WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

DATA BUOY COOPERATION PANEL

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TWENTY-THIRD SESSION

ITEM: 2.2.1

JEJU, REPUBLIC OF KOREA
15-19 OCTOBER 2007

ENGLISH ONLY

REPORTS BY THE ACTION GROUPS

(Submitted by the DBCP Action Groups)

Summary and purpose of 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 be invited to comment, and particularly make decisions or recommendations, as appropriate on the following topics:

(a) Note and comment on the information contained in this document;

(b) Take into account the contents of the report when discussing relevant agenda items.

Appendices:
- A. Report by the Global Drifter Programme (GDP)
- B. Report by the Tropical Moored Buoy Implementation Panel (TIP)
- C. Report by the E-SURFMAR, EUCOS Surface Marine Programme
- 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 OceanSITES

Appendix A

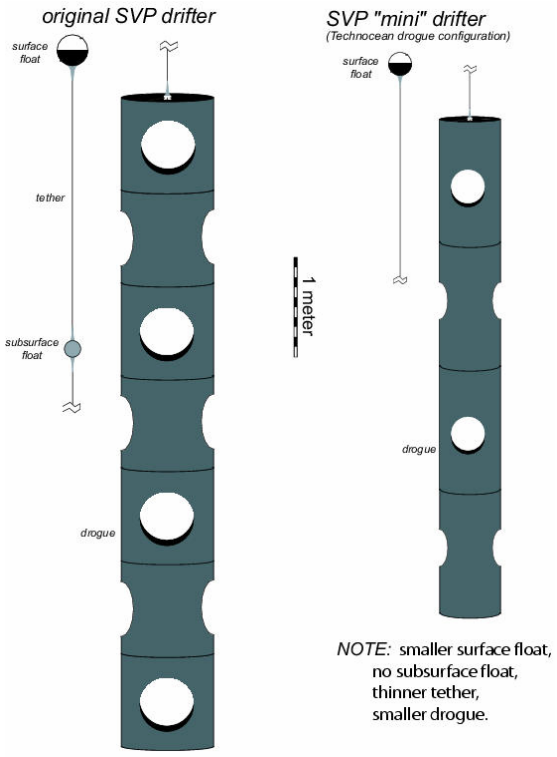
Report by the Global Drifter Programme
By: Shaun Dolk, University of Miami/CIMAS
NOAA/AOML/PhOD/GDP

The **Global Drifter Program (GDP)**, managed by Dr. Rick Lumpkin, is composed of the Drifter Operation Centre (DOC) and the Data Assembly Centre (DAC). The GDP is one of the primary branches of the Physical Oceanography Division at NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML).

The objectives of the GDP are to maintain a global 5x5 degree array of 1250 ARGOS-tracked surface drifting buoys and provide a data processing system for scientific use. A sustained array of 1250 surface drifting buoys helps create an accurate and globally dense set of in-situ observations of mixed layer currents, sea surface temperature, atmospheric pressure, winds and salinity. With these observations, the data processing system is used to perform research, as well as monitor and predict short-term seasonal to interannual (SI) climates.

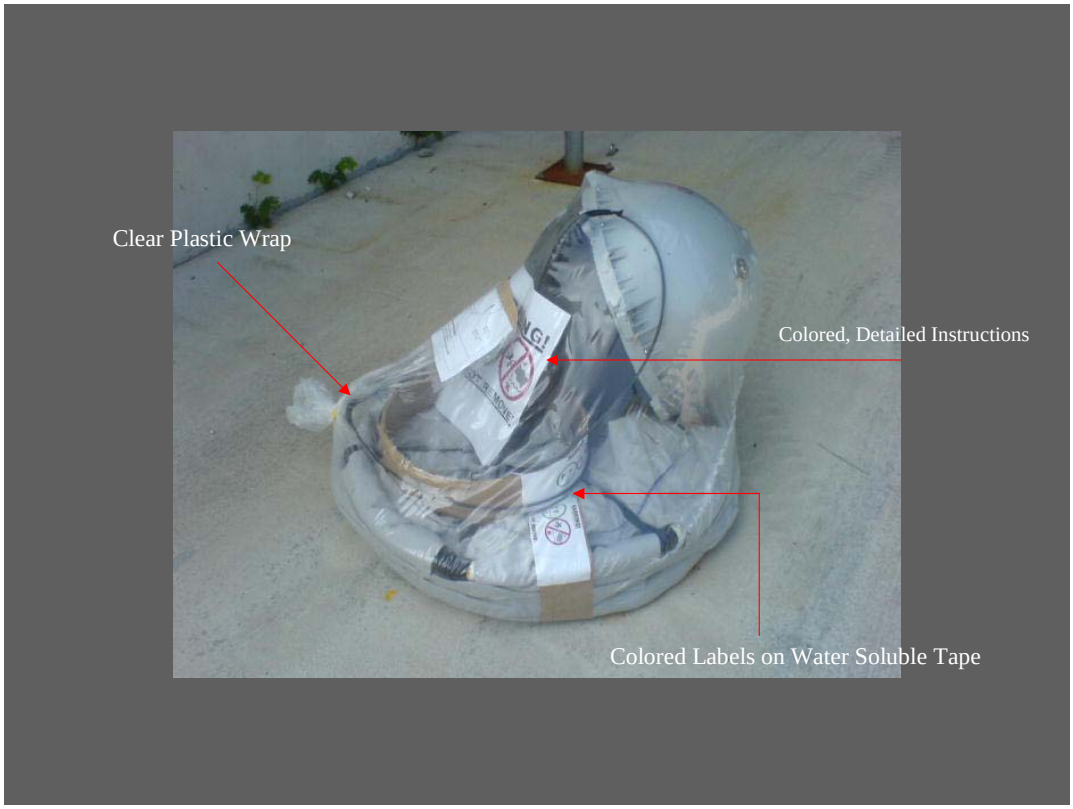
In order to obtain these objectives, the GDP determines areas of interest, locates Vessels of Opportunity (VOS) (who help deploy buoys while in transit), coordinate deployment locations, process data, archive data, develop and distribute data-based products and post all quality controlled results on the GDP website (http://www.aoml.noaa.gov/phod/dac/gdp.html).
Within these daily activities, the GDP works closely with various companies and institutions. One of the biggest collaborators with the GDP is NOAA's Joint Institute of Marine Observations (JIMO). Thanks to JIMO, managed by Dr. Peter Niiler, drifter inventory is maintained, product advancement continues and cooperation increases on a global level.

Along with JIMO, the GDP works closely with the drift buoy manufacturers. These relationships are a vital part of this project, as clear communication and understanding are needed to ensure both the safety of those involved, as well as the ability to obtain accurate results.
In early 2006, the DAC undertook a complete re-evaluation of drogue presence for all drifters, January 1998 to March 2006. This re-evaluation was necessary because in some cases, drogue status was not being correctly interpreted due to changes in sensors: divergence between different manufacturers' procedures, differences in submergence sensitivity, and possible misinterpretation of tether strain records. Based on this experience, several recommendations and suggestions were made at the 2006 DBCP meeting in La Jolla. Overly sensitive submergence sensors were to be modified as quickly as possible to reduce signal noise; in the longer term, the GDP recommended that all manufacturers change from submergence sensor to tether strain (or add tether strain) for drogue detection, currently used by one manufacturer. At present, we have not seen improvements in the sensitivity of submergence sensors where it is necessary, and tether strain has not been implemented by additional manufacturers.



