partnership (ITP) (verbal presentation by Mr Ross Hibbins (Australia) 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)

1) Summary

Name of Action Group	The Global Drifter Programme (GDP)
Date of report	31 July 2011
Overview and main requirements addressed	The goals of the GDP are to: 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	The global ocean
Type of platform and variables measured	Lagrangian drifters measuring the following variables: Basic: surface velocity, SST; Other: surface pressure, wind, salinity, 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, 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 2010/2011; and planned in 2011/2012)*	None
Current status summary *(mid-2011)*	Annual size of array maintained close to 1250 drifters. Current size as of June 20, 2011 is 1154 drifters.
Summary of plans for 2012	Maintain array at ~1250 drifters; re-evaluate drogue presence for historical data; begin incorporating salinity data into data stream; continue participation in Iridium and Argos 3 pilot projects; conduct ADB study of SVPB drifters.

2 Deployment plans for 2012

Deployments in the period 22 May 2010 through 21 May 2011 are shown in Fig. 1. Some unusual or outstanding deployments during this period include

- 20 in the tropical Atlantic Ocean and Gulf of Guinea from the R/V *Ronald H. Brown* during the July—August 2011 PIRATA Northeast Extension (PNE) servicing cruise.
- 10 in the southern Atlantic Ocean from the R/V *Ronald H. Brown* during the CLIVAR A10 cruise.
- 20 across the Pacific Ocean during the DART servicing cruise.
- 30 in the western Indian Ocean and 30 in the eastern Atlantic Ocean and Gulf of Guinea from various US Navy vessels, as part of the "African Partnership Station III" program.
- 10 from the Argo-chartered *Kaharoa* along 18°S, from 180—100°W.
- 40 from the R/V *Revelle* during the upcoming DYNAMO cruise in the Indian Ocean.
- 7 off the coast of Japan, to help track debris associated with the March 11, 2011 earthquake and tsunami.
- 23 in the equatorial Pacific during the TRITON servicing cruise.

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 2011—2012 include the possible US Navy-led "African Partnership Station IV" program in the western Indian and eastern Atlantic, the DART servicing cruise, and the 2012 Argo charter of the *Kaharoa* in the South Pacific. 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 (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.

As of June 27, 2011, there were 1061 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 27 June 2011, the DAC sent all data covering the period July 2007 through December 2010 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 has been documented in two publications this year, Grodsky et al. (2011) and Rio et al. (2011). In response to Grodsky et al., the GDP announced on its web site in May 2011 that:

> A new study demonstrates that a significant fraction of drifters in the time period January 2004 through December 2008 may have undiagnosed drogue loss, resulting in significantly greater windage than experienced by drogued drifters. While the GDP assesses these data for drogue presence reanalysis, we recommend that users interested in exclusively drogue-on data use only the first 90 days of data for drifters deployed during this time period.

A drogue presence reassessment for this period is being undertaken using different approaches at Scripps (L. Centurioni) and AOML (R. Lumpkin), the latter in collaboration with S. Grodsky and J. Carton of Univ. Maryland.

4) Instrument practices

For the seventh consecutive year, AOML will deploy clusters of drifters, at the same time and location, with one drifter from each of four different manufacturers (Clearwater, Metocean, Technocean, Pacific Gyre). This AOML Data Buoy (ADB) study aims to compare and evaluate the packaging, activation, and sensor/drogue/transmitter performance of drifters from these manufacturers. For the coming year, we plan to deploy five clusters of SVPB drifters from the four manufacturers during August/September.

5) Evolution of the Global Drifter array, 21 June 2010—20 June 2011

The growth of the array through 20 June 2011 is shown in Fig. 2. For the most recent 365 days, the array had an average size of 1248 drifters. This period began with the array at its maximum of 1375 drifters, reached in response to a small array and large number of deaths the year before (see last year's DBCP report). The array size fell through the year, reaching 1145 on 28 March 2011 and remaining relatively steady thereafter. Its size on 20 June 2011 was 1154 drifters.

Annex

Status maps and graphics

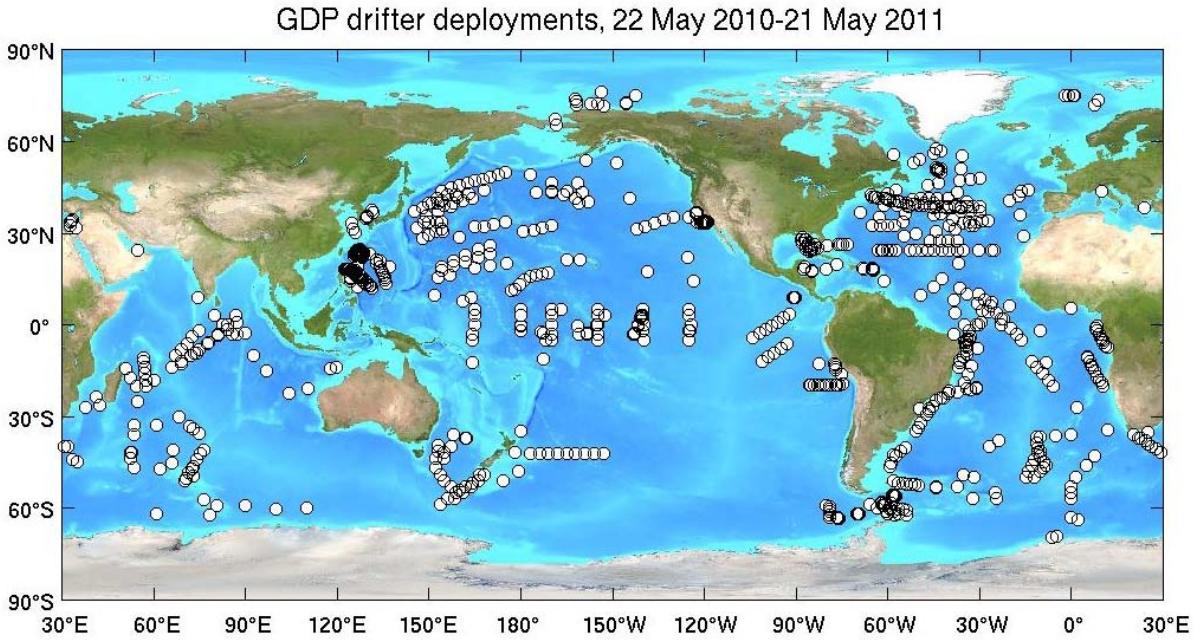

Fig. 1: Deployment locations during the year. A total of 1007 drifters were deployed.

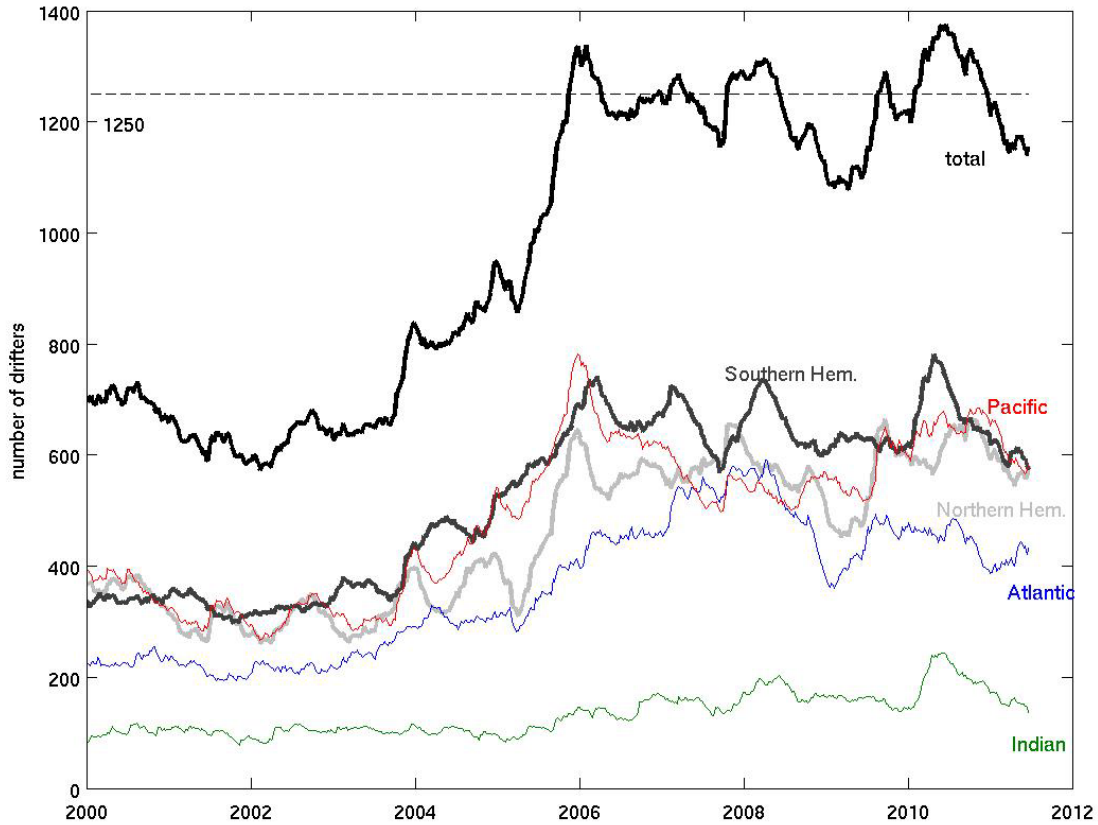

Fig. 2: Size of global drifter array in regions. Atlantic/Indian divided at 25°E in the Southern Ocean, Atlantic/Pacific at 70°W in the Southern Ocean, Indian/Pacific at 125°E south of Timor.

APPENDIX B

REPORT BY THE TROPICAL MOORED BUOY IMPLEMENTATION PANEL (TIP)

1) Summary

Name of Action Group	The Tropical Moored Buoy Implementation Panel (TIP)
Date of report	31 July 2011
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. 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. 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 2010/2011; and planned in 2011/2012)*	PIRATA-15/TACE/TAV, 2-5 March 2010, Miami, Florida CLIVAR/GOOS Indian Ocean Panel 7th Session 12-16 July 2010, Perth, Australia TIP Workshop, 26 September 2010, Oban UK. 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
Current status summary *(mid-2011)*	TAO/TRITON: 65 of 67 surface moorings reporting. PIRATA: 16 of 17 surface moorings reporting. RAMA: 17 of 24 surface moorings reporting.
Summary of plans for 2012	TAO/TRITON: Maintain 72 mooring array. PIRATA: Maintain 18 mooring array RAMA: Maintain 30 implemented sites.

2 Deployment plans for 2012

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 2010 through June 2011 the PMEL web pages had more than 15M hits and delivered more than 224K data files in response to nearly 24K user requests.

3.1.1 Data policy

Data are freely available on the web.

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 ALTAS 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 2010 through 30 June 2011 was 86% for TAO/TRITON, 86% for PIRATA and 66% for RAMA. 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 77%, compared to 90% for TAO (since 1980) and 91% for PIRATA (since 1997). Cancelled and delayed RAMA cruises have resulted in deployments much longer than the 12-month design lifetime of the moorings. Two moorings recovered in October 2010 had been deployed for 23 months. As of July 2011, 2 other sites have not been serviced for 22 months, with no cruise scheduled in the area due to security issues (5.6 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.
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A new RAMA web site (http://www.pmel.noaa.gov/tao/rama/) was released in April 2011. The site provides 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 Refresh moorings will replace ATLAS moorings at up to eleven TAO sites in the coming year. Refresh systems telemeter 10-min resolution data via Iridium each hour. Hourly data from Refresh systems in-test have been placed on the GTS under a separate WMO ID from the nearby ATLAS to familiarize users with the increased amount of data.