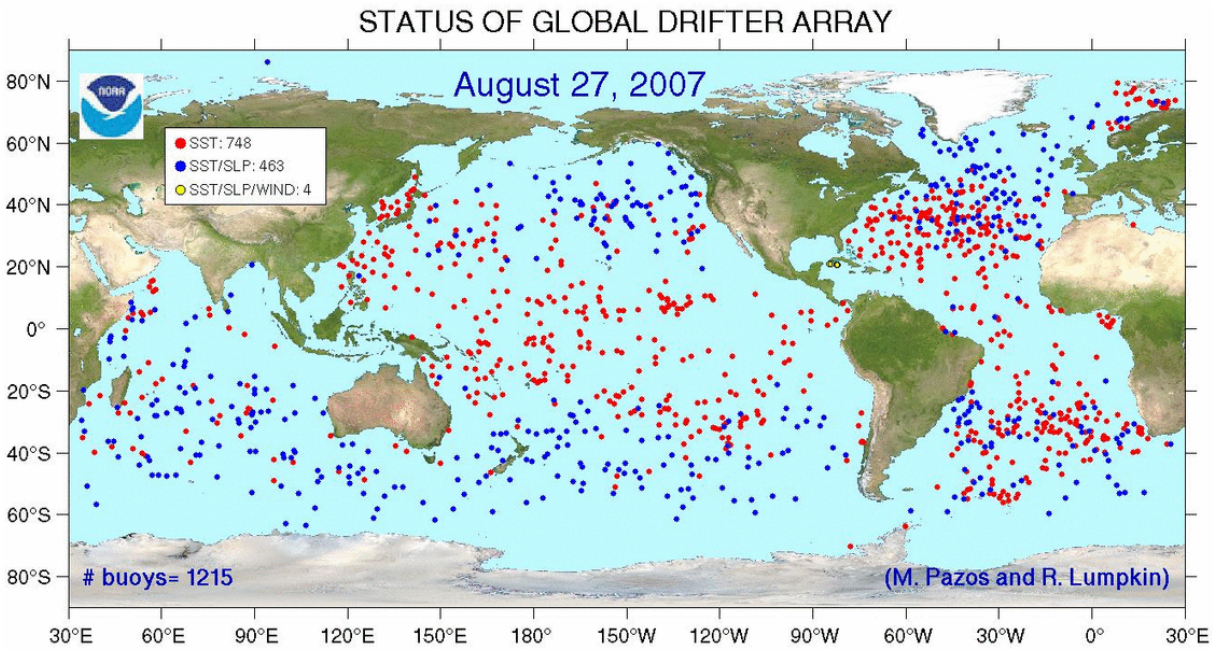
In addition to the drogue detection modifications, there is also a need to modify the ability to activate the buoy without the removal of the magnet prior to deployment. Currently, three of the four manufacturers are using a system in which the magnet is connected with water-soluble tape and as such, the magnet falls off after it has been deployed. This solution has proven to be a good remedy as the buoys remain “off” (not transmitting) until they have been deployed. At present, one manufacturer is still using the “pull pin” magnet to activate its buoys. This is concerning because there have been instances when buoys have been deployed without this pin being removed. In these cases, the buoys never transmit a location and are classified “Failed on Deployment”.

Finally, the GDP would like to reiterate the importance of the packaging of these drift buoys. Safety is a major concern for all who are involved in this project and every precautionary measure should be taken to ensure this point. One of the easiest ways to promote safety is to educate the individuals who are deploying and handling these instruments. Though a drift buoy is harmless, when it ends up in the hands of someone who has never seen one, we want them to know how to handle it. The way to educate people how to deploy (and handle) these instruments is to have detailed instructions that explain proper usage. Ideally, the GDP would like to see all buoys wrapped in clear plastic contain detailed (coloured) instructions on the outside of the wrapping and (coloured) labels on water soluble tape that indicates the proper deployment techniques. It is the belief of the GDP that taking these measures will maximize safety.



In the upcoming year, the GDP is looking to resolve these problems and make proper adjustments to continue the advancement of these instruments. The communication and cooperation between the GDP and drift buoy manufacturers in the past show that these adjustments can be made easily.

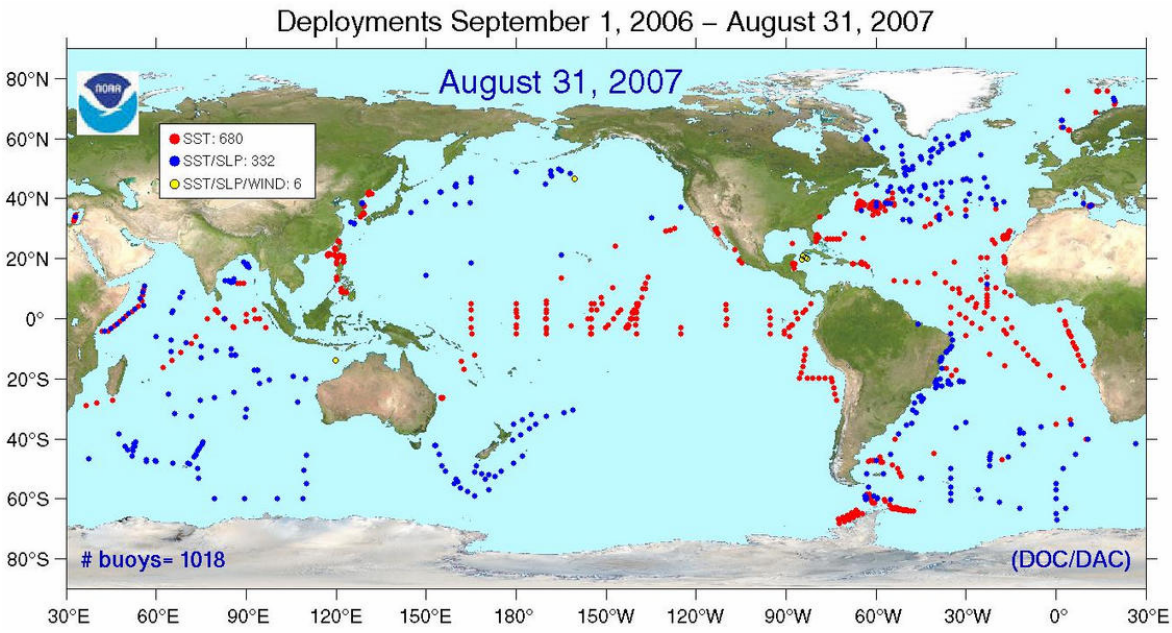
In FY2007, (1 September 2006 to 31 August 2007) there were a total of 1003 buoys deployed, surpassing the planned deployment of 960 buoys. When these deployment totals are compared to that of the deployments from last FY, you see there were 119 more buoys deployed, bringing the total number of buoys on GTS to 1215. Last year at this time, 884 buoys had been deployed with 1059 transmitting on GTS.



Of the1003 buoys deployed in FY2007, a total of 142 of these were classified as research buoys (Consortium Research). The break down of these deployments is as such:

North Atlantic:	219
Tropical Atlantic:	169
South Atlantic:	152
North Pacific:	63
Equatorial Pacific:	206
South Pacific:	41
Indian Ocean:	147
Mediterranean Sea:	6

Total # of drifters
Deployed in FY2007: 1003



Being that FY2008 is International Polar Year, there is a strong desire to increase the awareness of the sea surface temperature, barometric pressure and mid level ocean current velocities in the higher latitudes (>40°). Historically, these areas have been sampled with less regularity, thus creating a need to increase the number of buoys deployed in these regions.

In FY2007, there were a total of 323 buoys deployed in areas with latitude greater than 40°. When we break down these deployments by region, we see that the dispersion between North and South is rather similar.

North Atlantic (greater than 40°N): 103

North Pacific (greater than 40°N): 35

} 138 Northern Deployments >40°N

42.7%

South Atlantic (greater than 40°S): 124

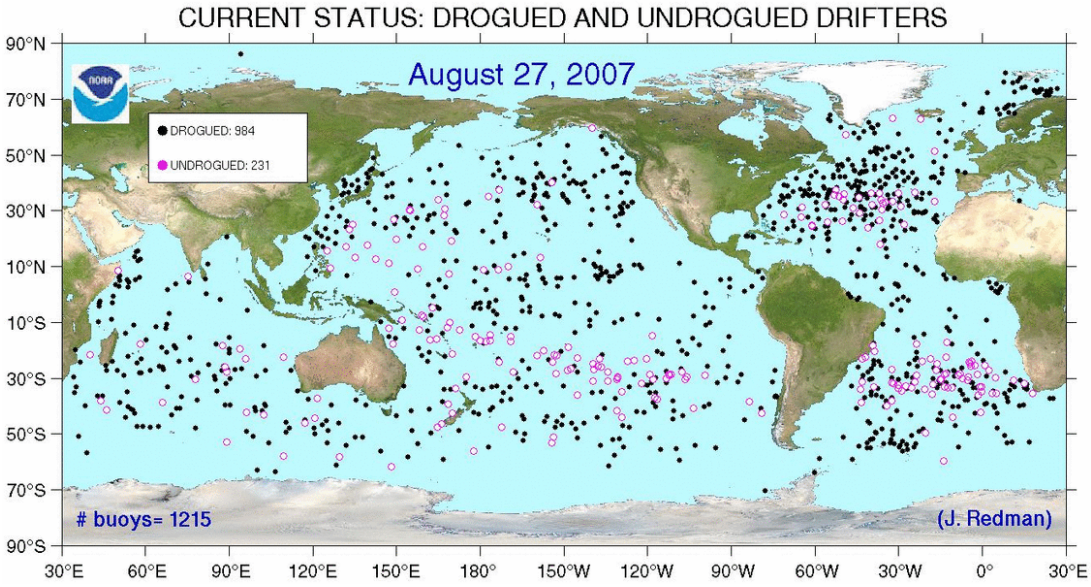
South Pacific (greater than 40°S): 21

South Indian (greater than 40°S): 40

} 185 Southern Deployments >40°S

57.3%

Taking a closer look at the type of buoys deployed; of the 323 buoys, a total of 180 of these buoys were SVPB's (55.7%), 121 were SVP's (37.5%) and 22 were SVPG's (6.8%).



Based on these results, it is the goal of the GDP to increase the number of these deployments and reach a combined total of 375 buoys in regions with latitude greater than 40°. The GDP would also like to increase the amount of SVPB's deployed at these higher latitude locations to a rate of 60%. These increases in the upcoming year are to be achieved with hard work and the help of numerous institutions throughout the world.

One such institution that has recently joined the GDP is the National Oceanographic Research Institute (NORI) of the Republic of Korea. NORI began its participation early in the calendar year of 2007 making strides to join the likes of the many other major players in the deployment of drift buoys and processing of drifter data. Since joining the program in May of 2007 NORI has already deployed 17 buoys and has the capacity to deploy another 41 before the end of the FY. The GDP would not only like to thank NORI for their participation in this quest, but also for hosting the 23rd annual meeting of the Data Buoy Cooperation Panel.

Appendix B

Report by the Tropical Moored Buoy Implementation Panel (TIP)

Tropical Moored Buoy Implementation Panel (TIP) Report to the 21st Session of the Data Buoy Cooperation Panel

Jeju, Republic of Korea
15-19 October 2006

The Tropical Atmosphere Ocean/Triangle Trans-Ocean Buoy Network (TAO/TRITON) moored buoy array is a central component of the ENSO Observing System, deployed specifically for research and forecasting of El Niño and La Niña. The Array consists of 55 ATLAS moorings maintained by the National Data Buoy Centre (NDBC) and the Pacific Marine Environmental Laboratory (PMEL), 12 TRITON moorings maintained by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), and 5 subsurface Acoustic Doppler Current Profiler (ADCP) moorings (4 maintained by NDBC and 1 by JAMSTEC). In addition to these core moorings, there are several moorings deployed as enhancements, including 4 TRITON moorings in the far western tropical Pacific along 130 E and 137 E, and test site(s) maintained by NDBC for mooring refresh development.

At present (August 28, 2007), La Nina-like conditions prevail in the tropical Pacific, with eastern tropical Pacific sea surface temperature anomalies as large as -2.0 ºC, western warm pool anomalies greater than 0.5 ºC, and easterly wind anomalies over much of tropical Pacific. The most recent (August 9, 2007) EL *NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION* issued by NOAA's Climate Predication Centre states that "ENSO-neutral conditions are expected to continue through August 2007, with a slightly greater than 50% chance of La Niña developing during the next couple of months.".

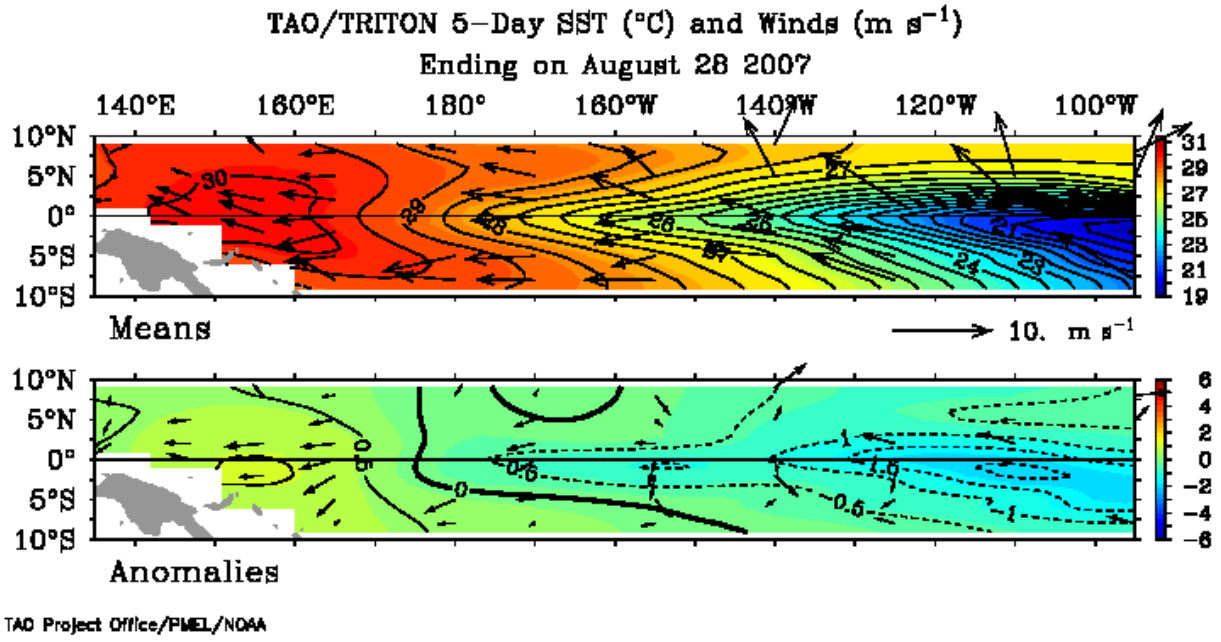


Figure 1. Sea surface temperature (contours) and surface wind velocity (arrows) from the TAO/TRITON mooring array. The upper panel shows the measured values and the lower panel shows the difference from climatological values. TAO/TRITON mooring locations are at the base of the wind vectors.

The Pilot Research Moored Array in the Tropical Atlantic (PIRATA) moored array increased in

2007 to a 17 surface mooring and 1 subsurface ADCP mooring configuration with the addition of 2 ATLAS moorings in the northern tropical Atlantic. One mooring, deployed on a one-year test basis in a South African led effort as part of the Benguela Current Large Marine Ecosystem Project (BCLME), was removed. This mooring in the southeastern equatorial basin (designated the SE Extension) may be redeployed in the future. Mooring preparation, data processing, and evaluation are provided by the US. Ship time for mooring maintenance is provided by Brazil, France, and the US. Cruises are staffed by US, French and Brazilian technicians.

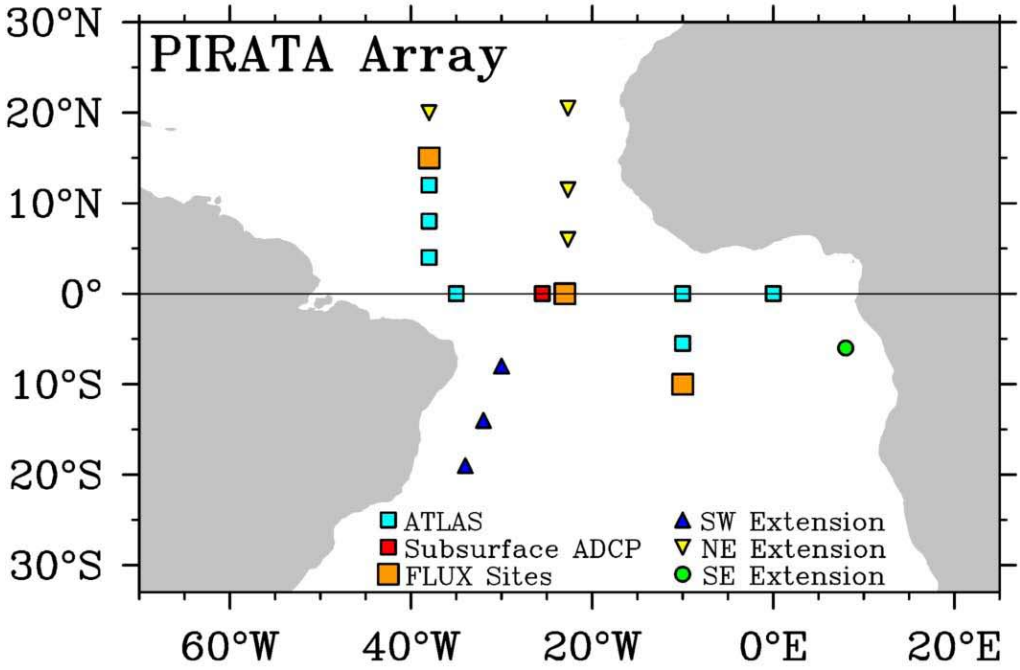


Figure 2. Mooring locations within the PIRATA Array.

The primary data telemetered in real time from moorings in both the TAO/TRITON and PIRATA Arrays are daily mean surface measurements (wind speed and direction, air temperature, relative humidity and sea surface temperature) and subsurface temperatures. NextGeneration ATLAS moorings provide optional enhanced measurements, which include precipitation, short and long wave radiation, barometric pressure, salinity, and ocean currents. High temporal resolution (10-min or less record interval) measurements are available in delayed mode. A new initiative to add heat, moisture and momentum flux measurements at 4 TAO and three 3 PIRATA moorings was completed in 2007. Additional flux measurement sites are deployed or have been identified within the Indian Ocean moored array presently under development (see below). The addition of sea surface salinity (SSS) measurements to all TAO moorings was essentially completed with 54 of 55 moorings deployed in 2007.