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 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 TFlex, intended to replace the legacy ATLAS moorings in tropical research arrays. TFlex observations are essentially equivalent to ATLAS, using more commercially available components and provide higher temporal resolution data in real time. The first prototype system was deployed for comparison and testing in March 2011 within a few miles of an ATLAS system at 12°S 93°E. Under the terms of an IA between the US and Indonesia, TFlex supports both RAMA and the Indonesian Global Ocean Observing System (InaGOOS).

The new TFlex and Bia-Long mooring systems telemeter data via Iridium. Methods to submit data from these systems onto the GTS have yet to be established.

5) Other issues

5.1 RAMA Implementation

As of July 2011 the number of RAMA sites implemented stands at 30 (65% complete). Sites implemented in the past year include 16°S 55°E (October 2010), 12°S 93°E (March 2011) and 16°S 81°E (June 2011).

Between July 2010 and June 2011, 224 sea days were provided in support of RAMA sites: India provided 106 days, 74 days for PMEL's ATLAS and ADCP moorings and 32 days for NIO's Deep Ocean moorings; Japan provided 34 days in support of their m-TRITON and ADCP moorings; Indonesia provided 65 days, 51 for PMEL's ATLAS and TFlex moorings and 14 days for FIO's surface and subsurface moorings. During this period 24 of 30 RAMA sites were serviced. As of July 11, 2011, 17 of 24 surface moorings were reporting data (16 on the GTS).

The University of Tasmania has proposed an investigation of transports in the subtropical Southeast Indian Ocean in 2013, during which a RAMA mooring would be deployed near 25°S 97°E. Additional implementation in the near future will be limited due to security issues related to piracy (5.6 below)

5.2 Array enhancements

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

Biogeochemical measurements are made from 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/) and 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. 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).

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 a Memorandum of Agreement between the United Nations Development Programme (UNDP) and NOAA which was signed in May 2011. The agreement covers technical support, research cooperation, technology development and data management for RAMA.

To facilitate and coordinate resources that may be applied to the Indian Ocean Observing System, an IndOOS Resource Forum 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.

JAMSTEC conducted capacity building workshops for the transfer of surface buoy technology in Jakarta and Serpong, Indonesia, June 8-11, 2010, and May 9-10, 2011. A goal of this collaboration is for Indonesia to assume responsibility for a TRITON site in 2012. PMEL conducted a technical training session on mooring systems for 2 Indonesian scientists on August 16-20, 2010, in support of InaGOOS, and hosted a visit by a University of Sao Paulo scientist on October 25-27, 2010, to aide in the development of the University's mooring systems. Another PMEL technical training session for 3 Indian scientists will be held on September 6-9, 2011, to expand support of RAMA moorings within India. NOAA's hosts annual capacity building workshops in Indonesia (July 18-22, 2011) and also site visits in the US by Indonesian scientists (at AOML and NDBC, July 18-22, 2011).

The Tropical Moored Buoy Implementation Panel (TIP) held its tenth session (TIP-10) on September 26, 2010, at the Scottish Association for Marine Science (SAMS) in Oban, Scotland. The meeting was held immediately prior to the 26th session of the Data Buoy Cooperation Panel (DBCP-26) at the same location. TIP-10 established a technical coordination group (TCG) to facilitate the flow of technical and logistical information among the many agencies involved in TAO/TRITON, PIRATA and RAMA. A second important outcome of the meeting was to recommend adoption of a common set of protocols for expanding the moored buoy arrays in all three ocean basins. These protocols are based on how PIRATA managed its expansion since 2005.

The Korean Ocean Research & Development Institute (KORDI) deployed a surface mooring near 10°N 150°E in May 2010. Inclusion of this and other new mooring sites into existing tropical arrays will follow the TIP protocols mentioned above.

5.4 Research experiments

The US is conducting a multi-year (2008-2012) 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.

IFM-GEOMAR and IRD conducted a process study in the Gulf of Guinea in May through July, 2011, including a glider swarm experiment making microstructure and tracer observations at the onset and peak of equatorial upwelling. PMEL contributed to the experiment by making near-surface, high vertical and temporal resolution velocity measurements from 2 PIRATA moorings. Complete ADCP profiles from the moorings were telemeter to shore in real time via Iridium.

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/CINDY2011 consists 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 CLIVAR Northwestern Pacific Ocean Circulation and Climate Experiment (NPOCE), intended to better understand western boundary ocean circulation systems, has begun in the western tropical Pacific Ocean. Two subsurface moorings in the Mindanao and one mooring in the Luzon strait are in place. The western part of TRITON also enhances and supports the NPOCE program.

The CLIVAR Southwest Pacific ocean circulation and Climate Experiment (SPICE) has also begun. Observations include gliders and several subsurface mooring systems in straits of the region. The TRITON buoy at 5°S 156°E will be paired with a SPICE mooring to provide geostrophic transport measurements.

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 consists of field survey over eastern equatorial Indian Ocean, Bay of Bengal and Andaman Sea.

5.5 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. Some ATLAS moorings in RAMA have been modified to inhibit vandals from boarding the buoy. As a consequence of the modification the moorings also lack meteorological sensors. These modified ATLAS moorings have not exhibited survivability rates significantly higher than moorings with standard towers and will be discontinued.

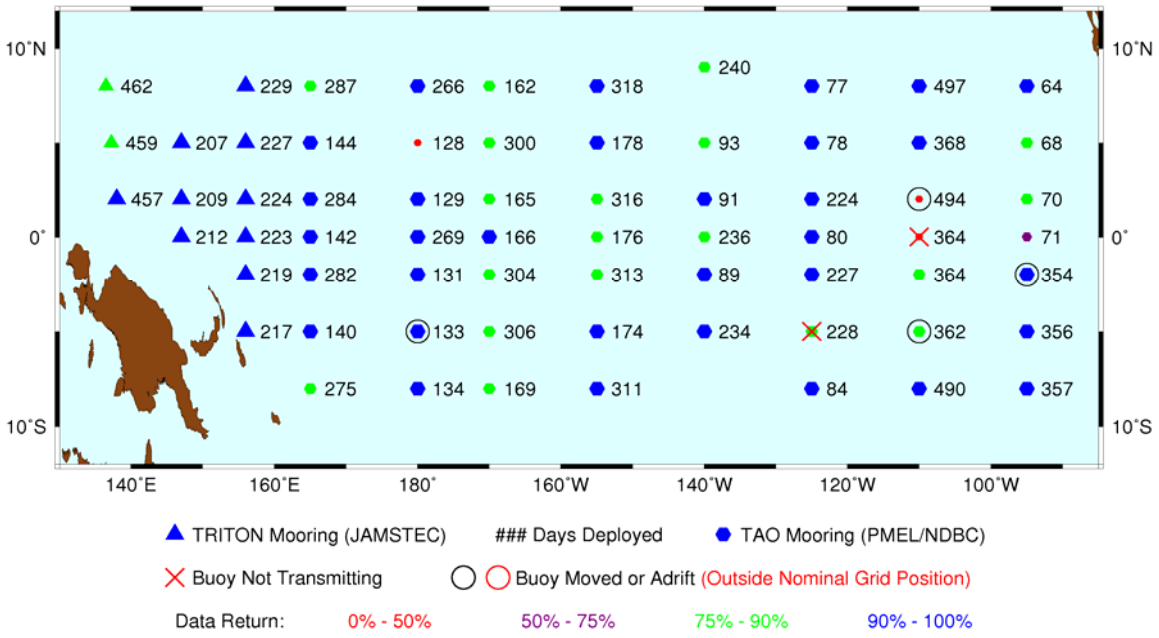
5.6 Piracy

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. ASCLME contracted the Seychelles Coast Guard to supply a security escort while the RV Algoa serviced RAMA moorings within the Exclusion Zone in October 2010. Two sites previously implemented in the Exclusion Zone along 67°E were not serviced in the past year due to lack of security measures during a Sagar Nidhi cruise.

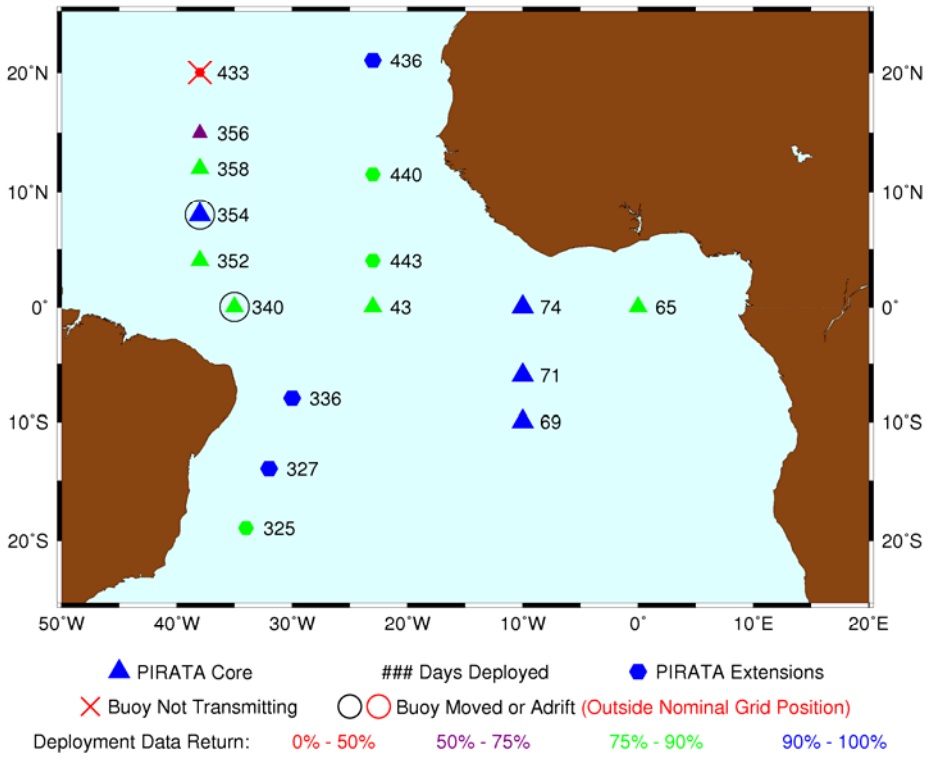
Annex

Status maps and graphics

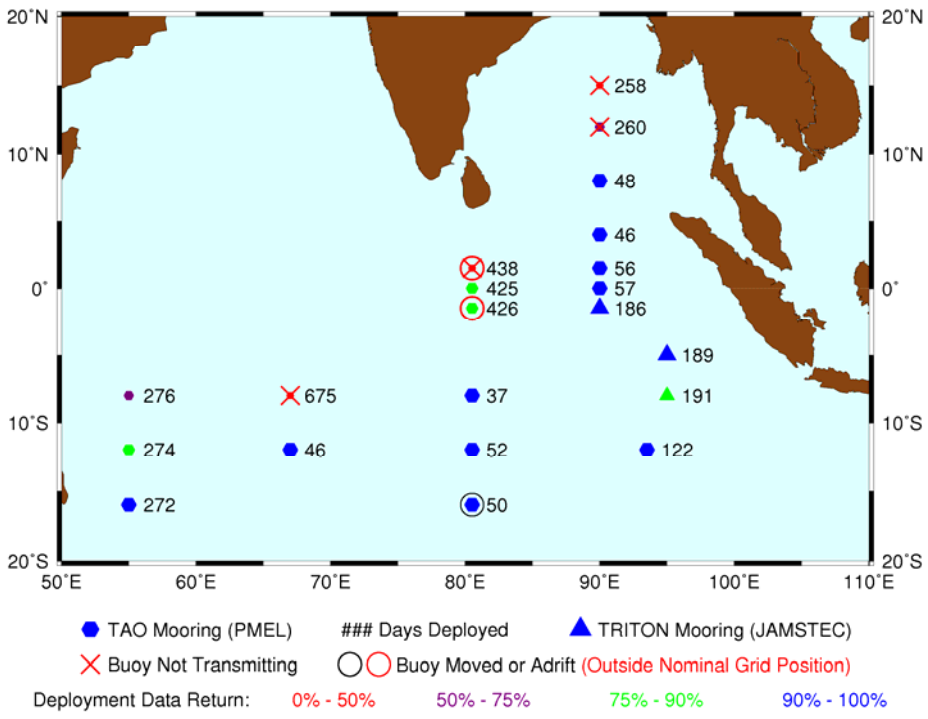
TAO/TRITON Mooring Status Update: Jul 21, 2011