TAO/TRITON data return remains good, with an overall value for real-time primary data availability of 82% for the period 1 October 2006 to 15 August 2007. (Data return statistics for the period 1 October 2006 to 30 September 2007 will be available at the time of the Panel meeting.) Damage to moorings and sensors due to fishing activity continues to be of concern. This damage accounts for a significant amount of data loss, especially in the far eastern and far western portions of the Pacific basin. PIRATA real-time data return for the same period was 90%. PIRATA data return has typically been lower than that for TAO, primarily due to a greater relative amount of vandalism (concentrated in the Gulf of Guinea) and a smaller array size. The occurrence of vandalism can be episodic (perhaps in response to the abundance of fish and number of fishermen) and the amount of vandalism appears to have been lower than normal for PIRATA in the past year. Moreover, the

increase in array size over the past several years from the original 10 moorings to 17 in 2007 has effectively decreased the percentage loss represented by any one mooring.

Management of the TAO portion of TAO/TRITON officially transferred from PMEL to NDBC in October 2004. Responsibility for field operations transferred to NDBC on January 1, 2007. Instrument preparation remains at PMEL while a “refreshed” ATLAS system comprised of more “off-the-shelf” components is underway at NDBC. Two prototype refreshed systems were deployed in 2007, one in the Gulf of Mexico and one in the TAO array.

Progress continues towards the development of a 47-element Indian Ocean Observing System (IndOOS), a multi-national, multi- platform network designed to support climate forecasting and research. IndOOS is a regional cornerstone of the Global Earth Observing System of Systems (GEOSS) and has been endorsed by committees of the World Climate Research Program and the Intergovernmental Oceanographic Commission. Initial moorings in the array included one subsurface ADCP mooring (first deployed in 2000) and 2 TRITON moorings (first deployed in 2001) maintained by JAMSTEC, and 3 subsurface ADCP moorings (first site deployed in 2000) maintained by NIO. PMEL's specific contribution to IndOOS is a network of ATLAS and acoustic Doppler current profiler (ADCP) moorings at strategic locations throughout the basin. ATLAS moorings were first deployed in the Indian Ocean array in 2004. In the past year, the array of ATLAS moorings expanded from 4 to 8 sites. The total moored buoy array, including all national contributions, is now 32% complete.

Indian Ocean ATLAS moorings are maintained through collaboration between the US, which provides equipment, data processing, and dissemination and technicians for field operations, and India, Indonesia and France, which provide ship time. The Indian Ocean ATLAS moorings are instrumented similarly to those in PIRATA. In addition, all have near surface (10 m) current meters, and two sites have OceanSITES flux enhancements, which include longwave radiation, barometric pressure, and additional subsurface current meters. The People’s Republic of China First Institute of Oceanography plans to deploy a subsurface mooring south of Java in September/October 2007. Other expansion plans for the coming year include two additional ATLAS mooring to be deployed in the Bay of Bengal in October/November 2007 and two additional ATLAS moorings to be deployed in spring 2008, all from the ORV Sagar Kanya.

PMEL is planning several changes to the moored array in an attempt to decrease the amount of data lost to vandalism. To address the problem of theft of instrumentation, standard hardware on surface moorings will be replaced by hardware that requires special tools. Initial deployments of this hardware are scheduled for September/October 2007. Another change will be to remove meteorological sensors from some surface moorings and to modify the buoys to discourage vandals from boarding or attaching a line to the buoy. Surface and subsurface measurements will continue to be telemetered from these moorings from a transmitter embedded in the buoy. If this modification results in a decrease in mooring loss, surface meteorological sensors with vandal resistant packaging may be reintroduced to the sensor suite. Prototypes of these moorings are scheduled for deployment in spring 2008. A third change will be to increase the number of subsurface moorings relative to surface moorings. Prototype ADCP subsurface moorings, enhanced for upper water column measurement of temperature and salinity, are being designed for deployment in spring 2008.

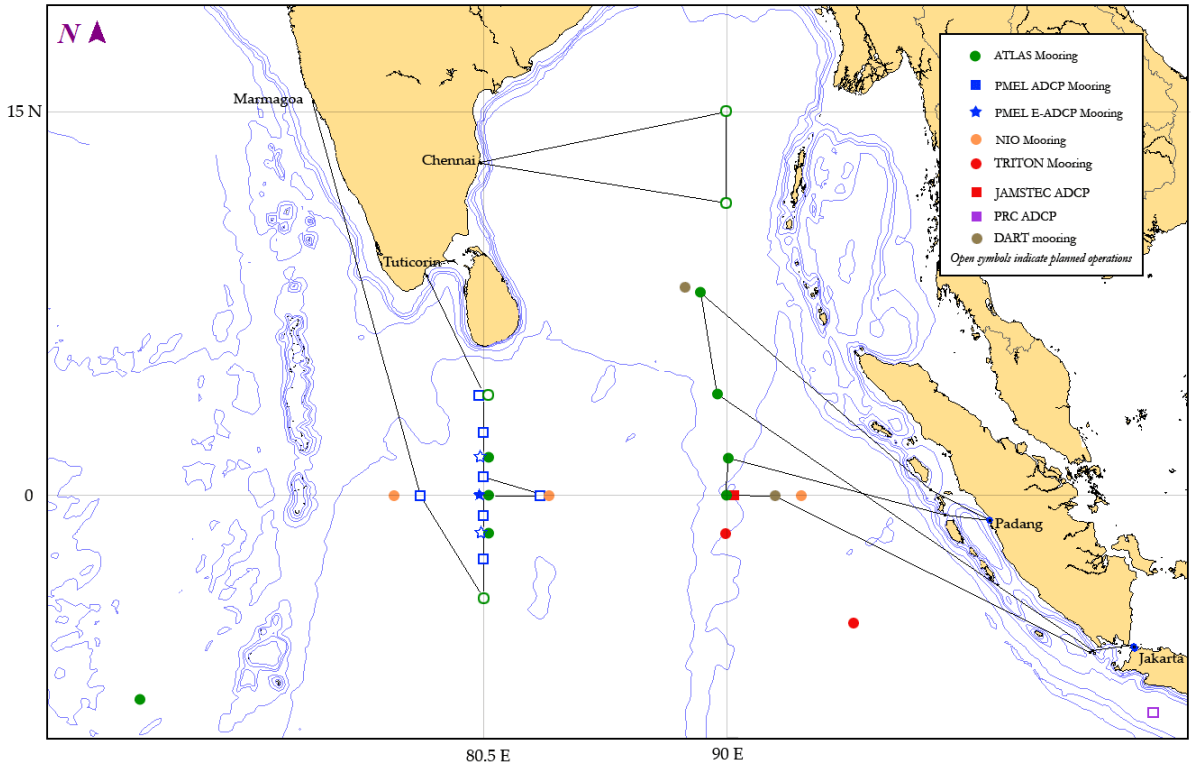


Figure 3. Locations of existing Indian Ocean mooring sites (solid coloured symbols) and those scheduled to be deployed in late 2007 and 2008 (open symbols). Ship tracks for proposed cruises are shown as solid lines.

More information on TAO/TRITON, PIRATA, and the Indian Ocean Array along with data display and dissemination are available on the web at www.pmel.noaa.gov/tao.

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Appendix C

REPORT BY E-SURFMAR

EUCOS-SURFACE MARINE PROGRAMME

2007

1. INTRODUCTION

On 1st April 2003, an optional programme, E-SURFMAR, was established by the European Meteorological Network (EUMETNET) within the framework of its Composite Observing System (EUCOS). Its main objectives are to co-ordinate, optimise, and progressively integrate the European activities for surface observations over the sea – including drifting and moored buoys, and voluntary observing ships. Seventeen out of the twenty-two EUMETNET members agreed to participate in the five next years of the programme (2007-2011): Belgium, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden and United Kingdom.

According to a Memorandum of Understanding, signed in 2004 between the European Group on Ocean Stations (EGOS) and E-SURFMAR, it was agreed that, from 1st January 2005, E-SURFMAR would assume overall responsibility for the moored and drifting buoy networks managed by EGOS. The responsibilities of EGOS members have been transferred to an E-SURFMAR Data Buoy Technical Advisory Group (DB-TAG). E-SURFMAR was adopted as an action group of the DBCP, replacing EGOS at the DBCP twentieth session (Chennai, India 18-22 October 2004).

Financial contributions to the programme are shared among the participants according to the GNI of their respective country. For data buoys, the E-SURFMAR budget includes : the funding of a part time Data Buoy Manager; the purchase of drifting buoys; funding of drifting buoy communication costs from 1st January 2006; compensations for the amortization and the maintenance of 4 moored buoys; and the contributions of participants to the DBCP fund.

2. PROGRAMME MEETINGS

-The first E-SURFMAR Data Buoy Technical Advisory Group (DB-TAG) meeting took place immediately following the closure of the final meeting of the EGOS Management Committee (Geneva 18-19 January 2005).
-The second DB-TAG meeting was held in Hamburg 31May to 1 June 2005.
-The third DB-TAG meeting was held in Galway 13-14 June 2006.
-The fourth DB-TAG meeting was held in Larnaka 15-16 May 2007

3. OPERATIONAL PROGRAMME

3.1 Drifting buoys

ar	-B	-BW	GE	E-W	er	tal
-97	13	0	17	13	0	**43**
-98	28	7	14	4	0	**53**
-99	30	4	21	6	6	**67**
-00	41	5	15	6	2	**69**
-01	19	2	7	4	0	**32**
-02	36	5	8	0	0	**49**
-03	45	5	8	2	0	**60**
-04	26	3	4	0	0	**33**
-05	51*	1	4	0	0	**56**
-06	56*	1	0	0	2	**59**
-07	92*	3	0	0	0	**95**
tal	**437**	36	98	35	10	**616**

Table 1. The number of drifting buoys deployed for according to buoy type (Reference period: 1st Sept to 31st Aug.)

As shown in table 1, **95 drifting buoys** were deployed between September 2006 and August 2007 including (*) **50** upgrades of SVP drifters. Four out of the SVP-B were fitted with GPS and Iridium transmitter. The 3 SVP-BW drifters are a contribution of Environment Canada.

Many of the deployments in 2006/07, as in previous years, were carried out by research vessels, voluntary observing ships, and ships of opportunity plying the Atlantic Ocean from ports including Halifax (Canada), Reykjavik (Iceland), Foynes (Ireland), Le Havre (France), Fos (France), Brest (France), London (UK), Fairlie (UK), Charleston (USA), Boston (USA), Trondheim and Aalesund (Norway), Setubal (Portugal). Three drifters from OGS, (Instituto Nazionale di Oceanographia e Geofisica Sperimentale, Italy) upgraded with barometers were also deployed in the Western Mediterranean Sea. Forty-five drifters from GDP upgraded with barometers were deployed by ships plying from USA to Europe and Iceland.

Although the E-SURFMAR area of interest is mainly up to 70°N (i.e. to the ice limits), the EUCOS area actually extends to 90°N. Three ICEB buoys and four SVP-B (2 with Iridium transmitters) will be deployed by September 2007 in the Arctic for IPY (International Polar Year).

r	98	99	00	01	02	03	04	05	06	07
o										
ir	%	%	%	%	%	%				
l										

Table 2. The number of drifting buoys deployed for EGOS/E-SURFMAR according to deployment method

(Reference period: 1st Sept to 31st Aug.)

The number of operational buoys providing Air Pressure (AP) measurements, generally comprised between 40 and 50 from 2000 to 2005, is now about 95. The deployment of SVP-B drifters has been growing every year, further increased by the use of barometer upgrades from 2005. In contrast, the deployment of FGGE type buoys has been decreasing (see Figure 1) and this kind of buoy is no longer used within E-SURFMAR. The minimum number of operational drifting buoys at the end of each month in 2006-2007 was 62 (in January 2007) and the maximum was 95 (in August 2007).

The mean lifetime (for Air Pressure) of the SVP-B drifters was approximately 12 months (384 days) if we exclude the 8 early failures; 350 days if we include them. The average age of the network was 323 days by the end of August 2006 and 287 days by the end of August 2007. Sixty-seven buoys failed to report air pressure measurements.

Most of drifting buoys use the Argos system to report their data. The evaluation of the Iridium communication system began as a contribution to the DBCP drifter Iridium Pilot Project. This will improve the data timeliness at a lower transmission cost.

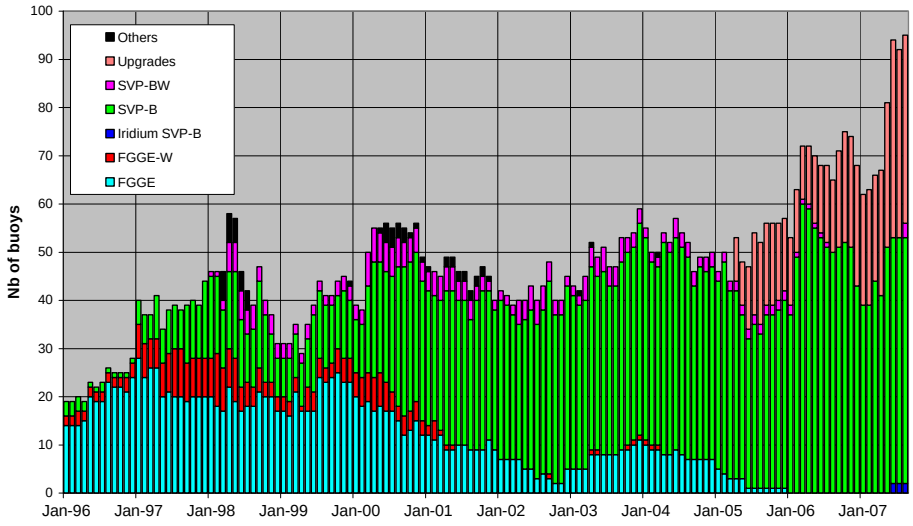

Figure 1. The number of operational EGOS/E-SURFMAR drifting buoys by the end of each month from 1996 to 2007

The availability, timeliness, and quality of drifting buoy data continue to be carefully monitored.

The availability of data depends on the number of buoys operating in the EUCOS area. The number of reports received within 50 minutes remains stable (500 per day on average) until July 2007. We can note an improvement from July 2007 with about 800 messages per day. More than 2000 hourly observations per day had been reported on the GTS since June 2007.

CLS Argos processes the data from 5 satellites. About 70% are received by HH+100.

The 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 had a significant seasonal variation, being higher in winter than in summer (maximum 0.9 hPa in February 2007, minimum 0.5 hPa in July 2007). This

could be due to less accurate measurement in rough seas and to more low -pressure systems crossing the North Atlantic in winter.

Real time observations from drifting buoys are subject to routine quality monitoring. Besides monthly statistics, provided by various meteorological centres for individual buoys, tools are used by Meteo-France to identify buoys reporting dubious data as quickly as possible. Among these tools is a blacklist computed over the previous 14 days, which is available on the web at: http://www.meteo.shom.fr/qctools/eblackap.htm .

3.2 Moored buoys

In 2004, the E-SURFMAR design study recommended that four moored buoys were needed to meet the EUCOS requirements, i.e. providing a suitable network to improve the quality of regional NWP over Europe, and for the validation and calibration of satellite wind and wave measurements. UK, Ireland, France, and Spain operate the four E-SURFMAR moored buoys. (i.e. three K-pattern buoys and one SeaWatch buoy respectively).

In accordance with the MOU between EGOS and E-SURFMAR the monitoring of the previous EGOS moored buoy network has been continued. The availability, timeliness, and quality of moored buoys data are carefully monitored. By the end of August 2007, 16 K-pattern buoys and 14 Oceanor buoys were operating.

Operating EGOS moored buoys (K-pattern)

WMO	Name	nobs	Wi	AT	AP	dP	ST	Wa	Ws	Dr	Sb	U	SS	O	Start_end	Lat	Lon
61001	Cote d'Azur	708	X	X	X	X	X	X	-	-	-	X	-	O	0108-3108	43.40	7.80
61002	**Lion**	**742**	**X**	**X**	**X**	**X**	**X**	**X**	**-**	**-**	**-**	**X**	**-**	**O**	**0108-3108**	**42.10**	**4.70**
62001	Gascogne	746	X	X	X	X	X	X	-	-	-	X	-	O	0108-3108	45.30	-5.00
62029	K1	745	X	X	X	X	X	X	-	-	-	X	-	O	0108-3108	48.70	-12.50
62052	Ushant	735	X	X	X	X	-	X	-	-	-	X	-	O	0108-3108	48.50	-5.80
62081	K2	746	X	X	X	X	X	X	-	-	-	X	-	O	0108-3108	51.00	-13.20
62090	M1		-	-	-	-	-	-	-	-	-	-	-			53.10	-11.20
62091	M2	725	X	X	X	X	X	X	-	-	-	X	-	O	0108-3108	53.50	-5.40
62092	M3	744	X	X	X	X	X	X	-	-	-	X	-	O	0108-3108	51.20	-10.50
62093	M4	744	X	X	X	X	X	X	-	-	-	X	-	O	0108-3108	54.70	-9.10
62094	M5	553	X	X	X	X	X	X	-	-	-	X	-	O	0108-3108	51.70	-6.70
62095	**M6**	**736**	**X**	**X**	**X**	**X**	**X**	**X**	**-**	**-**	**-**	**X**	**-**	**O**	**0108-3108**	**53.10**	**-15.90**
62105	K4	729	-	X	-	-	X	X	-	-	-	X	-	O	0108-3108	55.80	-11.40
62108	K3	738	-	X	X	X	X	X	-	-	-	X	-	O	0108-3108	53.50	-19.50
62163	Brittany	743	X	X	X	X	X	X	-	-	-	X	-	O	0108-3108	47.50	-8.40
64045	**K5**	**742**	**X**	**X**	**X**	**X**	**X**	**X**	**-**	**-**	**-**	**X**	**-**	**O**	**0108-3108**	**59.10**	**-11.70**
64046	K7	737	-	X	X	X	X	X	-	-	-	X	-	O	0108-3108	60.70	-5.20

Comments:

- EUCOS moored buoys are presented in bold characters.