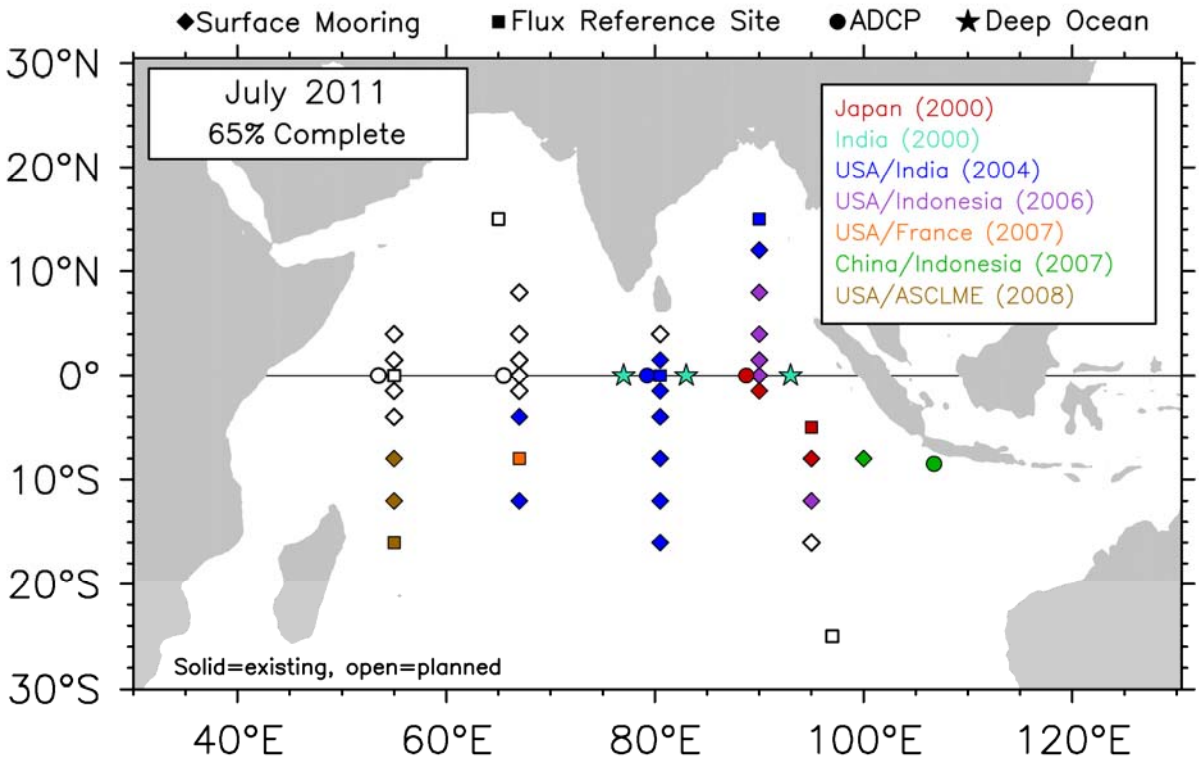
PIRATA Mooring Status Update: Jul 21, 2011

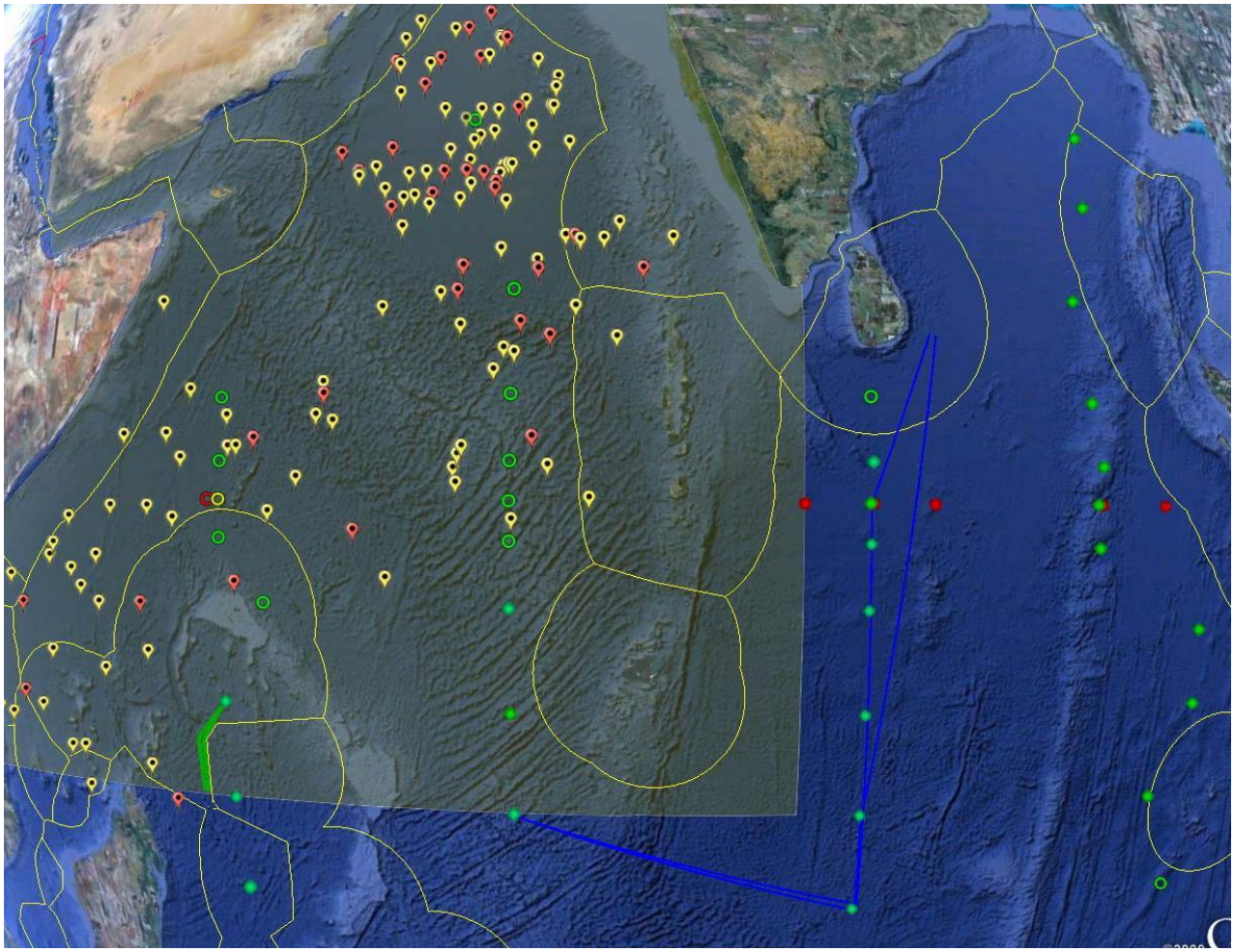


Indian Ocean Mooring Status Update: Jul 21, 2011



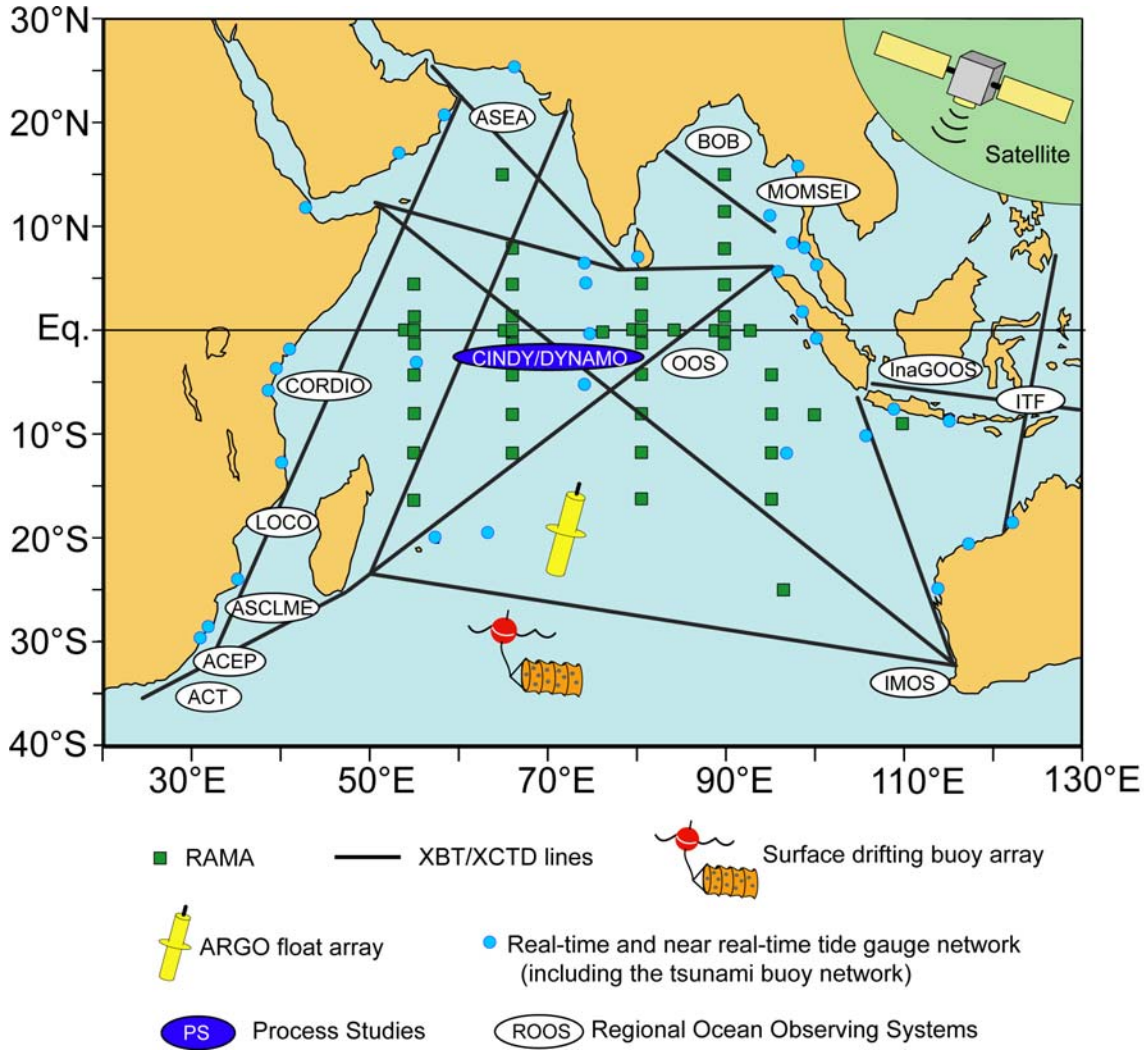
RAMA Implementation Status





Lloyds of London Piracy Exclusion Zone for 2011 (yellow background). Attempted (yellow symbols) and actual piracy attacks (red symbols) near RAMA sites are shown for the period January 2010 through May 2011. Green line is the track of the RV Algoa while under security escort in October 2010. Blue line is track of RV Sagar Nidhi in May/June 2011, which required avoidance of Exclusion Zone.