Operating EGOS moored buoys (Seawatch and Wavescans)

WMO	Name	nobs	Wi	AT	AP	dP	ST	Wa	Ws	Dr	Sb	U	SS	O	Start_end	Lat	Lon
13130	Gran Canaria		X	X	X	-	X	X	X	-	-	-	-	O		28.18	-15.82
13131	Tenerife Sur		X	X	X	-	X	X	X	-	-	-	-	O		28.00	-16.58
61196	C. Begur		X	X	X	-	-	X	X	-	-	-	-	O		41.92	3.65
61197	Mahon		X	X	X	-	-	X	X	-	-	-	-	O		39.72	4.42
61198	C. de Gata		X	X	X	-	X	X	X	-	-	-	X	O		36.57	-2.33
61199	M. Alboran		-	-	-	-	-	-	-	-	-	-	-			36.23	-5.03
61280	Tarragona		X	X	X	-	X	X	X	-	-	-	-	O		40.77	1.47

61281	Valencia	-	-	-	-	-	-	-	-	-	-	-	39.47	-0.27
62024	Bilbao-Visc.	-	X	X	-	X	X	X	-	-	-	-	O	43.63	-3.03
62025	C. de Penas	-	X	X	-	X	X	X	-	-	-	-	O	43.73	-6.17
62082	E. de Bares	X	X	X	-	X	X	X	-	-	-	X	O	44.07	-7.62
62083	Villano-Sis.	X	X	X	-	X	X	X	-	-	-	X	O	43.48	-9.22
62084	**C. Silleiro**	**X**	**X**	**X**	**-**	**X**	**X**	**X**	**-**	**-**	**-**	**X**	**O**	**42.12**	**-9.40**
62085	G. de Cadiz	X	X	X	-	X	X	X	-	-	-	X	O	36.48	-6.97
	C. de Palos	X	X	X	-	X	X	X	-	-	-	X	O	37.65	-0.32
	Dragonera	X	X	X	-	-	X	X	-	-	-	-	O	39.56	2.11

Comments:
- GTS BUFR data monitoring tools are not yet available. This explains why the number reports and the observation period are missing.
- The snapshot for Seawatch and Wavescan buoys is dated September 3rd, 2007
- The EUCOS buoy is presented in bold characters.

The INM (Spain) is reporting data from the Cabo Silleiro buoy (as well as others operated by Puertos del Estado) to the GTS in BUFR code. The messages received in Toulouse RTH are forwarded to Exeter and Offenbach. However, these data are apparently not yet being processed or used by forecast meteorological centres. INM is working to modify the BUFR code they use to the BUFR template proposed by the DBCP.

At present, of the 4 E-SURFMAR moored buoys, only Cabo Silleiro is able to provide directional wave spectra data. Lion is providing omni-directional wave spectra. Development work has been undertaken by the UK Met Office to permit the K series buoys to report directional wave spectra using Iridium as the transmission system. A spectral wave system is expected to be installed on K5 soon. Once proven on K5 the system will be procured and installed on the M6 and Lion buoys. M6 deployed in deep water (3000 m) on the end of September 2006 replaced M1 (moored in 100 m water depth) as E-SURFMAR buoy in order to provide wave data unaffected by the continental shelf. M1 was kept in place by Ireland.

The availability of moored buoy data depends on the number of buoys operating. An average of more than 200 hourly observations per day has been reported on the GTS from the initial EUCOS buoys. About 70 messages per day were reported from the 3 K-pattern E-SURFMAR from September 2006 except in May 2007 (50) and June 2007 (55) due to problems on Lion buoy.

More than 95% of data were received by HH+50 minutes (to be compared to the timeliness of the EUCOS target 85%) for the K-pattern buoys.

The Air Pressure (AP) differences with the French model outputs shows the target of 0.5% of Gross Errors is generally achieved except in March 2007 where K5 reported 66 Gross Errors (GE). The RMS of AP differences are between 0.4 to 0.9 hPa.

Real time observations from moored buoys are subject to routine quality monitoring in the same way as drifting buoys.

4. PLANS

4.1 Drifting buoys

The E-SURFMAR design study has recommended the deployment of an average of 175 SVP-B type drifters per year. For financial reasons (buoy and transmission costs), this will take several years to achieve. However, the drifting buoy component has been fully funded by E-SURFMAR since 2006, i.e.

in addition to the drifting buoy purchases, all the communication costs are funded by E-SURFMAR. Within the allocated, budget about 100 buoys (including 30 upgrades) will deployed in the E-SURFMAR area of interest in the coming twelve months.

The transmission of drifting buoys data through Iridium will be more and more used as an alternative to Argos (about 50% planned in 2008).

E-SURFMAR will continue to evaluate the contribution to the International Polar Year. The main challenge with the ice buoys is their ability to survive after being released from frozen ice. If it could be proven that NWP over Europe benefits from buoy data in the Arctic region (studies to be carried out), then E-SURFMAR could consider the regular deployment of such buoys.

4.2 Moored buoys

K5 (59.1N – 11.5 W), Cabo Silleiro (42.1N – 9.4W), Lion (42.1N – 4.7E) and M6 (53.1N – 15.9W) are designated as E-SURFMAR moored buoys.

The E-SURFMAR design study has recommended that all four buoys should provide directional wave spectra. By fall 2007, K5 buoy should report directional wave spectra data through Iridium 4 times each day at the main synoptic hours. Once proven the system could be procured and installed on the M6 and Lion buoys.

5. INFORMATION ON E-SURFMAR

The new EUCOS management team (DWD) opened the EUCOS website (http://www.eucos.net). Under the heading, “EUCOS Public” in “EUCOS networks” there is information about E-SURFMAR. This site is intended to be the official public site for E-SURFMAR. A link will be provided from this site to provide access to publicly available documents such as the reports.

In addition, there is a restricted working area web site for E-SURFMAR participants (http://esurfmar.meteo.fr), it is based on a collaborative scheme, which allows the participants to easily create and modify certain pages on the site.