Indian Ocean Observing System (IndOOS)



APPENDIX C

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

1) Summary

Name of Action Group	Surface Marine programme of the Network of European Meteorological Services, EUMETNET (E-SURFMAR)
Date of report	31 July 2011
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-TAG8 Heraklion 24-25 May 2011
Current status (mid-2011)	89 drifting buoys in operation (50 Iridium, 39 Argos). 4 E-SURFMAR supported moored buoys in operation, plus a further 45 others operated by members.
Summary of plans for 2012	Maintain a network of 100 drifting buoys, and the 4 reference moored buoys in operation.

2 Deployment plans for 2012

The drifting buoys will be deployed from various locations (Canada, Iceland, France, Norway, UK, USA, ...) in the Atlantic Ocean. The drifters from GDP upgraded with barometers will be deployed by vessels plying from USA to Iceland and from USA to Europe. 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.

At present, Cabo Silleiro (transmission through Inmarsat) is the only EUCOS moored buoy which reports directional wave spectra onto the GTS. Spectral data from K5 (transmission through Iridium) are still experimental. 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 modified version of the system developed by the Met Office for K5 will be also installed on the Lion buoy with similar capability on M6 in due course.

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 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 started in early 2011 allowing to transmit the data of the first drifters having a resolution of 0.01K for SST.

Half of the number of drifters operating are now using Iridium. This improves the data timeliness (see Annex). About 2,000 daily observations are carried out on to the GTS. The short term target (70%) of the percentage of data received within 50 minutes was reached. The long term target (90%) will be only reached if all the buoys move to Iridium SBD. NOAA buoys upgraded with barometers by ESURFMAR are still reporting through Argos.

The mean lifetime (for Air Pressure) of the SVP-B drifters was approximately one year (344 days). One hundred and fifty eight buoys failed to report air pressure measurements, instead of ninety eight last year. 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.

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 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 showed that the target of 1% of Gross Errors was easily being achieved. The RMS of AP differences still has a seasonal variation, being higher in winter (0.8 hPa) than in summer (0.6 hPa).

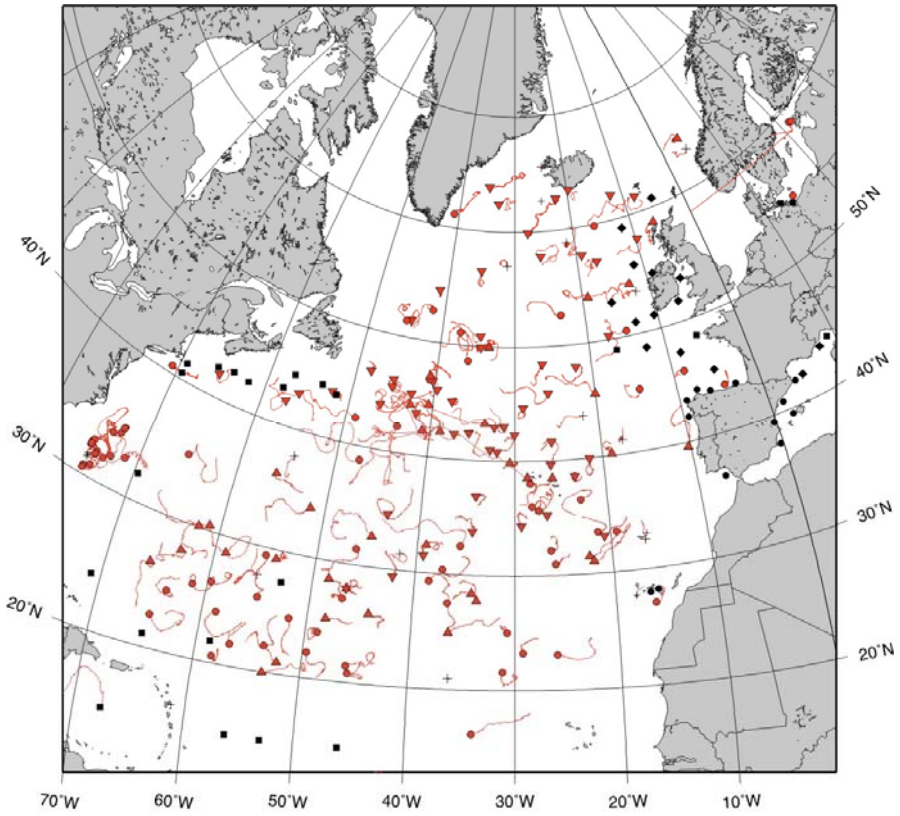
For moored buoys the Air Pressure (AP) differences with the French the target of 0.5% of Gross Errors was achieved. The RMS of AP differences are about 0.4 hPa.

4) Instrument practices

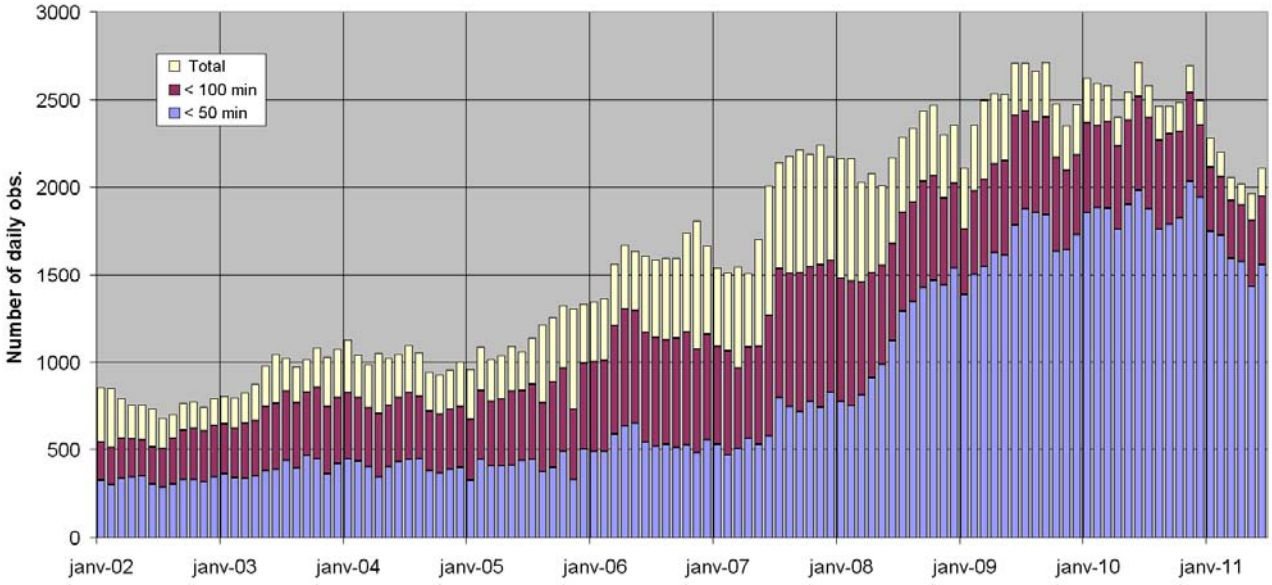
ESURFMAR drifting buoys uses recommended DBCP formats (DBCP-M2 for Argos, formats published on Iridium PP website for Iridium).

A draft technical document on E-SURFMAR moored buoys is under review. It is hoped to have a completed document for the next DBTAG meeting in May 2012.

Annex



Operating Buoys in E-SURFMAR area
Drifting buoy trajectories and moored buoy positions
(June 2011)



Drifting buoys data availabilty

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APPENDIX D

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

1) Summary

Name of Action Group	International Buoy Programme for the Indian Ocean (IBPIO)
Date of report	31 July 2011
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 14 in GENEVA in September 2011
Current status (mid-2011)	152 drifters (126 with Air Pressure) 44 moored buoys (30 for RAMA 65% of the planned 46 site array)
Summary of plans for 2012	Maintain a network of more than 150 drifters. Maintain the moored buoy arrays.

2 Deployment plans for 2012

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. More than 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 2011-2012).

RAMA maintenance will continue in the coming year. MOUs between the US and India or Indonesia will provide 90 or more sea days annually. JAMSTEC will maintain 4 RAMA sites on a cruise in May 2012. China's First Institute of Oceanography (FIO) intends to maintain their 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 July 25-29, 2011 in Chennai, India. Among the topics of discussion will be security plans for cruises within the Exclusion Zone, and coordination of cruise resources among agencies. As security issues are addressed, further implementation may proceed. PMEL will host a technical training session on mooring systems for 3 Indian scientists September 6-9, 2011.

NIOT will maintain a network of 14 deep sea buoys (Ocean Observation Systems, OOS), 6 in the Arabian Sea and 8 in the Bay of Bengal.

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 25 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 2012.

As in previous years, the GDP remains the biggest contributor to the IBPIO, with more than 100 planned drifters deployments. Some of the drifters are standard SVP (30 planned deployments) that only measure SST in addition to the surface current deduced from their movement.

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. Thirty five drifters using Iridium were deployed. This improves the data timeliness. One hundred and seventy one drifting buoys were deployed of which about 85% measured air pressure (SVP-B). The number of daily observations (about 3500 in June 2010) carried out on to the GTS decreased to about 2500 by the end of 2010 and beginning of 2011 then increased again to 3000 by June 2011(see Annex). The percentage of data received within 50 minutes increased from 20% (2009) to about 50% (2011) 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. Both FIO moorings were last serviced in February/March 2011. 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 was deployed in March 3011 within a few miles of the ATLAS system at 12°S - 93° E for comparison and testing.

By mid-2011, 16 of 24 RAMA moorings were reporting on the GTS (WMO ID's 14041, 14042, 14043, 14046, 23001, 23004, 23005, 23006, 23007, 53005, 53006, 53009, 53056, 53057, 53040, 53053).

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 1% of Gross Errors (excepted in July, August and September 2010). The RMS of AP differences being between 1.0 to 1.2 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

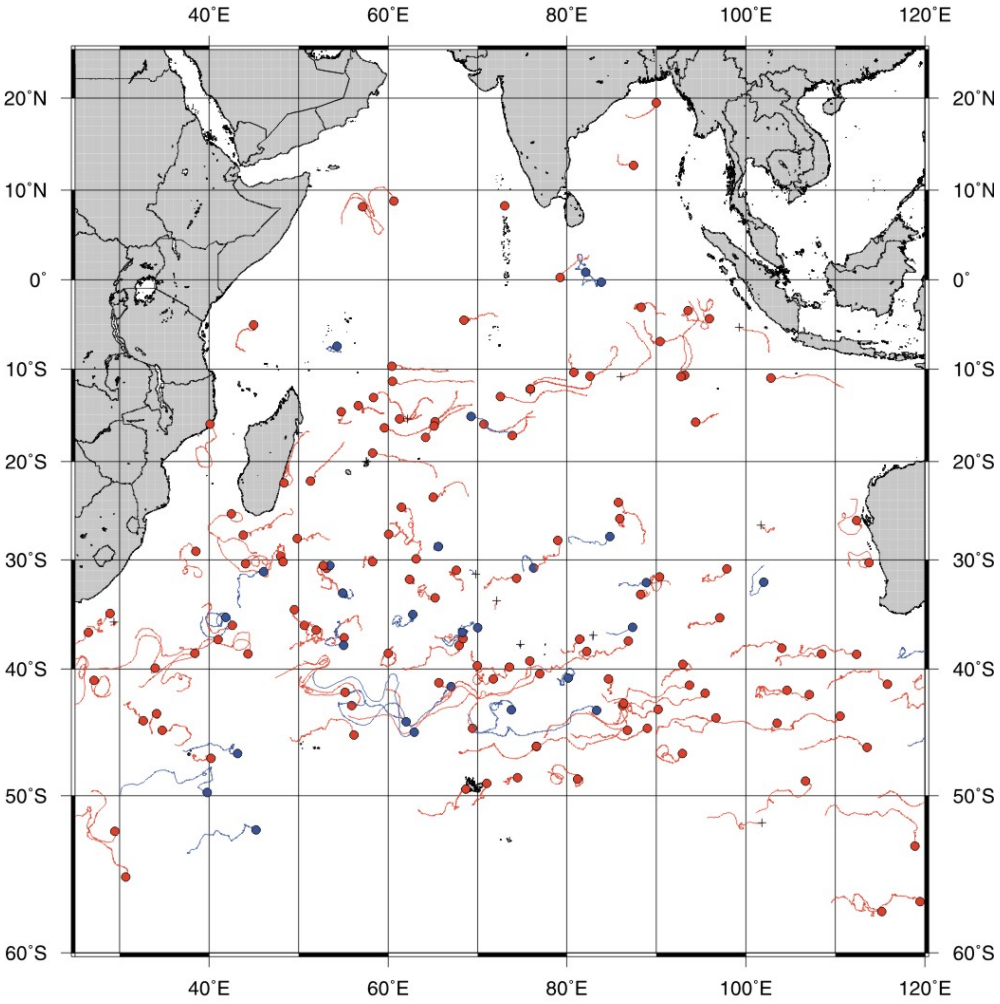
The combination of heavy vandalism and some moorings being deployed for unusually long periods has resulted in data return rates lower than those for the tropical moored buoy arrays in the Pacific and Atlantic Oceans. Bad weather and difficulty in obtaining timely and sufficient sea days has contributed to some RAMA moorings being deployed longer than their intended 12 months. The threat of Piracy has also contributed to moorings not being serviced.