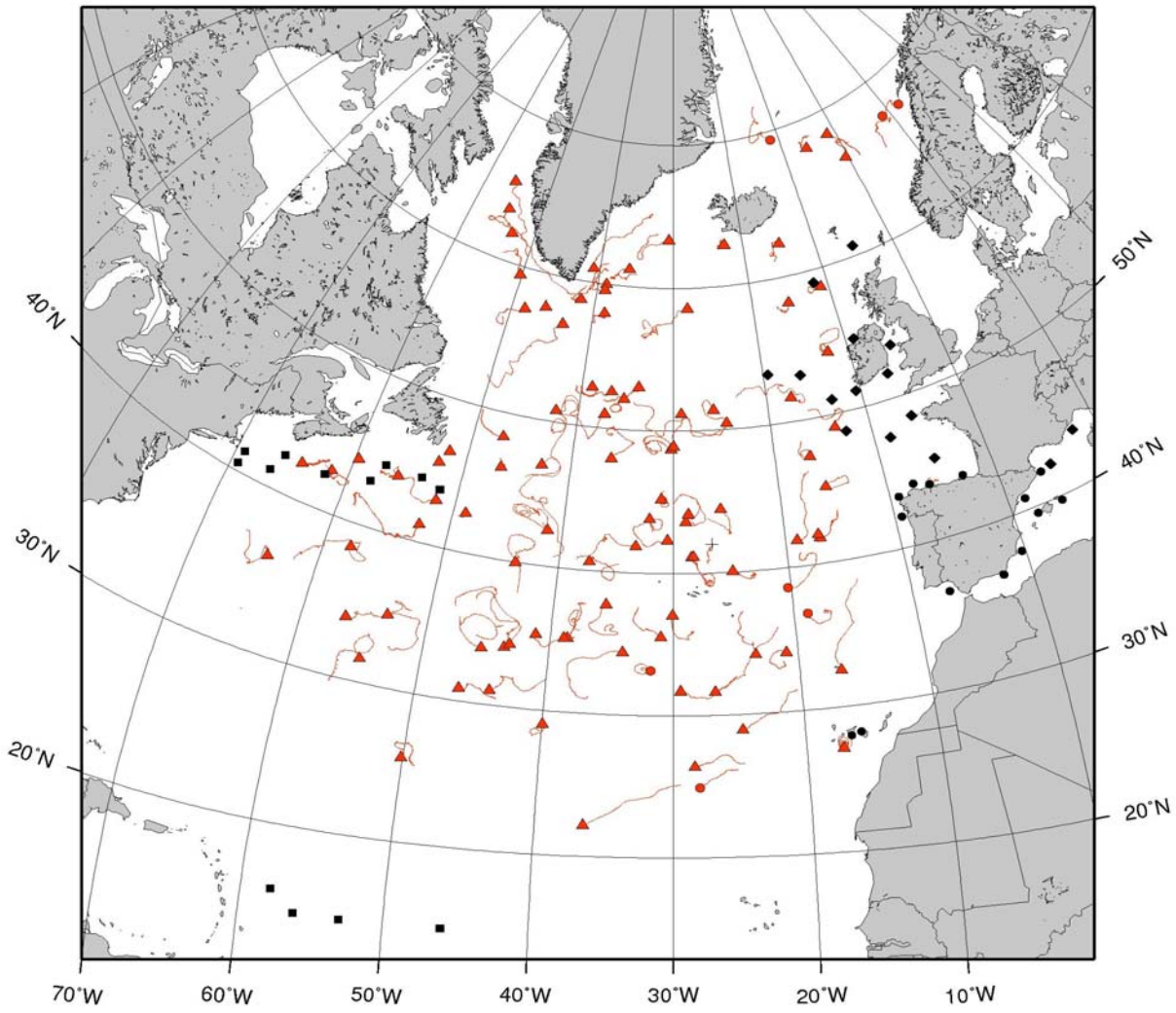

Figure 2. Operating Buoys in E-SURFMAR area
Drifting buoy trajectories and moored buoy positions
(August 2007)

- Drifting buoys AP
- Drifting buoys wind
- Esurfmar drifting buoys AP
- Esurfmar drifting buoys wind
- Moored buoys
- EGOS moored buoys
- EGOS Spanish moored buoys

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Appendix D

REPORT BY THE INTERNATIONAL BUOY PROGRAMME FOR THE INDIAN OCEAN (IBPIO) - 2007-

1. INTRODUCTION

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...).

There are presently seven organisations formally participating in the IBPIO :

- Australian Bureau of Meteorology (ABOM);
- Global Drifter Centre of NOAA/AOML (GDC), USA ;
- Meteo-France ;
- National Institute of Oceanography (CSIR/NIO), India ;
- National Institute of Ocean Technology (DoD/NIOT), India ;
- Navoceano, USA ;
- South African Weather Service (SAWS).

2. PROGRAMME MEETINGS

The tenth Programme Committee meeting of the IBPIO will to be held in Jeju, Republic of Korea, on 13 October 2007, prior to DBCP-23. The ninth Programme Committee meeting of the IBPIO was held on 14 October 2006 in La Jolla, USA, in conjunction with DBCP-22.

3. OPERATIONAL PROGRAMME

3.1 Drifting buoys

ar	P	-B	BW	GE	E-W	er	al
-97	30	42	0	5	3	0	**80**
-98	1	21	2	6	7	6	**43**
-99	68	56	1	4	2	5	**136**
-00	48	48	4	3	0	2	**105**
-01	48	27	0	5	3	0	**83**
-02	30	64	4	6	1	0	**105**
-03	20	63	1	2	2	1	**89**
-04	8	59	0	1	0	0	**68**
-05	40	35	0	0	1	0	**76**
-06	62	65	1	1	0	0	**129**
-07	42	118	1	0	0	0	**161**
al	397	598	14	33	19	14	**1075**

Table 1. The number of drifting buoys deployed for the IBPIO according to buoy type. (Reference period: 1st Sept. to 31st Aug.)

As shown in table 1, **161 drifting buoys** were deployed between September 2006 and August 2007. All of them were Lagrangian drifters and 73% measured air pressure (AP).

Participants in the IBPIO contribute to the programme in various ways: the provision of buoys (ABOM, GDC, Meteo-France, Navoceano, and NIO); the funding of barometer upgrades to SVP drifters provided by GDC (ABOM and Meteo-France) ; deployment arrangements (all); co-ordination (Meteo-France) and data transmission (Meteo-France and SAWS).

Many of the deployments in 2006/07, as in previous years, were carried out by research vessels and ships of opportunity plying the Indian Ocean from ports including Fremantle (Australia), Goa (India), Durban and Cape Town (South Africa), La Reunion and Kenya. Some ship voyages to remote islands were also used for deployments in the southern latitudes: Heard Island from Australia ; Amsterdam, Kerguelen, and Crozet Islands from La Reunion ; and Marion Island from South Africa. 8% of the buoys were air deployed by Navoceano for the last time, during the past 12 months (cf. table 2).

r	98	99	00	01	02	03	04	05	06	07
o		5							9	3
ir	0	0	0	0	0	0	0	0		
l		5	5		5				9	L

Table 2. The number of drifting buoys deployed for the IBPIO according to deployment method. (Reference period : 1st Sept. to 31st Aug.)

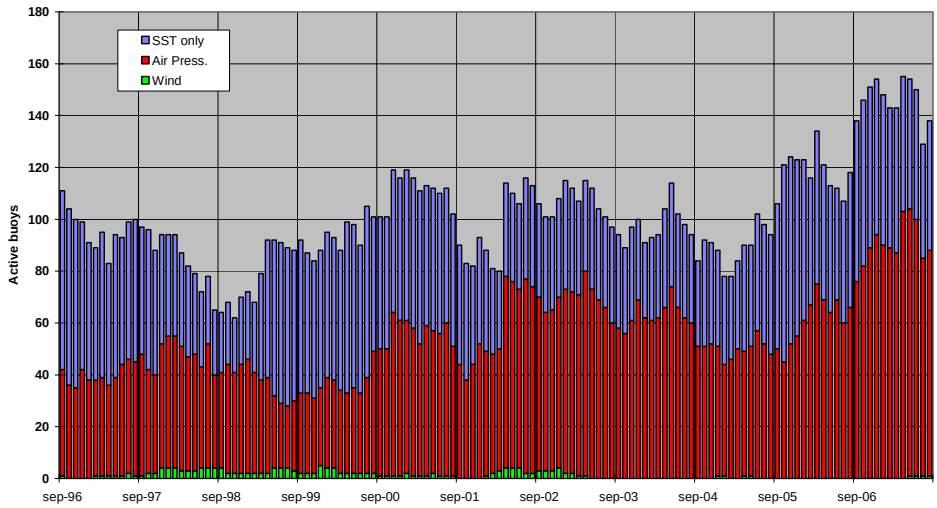


Figure 1. The number of operational IBPIO drifting buoys by parameters measured

The number of operational buoys providing AP measurements, which dropped to less than 50 by the end of August 2005 has increased over 80 since October 2006. It reached 103 by April and May 2007.

The number of buoys measuring SST only - in addition to their position – was 64 by October 2006. It dropped to 50 by August 2007. There was one drifting buoy reporting wind parameters in August 2007.

During the period from September 2006 to August 2007, 56 buoys owned by SAWS or GDC migrated from the South Atlantic Ocean and/or Southern seas to the IBPIO area of interest. In contrast, the number of buoys that escaped to the south of Australia was 51during the same period. Some of these escaping buoys were deployed near the SE boundary of IBPIO. The buoy fluxes over the past 12 months were quite neutral, as many buoys entered the Indian Ocean as escaped. The Indian Ocean benefits from a natural convergence that directs the buoys coming from the South Atlantic to the middle of the South Indian Ocean.

Owner	SST only	Air Pressure	Wind
Australian Bureau of Meteorology	0	16	1
Global Drifter Centre	48	62*	0
SAWS	0	1	0
Météo-France	0	1	0
NIO	0	6	0
Other	2	1	0
Total	**50**	**87**	**1**

Table 3. Operational drifting buoys (i.e. reporting onto the GTS) at the end of August 2007
** including drifters upgraded*

All drifting buoys use the Argos system to report their data. Most are fitted with the DBCP-M2 format.

The availability of data depends on the number of buoys operating in the area. The number of reports received within 50 minutes has shown a slight improvement during this intersessional period but remains less than 20% per day. About 2000 hourly observations per day had been reported on the GTS since November 2006, with a maximum at more than 2200 by the second quarter of 2007.

CLS Argos processes the data from 5 satellites. The timeliness at HH+100 minutes is about 40 to 50%.

Real time observations from drifting buoys are subject to routine quality monitoring. Besides monthly statistics, provided by various meteorological centres for individual buoys, tools are used by Meteo-France to identify buoys reporting dubious data as quickly as possible. Among these tools is a blacklist computed over the previous 14 days, which is available on the web at: http://www.meteo.shom.fr/qctools/blackap.htm .

3.2 Moored buoys

The Department of Ocean Development (DoD, India), now known as Ministry of Earth Sciences, through the National Institute of Ocean Technology (NIOT), has established the National Data Buoy Programme (NDBP) to collect real-time meteorological and oceanographic data from moored data

buoys in Indian waters.