Damage to buoys and theft of instrumentation continues to be a problem, especially at sites near areas of intense fishing activity.

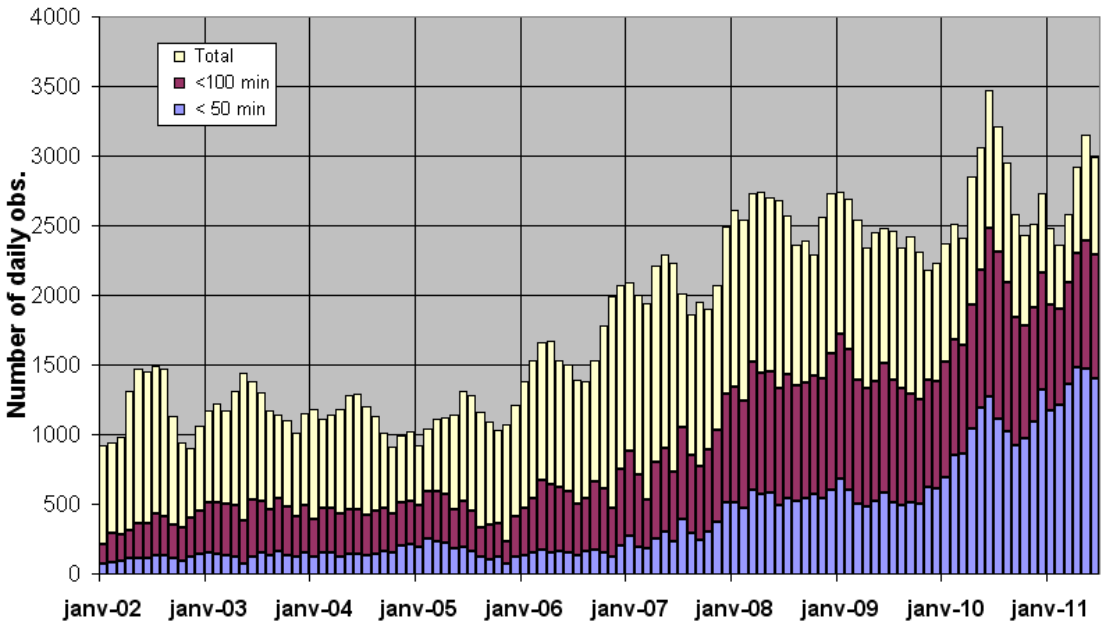
In addition to vandalism, well-publicized piracy events have resulted in the suspension of RAMA implementation off Africa and in the Arabian Sea. Lloyds of London defines an Exclusion Zone north of 12°S and west of 78°E in which additional premiums apply to insure commercial vessels. Previously set at 70°E, the eastern border of the zone was extended in 2011 in response to piracy incidences farther from the coast of Africa. ASCLME contracted the Seychelles Coast Guard to supply a security escort while the RV Algoa serviced RAMA moorings within the Exclusion Zone in October 2010. Two sites previously implemented in the Exclusion Zone along 67°E were not serviced in the past year due to lack of security measures during a Sagar Nidhi cruise.

Between July 2010 and June 2011, 224 sea days were provided in support of RAMA sites: India provided 106 days, 74 days for PMEL's ATLAS and ADCP moorings and 32 days for NIO's Deep Ocean moorings; Japan provided 34 days in support of their m-TRITON and ADCP moorings; Indonesia provided 65 days, 51 for PMEL's ATLAS and TFlex moorings and 14 days for FIO's surface and subsurface moorings. During this period 24 of 30 RAMA sites were serviced.

ANNEX



Drifting buoys trajectories (June 2011)



APPENDIX E

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

1) Summary

Name of Action Group	DBCP-PICES North Pacific Data Buoy Advisory Panel (NPDBAP)
Date of report	31 July 2011
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, Bill Burnett, and Shaun Dolk
Data centre(s)	Global Drifter Assembly Centre (DAC) Integrated Science Data Management (ISDM), Canada
Website	http://npdbap.noaa.gov/
Meetings	Yearly meetings usually held in conjunction with DBCP meetings. Next meeting planned 27 September 2011 in Geneva, Swiss
Current status (mid-2010)	From 01 August 2010 to 31 July 2011, 140 drifters have been deployed. 59 of these drifters were equipped with barometers, while the remaining 81 drifters were basic SVP type units.
Summary of plans for 2011	The goal for 2012 is to again reach 100 drifter deployments, of which, at least 60 drifters shall be barometer equipped.

2 Deployment plans for 2012

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.

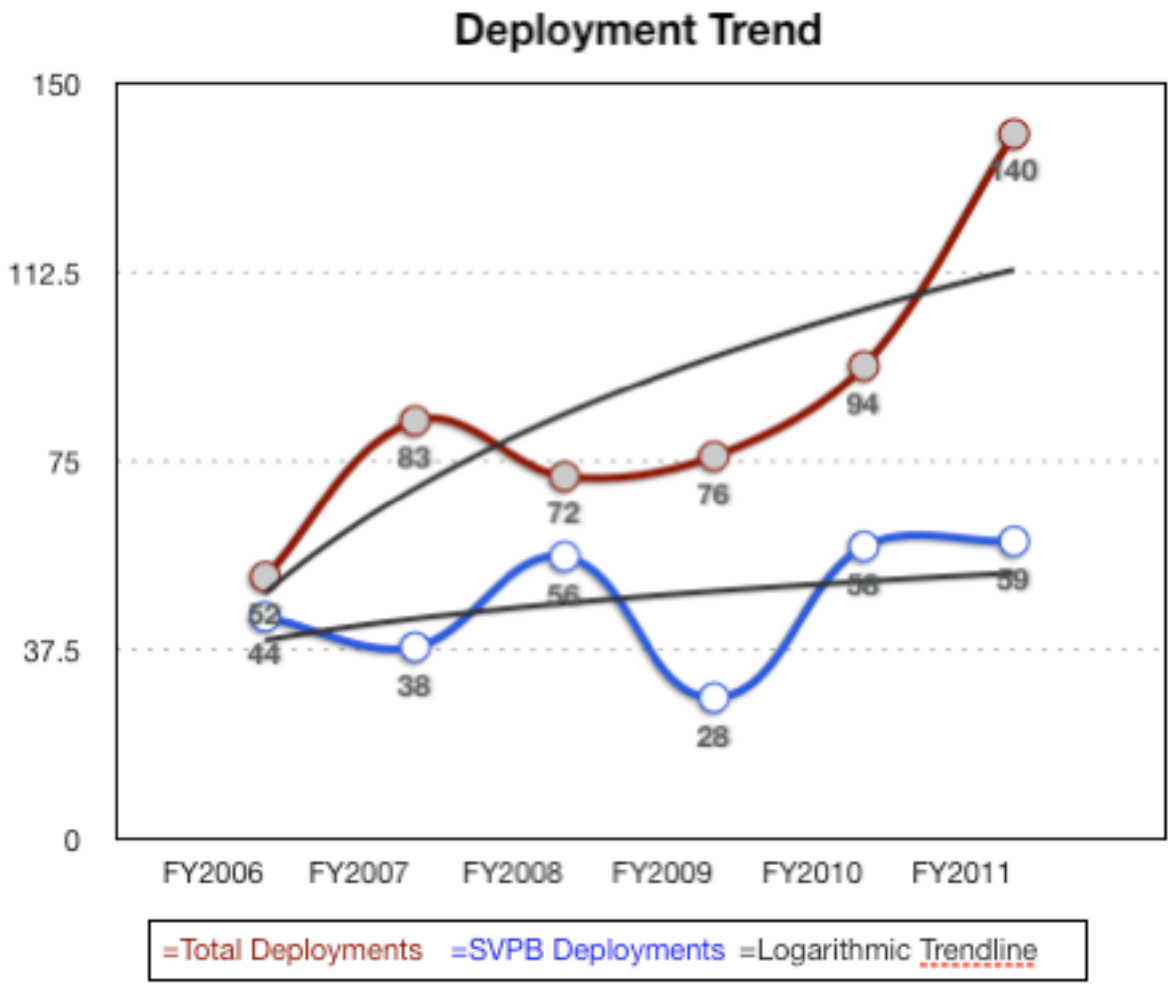
Metadata for GDP drifters are received at the DAC directly from drifter manufacturers who send standardized specification sheets for batches of identical drifters prior of delivery of the instruments. Portions of this metadata are extracted and are made available on the deployment log at the DAC web 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.

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



APPENDIX F

REPORT BY THE INTERNATIONAL ARCTIC BUOY PROGRAMME (IABP)

1) Summary

Name of Action Group	
Date of report	27 July 2011
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)	n/a
Website	http://iabp.apl.washington.edu/
Meetings *(meetings held in 2010/2011; and planned in 2011/2012)*	Annual meetings spring or early summer in the Northern Hemisphere. 21st Annual Meeting of the International Arctic Buoy Programme [IABP], hosted by Environment Canada, was held in Victoria, British Columbia, Canada, 1 – 3 June 2011
Current status summary *(mid-2011)*	Total of 72 buoys in the IABP array 19 July 2011 with an almost even split of Iridium and Argos for data transmission
Summary of plans for 2012 and for remainder of 2011	Participants will deploy 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

2 Deployment plans for 2012 and for remainder of 2011

Deployment plans for 2011 including those for the remainder of 2011 are posted on the IABP web page http://iabp.apl.washington.edu/overview_deploymentplans.html

Specific details on deployment plans, and opportunities for 2012 are not known at the time of this report. As plans and opportunities for deployments become known, Participants are encouraged to

make then known to the IABP Coordinator Ignatius Rigor Ignatius@apl.washington.edu
Annually, March or April, the current year plans are posted to:
http://iabp.apl.washington.edu/overview_deploymentplans.html

Participants are also encouraged to share their plans and opportunities with Jenny Hutchings, IARC, jenny@iarc.uaf.edu for posting on the web page http://www.iceplan.org/

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

The percentage of data from the buoys being distributed on GTS has not been calculated. Details on data timeliness (i.e. reception time at operational meteorological services minus observation time), including known problems, possible solutions, statistics, etc is not available

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) Issues

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.

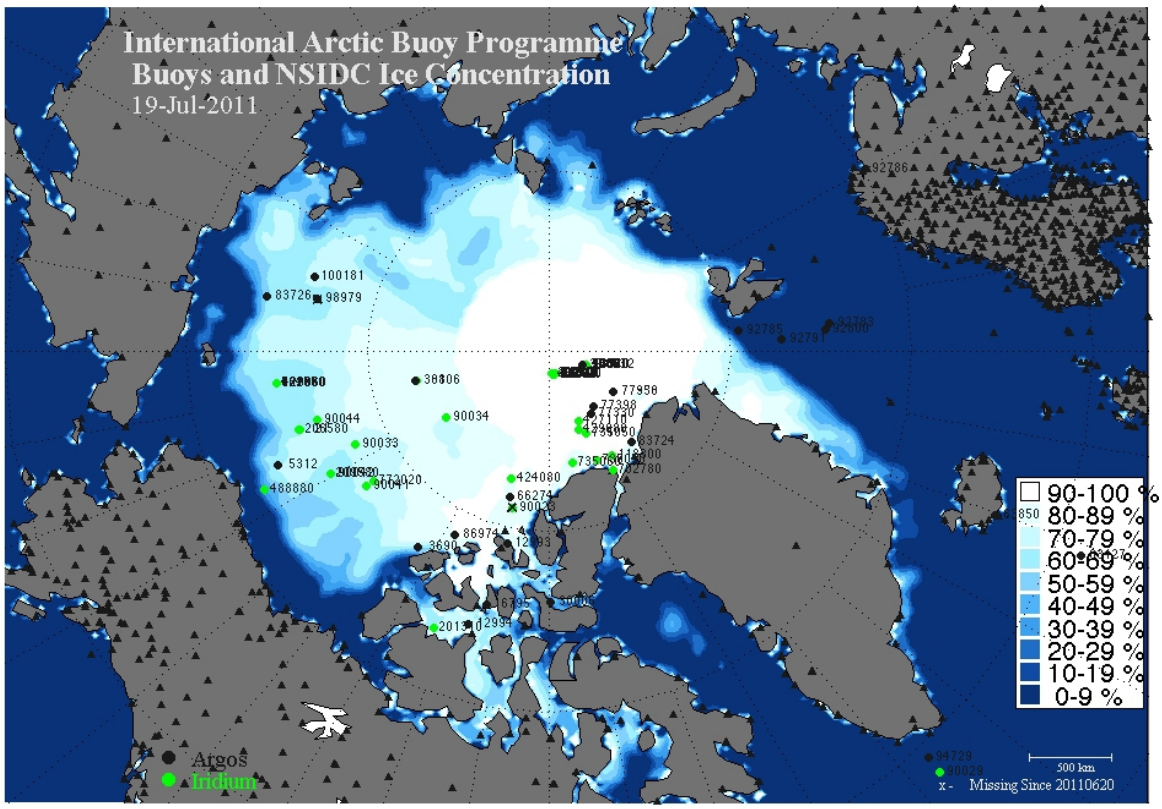
5.3 Obtaining data that did not get onto the GTS
During the IPY in particular, there were buoys on ice whose data has yet to make it to GTS or IABP archives. Efforts continue to get that data in GTS and IABP archives.

Annex - Status maps and graphics

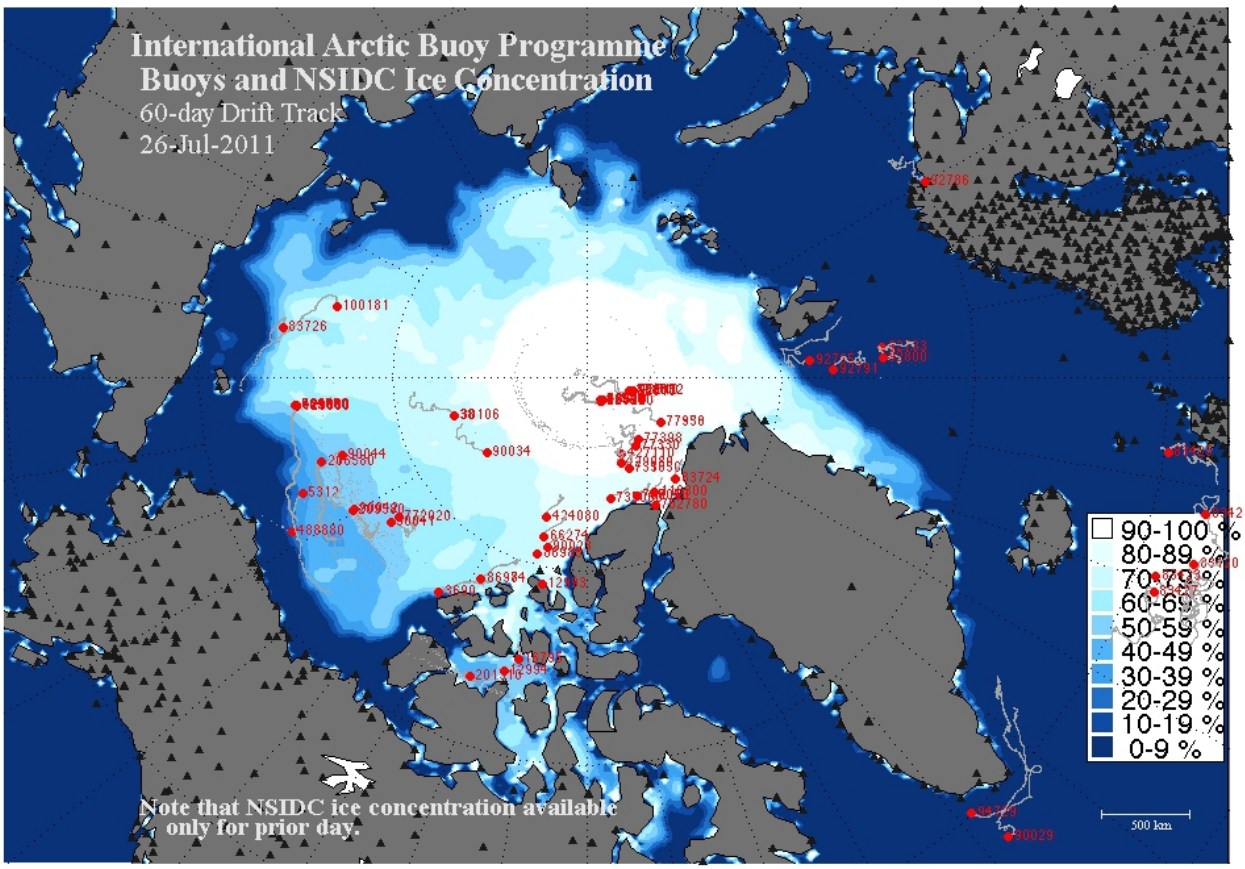
IABP Program Buoy Status 19 July 2011 with comparisons back to 2007

	2007 17 August	**2008 15 August**	**2009 9 August**	**2010 23 August**	**2011 26 July**
Ocean Profiling POPS or ITP	9	7	11	13	8
Ocean Profiling UpTempo				2	3
Arctic Ocean Flux Buoy		1	1	2	2
Ice Mass Balance	8	9	5	4	8
Near Surface Air Chemistry O buoy				1	nil
Only Surface air temperature and **surface air pressure**	33	30	25	11	5
Only Surface air temperature	1	1	1	1	Nil
Only Surface air pressure	8	20	40	22	20
Position only	30	23	6	15	25
Russian manned station		NP 35	NP 36	Nil NP37 Sep 2009 to May 2010	NP38
Total Numbers of buoys	**89**	**91**	**89**	**72**	**72**
Iridium **Argos**					**34** **38**

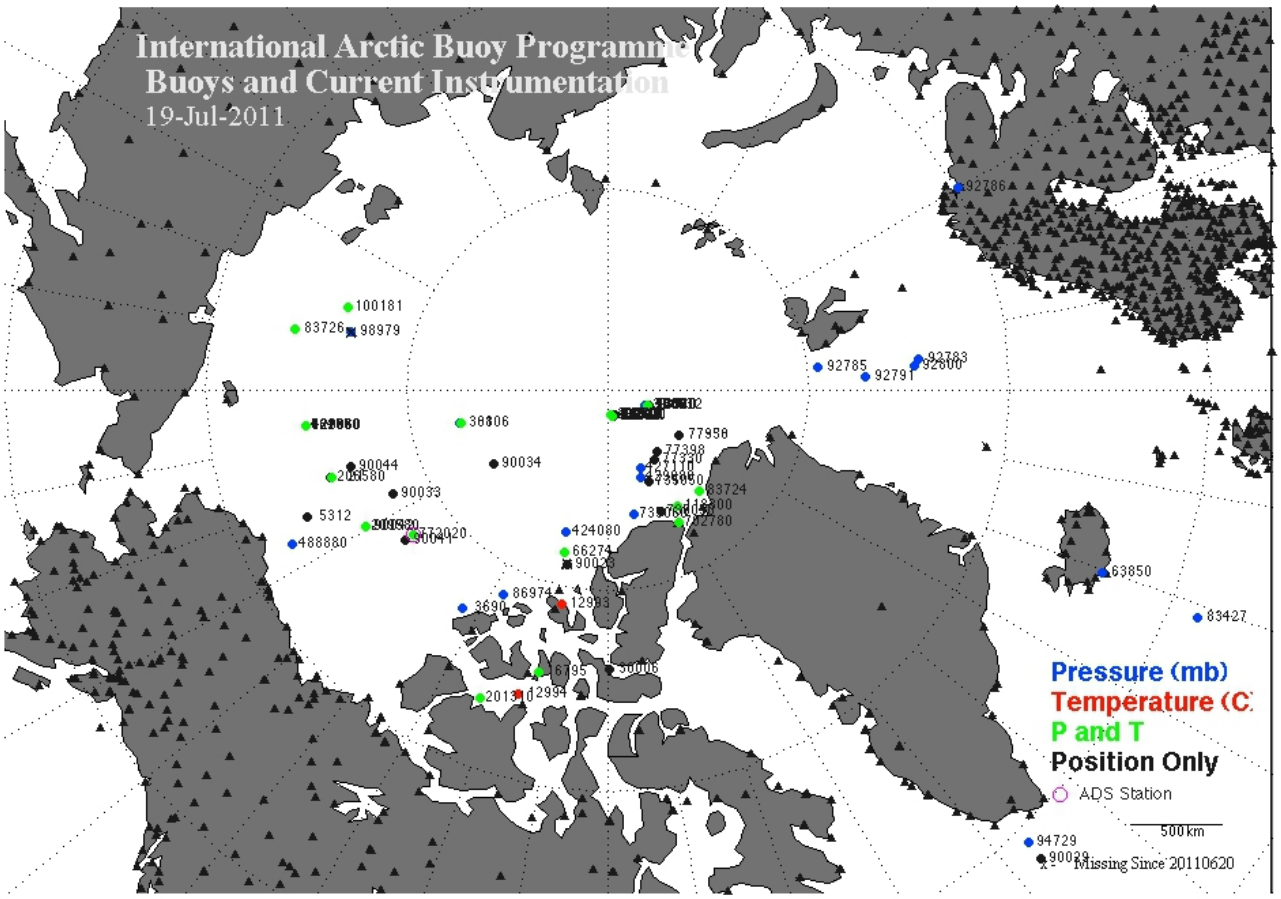
Map showing buoys using Iridium 19 July 2011 http://iabp.apl.washington.edu **monthly** map series


International Arctic Buoy Programme
Buoys and NSIDC Ice Concentration
19-Jul-2011
90-100 %
80-89 %
70-79 %
60-69 %
50-59 %
40-49 %
30-39 %
20-29 %
10-19 %
0-9 %
Argos
Iridium
500 km
Missing Since 20110620

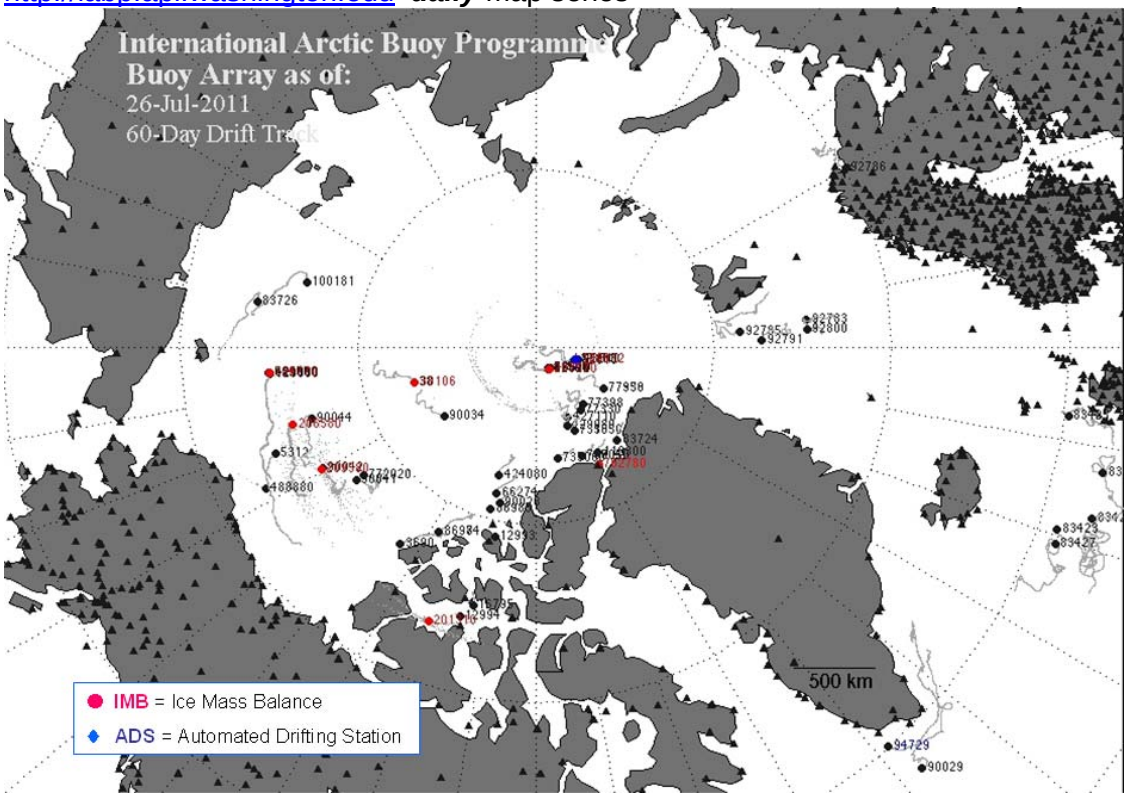
Map with 60-day buoy track and ice concentration *26 July* 2011
http://iabp.apl.washington.edu ***daily*** map series



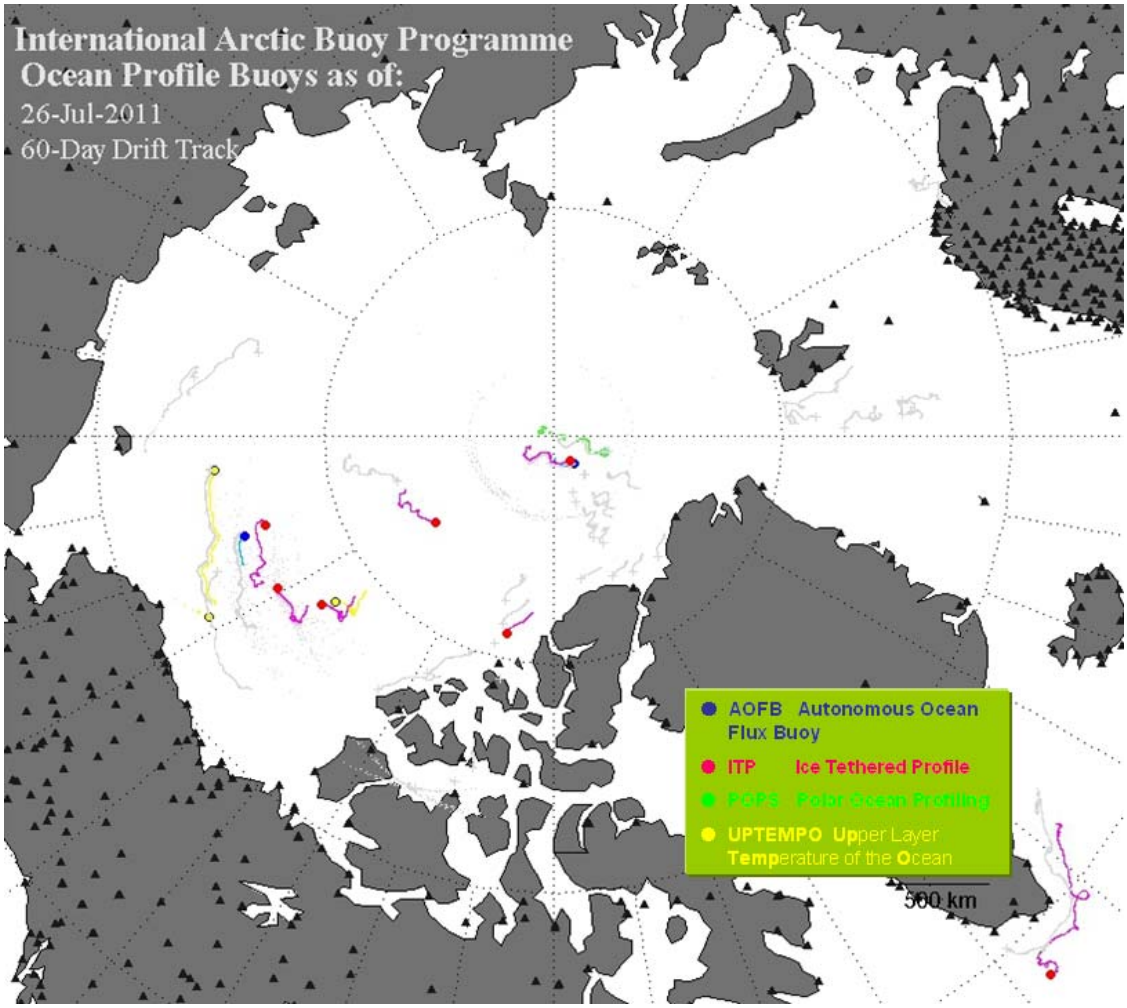
Map highlighting meteorological data provided 19 July 2011
http://iabp.apl.washington.edu **monthly** map series


International Arctic Buoy Programme
Buoys and Current Instrumentation
19-Jul-2011
100181
83726
98979
92786
92785
92791
92783
92600
38806
77950
90044
90034
90033
5312
424080
66274
63724
63850
83427
86974
12993
Pressure (mb)
Temperature (C
P and T
Position Only
ADS Station
500 km
94729
Missing Since 20110620

Map highlighting ice mass balance buoys and automated drifting stations *26 July* 2011
http://iabp.apl.washington.edu ***daily*** map series



Map highlighting ocean profiling buoys *26 July* 2011
http://iabp.apl.washington.edu ***daily*** map series


International Arctic Buoy Programme
Ocean Profile Buoys as of:
26-Jul-2011
60-Day Drift Track
AOFB Autonomous Ocean Flux Buoy
ITP Ice Tethered Profile
POPS Polar Ocean Profiling
UPTEMPO Upper Layer Temperature of the Ocean
500 km

APPENDIX G

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

[This report has not been submitted at the time of publishing this DBCP preparatory document – a revised document may be published at some later stage in case a report is submitted by the Action Group]

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APPENDIX H

REPORT BY THE INTERNATIONAL SOUTH ATLANTIC BUOY PROGRAMME (ISABP)

1) Summary

Name of Action Group	
Date of report	31 July 2011
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
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	
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
Website	http://www.jcommops.org/dbcp/isabp/index.html http://www.oceatlan.org/isabp/en/index.html
Meetings *(meetings held in 2010/2011; and planned in 2011/2012)*	Meetings are held every other year, normally in May-July. ISABP-13 took place in Buenos Aires, Argentina, on April 19, 2010
Current status summary *(mid-2011)*	As of July 25, 2011, there were a total of 147 drifters in the South Atlantic region, (78 SVP, 69 SVPB).
Summary of plans for 2012	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.

2 Deployments in 2011 and plans for 2012

Deployments during the last year (July 2010 through June 2011) are shown in Figure 1.

There were 79 SVP, 78 SVPB and 16 with salinity sensors deployed of which 25 failed on deployment. In addition, there were 12 SVPB Argos-3 pilot project drifters deployed, of which 2 failed on deployment. Efforts to populate hard to reach areas (i.e. Gulf of Guinea and Angola Basin) continued during the intersessional period, mainly with the help of the US Navy vessels, and some from the University of Ghana partnership efforts. Other deployments were carried out by the Brazilian Navy, South Africa Weather Service (SAWS), the Falkland Islands fishing vessels and several other vessels. Six drifters were given to the Administrator of Tristan da Cuhha in September 2010 to be deployed during this year. Four Argo floats were also deployed on the Gough relief voyage on behalf of the oceanographic department of the University of Cape Town. A PIE was also deployed on their behalf. The SAWS will deploy about 15 drifters on the annual Gough Island voyage on the S A Agulhas, Tristan da Cunha will also receive five more drifters to be deployed by their Fisheries Department during the course of the year.

Brazil will deploy a total of 88 drifters in 2011 (30 SVP provided by GDP and 35 SVPB upgraded by Brazil). Brazil also deployed 3 moored buoys in Feb/March and one of them was damaged, only two are now operational. It is expected the deployment of 3 more buoys for the next moths, after implementing improvements on vent safety. Three damaged buoys are being repaired, one coastal and two platform buoys. The aim is to maintain 6 moored boys from S to NE off Brazilian coast this year. Argentina will continue to deploye drifters in the area.
In 2012, the US Navy will continue its African Partnership Station program and will carry out more deployments in the area.

The GDP deployment plans from June 1, 2011 – May 31, 2012 are as follows:

Tropical Atlantic (20^0S – 20^0N):	SVP=150	SVPB=25	(upgraded by AOML or Meteo-France)
Extra Tropical Atlantic (40^0S – 20^0S):	SVP=25	SVPB=75	(upgraded by Brazil, AOML, SAWS)
Southern Atlantic (60^0S – 40^0S):	SVP=0	SVPB=174	(upgraded by AOML)

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 at http://www.goosbrasil.org/produtos/pnboia.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 July 25 there were 147 surface drifters in the South Atlantic region transmitting good quality data on the GTS. (South Atltantic Region defined to be 20^0N to 55^0S).

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 2011, 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

3.2 Data quality

4) Instrument practices

5) Status of the South Atlantic Drifter array

Figure 2 shows the status of the drifter array in the region. As of July 25, 2011 there were a total of 147 drifters actively reporting, 78 SVP and 69 SVPBs

Annex

Status maps and graphics

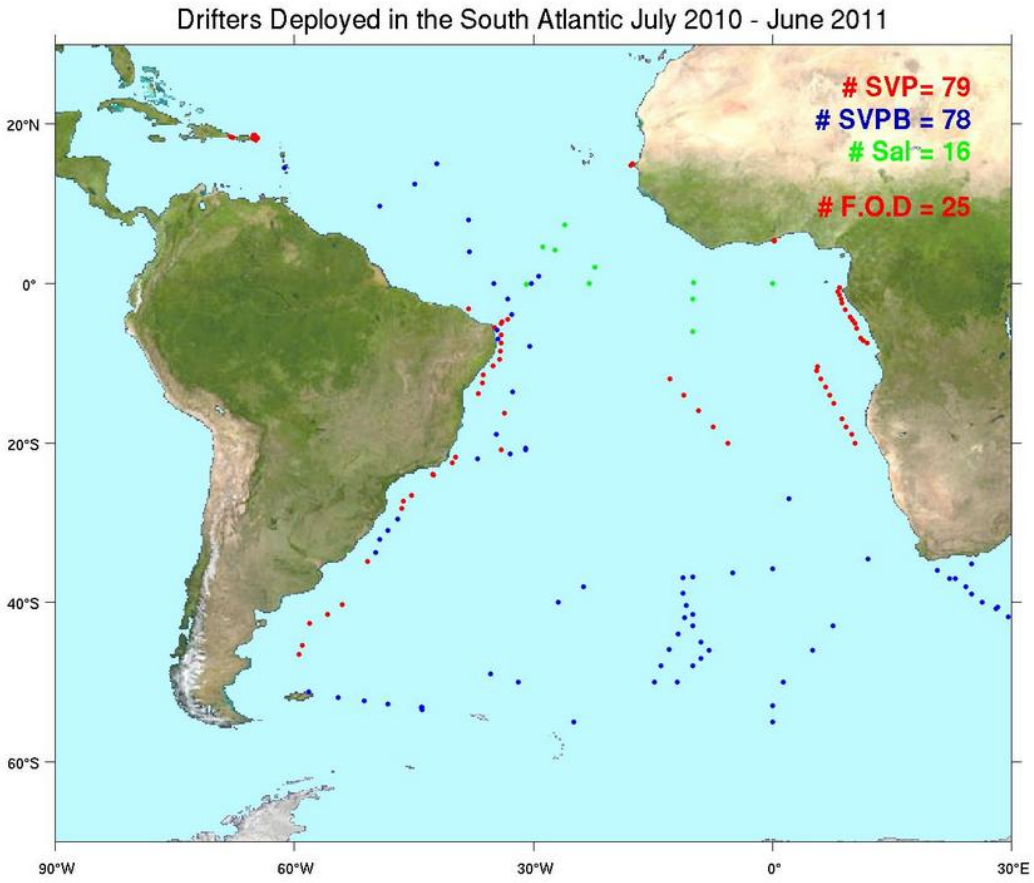

Figure 1: Deployment locations. A total of 185 drifters were deployed.

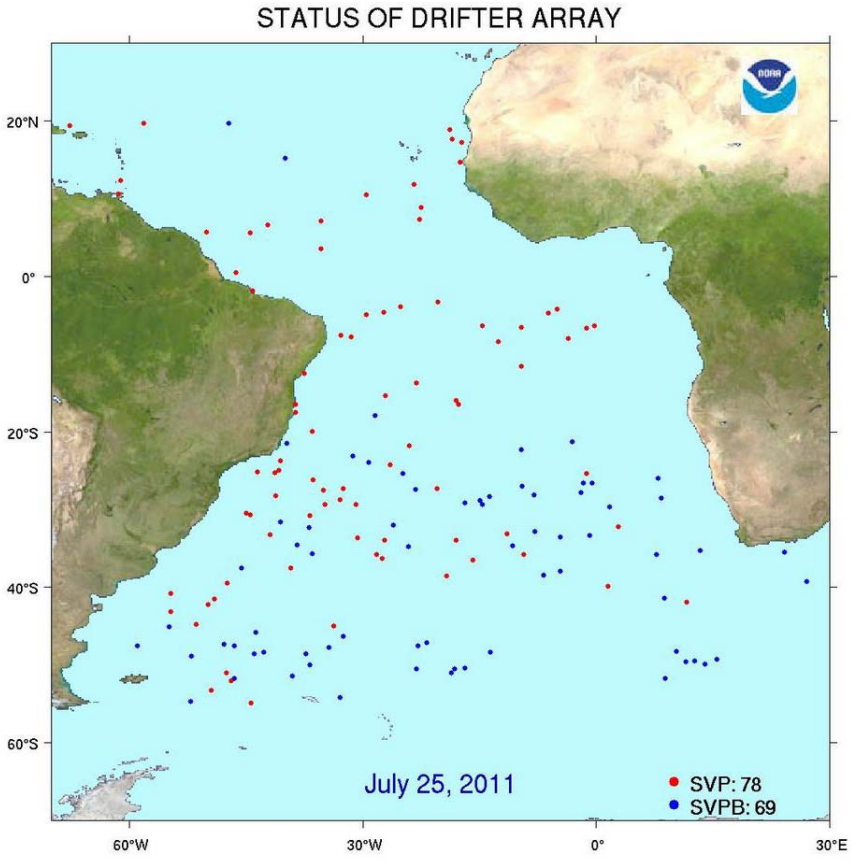

Figure 2: Status of the South Atlantic Array. A total of 147 drifters in the region

APPENDIX I

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

(Status and update on OceanSITES for DBCP27)

Since DBCP 26, there are several items of interest to report to the Panel.

In January, 2011, the 12th POGO Annual Meeting was hosted by the Korea Ocean Research and Development Institute (KORDI) in Seoul, South Korea. The POGO meeting expressend support of OceanSITES in its final declaration and pledged financial support and donations.

Additional activities took place at the Data Management level. Last year, the Data Management Team agreed on an update to the OceanSITES data format. This new data format is growing in acceptance and is being implemented by the current data providers. Data is flowing from most of the participants in the original OceanSITES Steering Team, and in some cases that is starting to include biogeochemical data (e.g. for EuroSITES).

The project office activities for OceanSITES have suffered the past year with the departure of Hester Viola. In September, Kelly Stroker, was appointed so functions in the project office can continue. One of the first focuses with be migrating the OceanSITES webpages from WHOI to JCOMMOPS, where Kelly will maintain the sites. Bob Weller and Uwe Send held a face-to-face meeting with Kelly before her official start date in Denver to discuss several OceanSITES activities.

The current Executive Committee consists of: Uwe Send and Bob Weller (co-chairs), Thomas Trull, Makio Honda, Vsn Murty, Richard Lampitt, Doug Wallace, Tony Knapp, Bill Burnett, Sylvie Pouliquen, and Thierry Carval. The Executive Committee will initiate regular WebEx calls. The first goal of the new committee is to formalize adopting of new sites and review the current list of proposed new sites. The committee will also discusse some exciting new ideas to tackle the 'low-hanging fruit' in terms of network enhancements to fulfill a goal of OceanObs09. One such idea is to deploy deep microcats on all moorings. This relatively minimal cost would add great value to the network.

Outreach, collaborations, and interfacing with other communities took place in various ways. Bob Weller represents the US OOI, is a member of OOPC, and attends many international meetings, building a connection to those. Uwe Send represents OceanSITES in the JCOMM panels such as OCG, in the Clivar GSOP panel, in US and international AMOC, and at international meetings such as IUGG.

A major OceanSITES meeting is now planned for Nov.29-Dec.2 with both the Steering Team and the Data Management Team meeting back to back. Topics to address include possible broadening of OceanSITES, e.g. to include boundary current observations or coastal carbon/ocean acidification timeseries.

APPENDIX J

REPORT BY THE INTERNATIONAL TSUNAMETER PARTNERSHIP (ITP)

1) Summary

Name of Action Group	International Tsunameter Partnership
Date of report	31 July 2011
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 cabled tsunameter systems, and multi-role tsunameter platforms. 2. Shared experiences and lessons learned on operational practices for tsunameter systems qualification, deployment, maintenance and operational monitoring. 3. Determined the status of real-time Tsunameter data exchange for all buoy types across all networks. 4. Collated and finalise the data on vandalism and sustainability as part of the vandalism report. 5. Identified issues and identified emerging technologies that could address the near-field tsunami warning problem.
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.
Targeted horizontal resolution	Along Tsunamigenic zones based on national warning centre requirements
Chairperson/Managers	Chair: Mr Ross Hibbins (AUS - BOM) Vice Chair: Dr. Bill Burnett (US - NOAA)
Coordinator	N/A
Participants	Bill Burnett – US – NDBC Eddie Bernard – US – PMEL Robert Lawson – US – SAIC Christian Meinig – US – PMEL Nick Street – UK – Sonardyne Dr. R. Venkatesan – India – NIOT Ken du Vall – US – Lighthouse R&D

	K. Premkumar – India – Win Marine Consultancy David McGilvray – Australia – Australian Maritime Systems Hamed Al Gheilani – Oman – Ministry & Fisheries David Murphy – USA – Sea- Bird Electronics Djoko Hartoyo – Indonesia – BPPT Donna Kocak – US – Csnet Ken Jarrott – AUS – BOM Ross Hibbins – AUS – BOM
Data centre(s)	There is no international data centre that archives the high resolutions data for Tsunameters as yet. Tsunami Watch Centres manage the real-time tsunameter data they receive based on operational needs.
Website	
Meetings *(meetings held in 2010/2011; and planned in 2011/2012)*	Last meeting - ITP #6 Oban, Scotland UK (1st – 2nd October 2010) Next meeting - ITP #7 Geneva, Switzerland (1st October 2011)
Current status summary *(mid-2011)*	Refer to Annex 1
Summary of plans for 2012	Refer to Annex 1

2 Deployment plans for 2012

Refer to Annex 1

3 Data management

3.1 Distribution of the data

The Tsunameter data is distributed to the Tsunami Watch Centres via the GTS or FTP. The US is providing DART data on the OPeNDAP website 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 2 countries to date, Australia and India. Australia has been transmitting data in the BUFR code form for pre-operational trial since March 2009 and this year India started coding their Tsunameter data in BUFR/CREX format. The US should be providing their data in the new BUFR/CREX code format soon, but global GTS dissemination will be by 2012.

3.1.2 Real-time data exchange

There are two modes by which Tsunameter data is exchanging real-time, GTS and FTP. Australia, Chile, Russia, Thailand and the US tsunameters are reporting real-time data on the GTS. Indian is currently is still working towards the approval to release their tsunameter data onto the GTS. Chile, Russia and the US have also made their Tsunameter data available via FTP.

3.1.3 Delayed mode data exchange

The exchange of delayed mode data has not been determined as yet. This is an agenda item at the ITP-7 meeting in Geneva.

3.2 Data quality

Data quality standards, quality control and fault detection is 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 this is an agenda item at the ITP-7 meeting in Geneva.

4) Instrument practices

Draft Instrument standards were developed by the ITP under the ICG-IOTWS. These standards will be reviewed at the ITP-7 meeting in Geneva.

5) Other issues as needed

The ITP needs to understand the process to obtain the Tsunameter requirement from the International Governmental Coordination groups is not clear under the DBCP.

Annex 1 - Network status

	Tsunameter network							
Country	Plan network	Currently operational	Tsunameter types	Data receive locally	Data transmitted on GTS	Data available via FTP	Data format types	Number of stations not operating due to vandalism
Australia	6	6	NOAA - DART II STD, NOAA - DART ETD, SAIC-DART II STD, SAIC-STB, SAIC-ETD	Yes	Yes	No	NOAA-DART, CREX/BUFR	0
Chile	3	1	SAIC-DART II STD,	Yes	Yes	Yes	NOAA DART	0
China								
INDIA	7	4	DART-STB (ARABIAN SEA & BAY OF BENGAL) INDIAN MADE TSUNAMI BUOY WITH SONARDYNE BPR 2 (BAY OF BENGAL)	Yes	being pursued by INCOIS Hyderabad	no	CREX/BUFR	0 Shortly network will be operational
Indonesia	20	2	InaBuoy, NOAA-DART-STD, NOAA-DART- ETD, SAIC-ETD					9
Japan								
Russia	1	1	SAIC - STB	No	Yes	Yes	NOAA DART	0
Thailand		1	SAIC-STB		Yes		NOAA DART	
US	39	35	NOAA - DART II STD, NOAA - DART ETD, SAIC-STB, SAIC-ETD	Yes	Yes	Yes	NOAA-DART	2 (42409 upper mooring had 6 of the 8 strands cut. 43412 stopped transmitting and is not on station; most likely run over)

NOAA-DART II-STD – (NOAA DART II Standard), NOAA-DART-ETD (NOAA DART Easy to Deploy), SAIC –STB (SAIC Tsunami Buoy) SAIC – ETD (SAIC Easy to Deploy) InaBuoy (Indonesian Tsunami Buoy)

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