The NDBP has established an array of 25 moored stations to support the Indian Meteorological Department (IMD), the Indian Climate Research Programme, Ports, the National Hydrographic Office, and other scientific and research activities. The real-time data are currently transmitted by IMMARSAT. Since mid-2000, IMD (Bulletin header SSVX01 DEMS) has distributed the surface meteorological data on the GTS in FM 18 BUOY code.

The moored buoy array requires regular maintenance by NDBP due to vandalism and severed moorings. At the end of August 2007, eleven moored buoys were reporting on the GTS (WMO ids: 23091, 23094, 23097, 23098, 23099, 23100, 23101, 23172, 23174, and 23493). NIOT brought out a low cost buoy to provide meteorological data from the ocean, and plans to deploy 50,early in September 2007. NIOT has established 5 tsunami surface buoy system and hopeful of establishing at least 6 deep ocean tsunami wave detection systems before end od September 2007.

Two TRITON buoys are maintained by the Japan Marine Science and Technology Centre (JAMSTEC). These buoys were first deployed in the eastern tropical Indian Ocean in November 2001 at 5°S 95°E (WMO Id. 53056) and 1.5°S 90°E (WMO Id. 53057). The moorings are serviced on an annual basis. Id 53056 was reporting on the GTS in August 2007, Id 53057 stopped in July 2007. JAMSTEC has also maintained a subsurface ADCP mooring near 0° 90 °E since 2000, which reports data in delay mode.

India's National Institute of Oceanography (NIO) has maintained subsurface moorings at 3 sites on the equator (77 °E, 83 °E, and 93 ° E) with the first deployment at 93 °E in 2000. These moorings are serviced on a 1 to 2 year schedule.

To support CLIVAR and GOOS, PMEL (USA) began to implement a deep-ocean moored buoy array in the Indian Ocean in co-operation with countries both within and outside this ocean. The first deployments were in October/November 2004 from the Ocean Research Vessel (OVR) Sagar Kanya owned by the Indian DoD. Three ATLAS moorings were deployed along 80.5°E (1.5°N, 0°, 1.5°S) and one at 0° 90°E; (one was on the GTS in August 2007: Id 23002). In addition, a subsurface ADCP mooring was deployed near 0° 80.5°E. These moorings were replaced nearly 2 years later in September 2006 from the Sagar Kanya. The combination of heavy vandalism and being deployed long beyond the mooring's 1-year design lifetime resulted in data return rates significantly lower than those for the tropical moored buoy arrays in the Pacific and Atlantic Oceans. The loss of data emphasizes the need for sustained and regular ship support for the mooring program to succeed and for measures to combat vandalism.

In addition to the replacement of previously deployed moorings, PMEL expanded the Indian Ocean array in late 2006 – early 2007 by deploying 4 additional ATLAS moorings (3 along 90 ºE between 1.5 ºN and 8 ºN, and one at 8 ºS 67 ºE) from research vessels provided by India, Indonesia and France; two were on the GTS in August 2007: Id's 23006 and 23007). These additions brought the total number of moorings in the array to 15 (10 surface, 5 subsurface).

The Indian Ocean moored buoy array sampled during the development of an Indian Ocean Dipole (IOD) event in the latter half of 2006. The IOD is an El Niño-like phenomenon that has significant regional and global climate impacts. The 2006 event was the first to be successfully predicted (by the Japanese Frontiers program) using a coupled ocean- atmosphere model. Mooring and other data collected as part of IndOOS are being used in modelling and observational analyses to identify the mechanisms that gave rise to this event and to understand the sources of its predictability.

As part of its effort to implement the moored buoy component of IndOOS, PMEL prompted a NOAA-wide discussion with the Indian Ministry of Earth Science (MoES) on collaborative programs in ocean-atmosphere observations, modelling, and prediction. The opportunity that PMEL's initial discussions with MoES presented was seized upon by NOAA's Climate Program Office to expand

dialogue across a wide range of activities for which the two organizations share mutual interests. In the same fashion, PMEL and the Climate Program Office have evolved a new partnership with Indonesian agencies to provide ship time in FY 07 and beyond in exchange for technical training.

Japan conducted a month-long process study (MISMO) near 0 ° 80.5 °E in November 2006. During the intensive observation period, additional surface and subsurface moorings were deployed and additional shipboard measurements made from R/V Mirai. The French/US VASCO-CIRENE research experiment near 8°S 67°E was conducted in January/February 2007 from R/V Suroit. In support of the experiment (which included atmospheric measurements from the Seychelles, oceanographic and atmospheric shipboard measurements, drifters, and profilers), PMEL deployed the ATLAS mooring at 8 ºS 67 ºE (WMO Id 14040 on the GTS in August 2007) mentioned above, plus a subsurface ADCP mooring which was recovered at the end of the experiment.

4. PLANS

IBPIO participants are regularly encouraged to increase their contributions of buoys, or to fund barometers to equip SVP drifters provided by GDC. Meteo-France and ABOM have funded barometer upgrades in the Indian Ocean since 1996 and 2000 respectively. Meteo-France and ABOM will deploy some Iridium drifters for evaluation during the next intersessional period.

4.1 Tropical regions

Efforts are aimed mainly at filling data gaps in the tropical regions, primarily during the Tropical Cyclone seasons. In the southern tropical area, the buoys are provided by NOAA/GDC, which, routinely include 10 barometer upgrades funded by Meteo-France. The ABOM plans to deploy 11 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 (at least 15 SVP-B and 4 SVP-BW).

In addition to the 10 drifters upgraded by Meteo-France, the GDC will provide 10 SVP with barometer upgraded by NOAA/SIO to the WMO Sub Region Office for Eastern and Southern Africa in Kenya. The GDC plans to supply 55 SVP drifters (i.e. without barometer) for deployment in the Indian Ocean if opportunities exist.

The CLIVAR/GOOS Indian Ocean Panel has designed a deep-ocean moored buoy array of 47 buoys in the Indian Ocean. This array is similar to the TAO and PIRATA arrays in the Pacific and the Atlantic oceans respectively, and implementation has begun as described above. At present, 15 moorings have been deployed. Cruises to maintain the existing array are planned in September/October 2007 (Indonesia's R/V Baruna Jaya III), spring 2008 (India's R/V Sagar Kanya) and the possibly a cruise aboard France's R/V Marion Dufresne in 2008. The People's Republic of China First Institute of Oceanography plans to deploy a subsurface mooring south of Java in September/October 2007. Two new ATLAS mooring sites will be established in the Bay of Bengal from the R/V Sagar Kanya in October/November 2007.

PMEL is planning several changes to the moored array in an attempt to decrease the amount of data lost to vandalism. To address the problem of theft of instrumentation, standard hardware on surface moorings will be replaced by hardware that requires special tools. Initial deployments of this hardware are scheduled for September/October 2007. Another change will be to increase the number of subsurface moorings relative to surface moorings. Prototype ADCP subsurface moorings, enhanced for upper water column measurement of temperature and salinity, are being designed for deployment in spring 2008. A third change will be to remove meteorological sensors from some surface moorings and to modify the buoys to discourage vandals from boarding or

attaching a line to the buoy. Surface and subsurface measurements will continue to be telemetered from these moorings from a transmitter embedded in the buoy. If this third modification results in a decrease in mooring loss, surface meteorological sensors with vandal resistant packaging may be reintroduced to the sensor suite. Prototypes of these moorings are scheduled for deployment in spring 2008.

4.2 Southern seas

In the Southern part of the Indian Ocean, the deployment of SVP-B drifters provided by GDC and upgraded by Meteo-France (10 to 15 units a year) should continue. The ABOM plans to deploy 11 SVP-B drifters in this area over the next 12 months including 6 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 Meteo-France and ABOM, GDC plans to provide up to 14 SVP-B drifters (upgraded by SIO) for deployment in the Southern Indian Ocean. The ABOM will also deploy 2 SVP-B buoys in or near the Indian Ocean Gyre.

The SAWS, through the PMO in Cape Town, continues to coordinate the deployment of drifters on behalf of GDC, ABOM and Meteo-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 2008. The PMO in Durban also provides logistic support for deployments in the Indian Ocean from ships of opportunity.

As in previous years, the GDC remains the biggest contributor to the IBPIO. Many of the drifters are standard SVP that only measure SST in addition to the surface current deduced from their movement.

5. INFORMATION ON THE IBPIO

IBPIO information is available on the World Wide Web at *http://www.meteo.shom.fr/ibpio/*. The main pages give a description of the programme, its objectives, and management, listings of participants and links to related subjects such as DBCP data quality control information. Some pages are updated monthly with buoy trajectories and deployment log. Buoy status tables are updated less frequently.

A promotional leaflet on the IBPIO can be obtained from the Chairman or the Programme Co-ordinator.

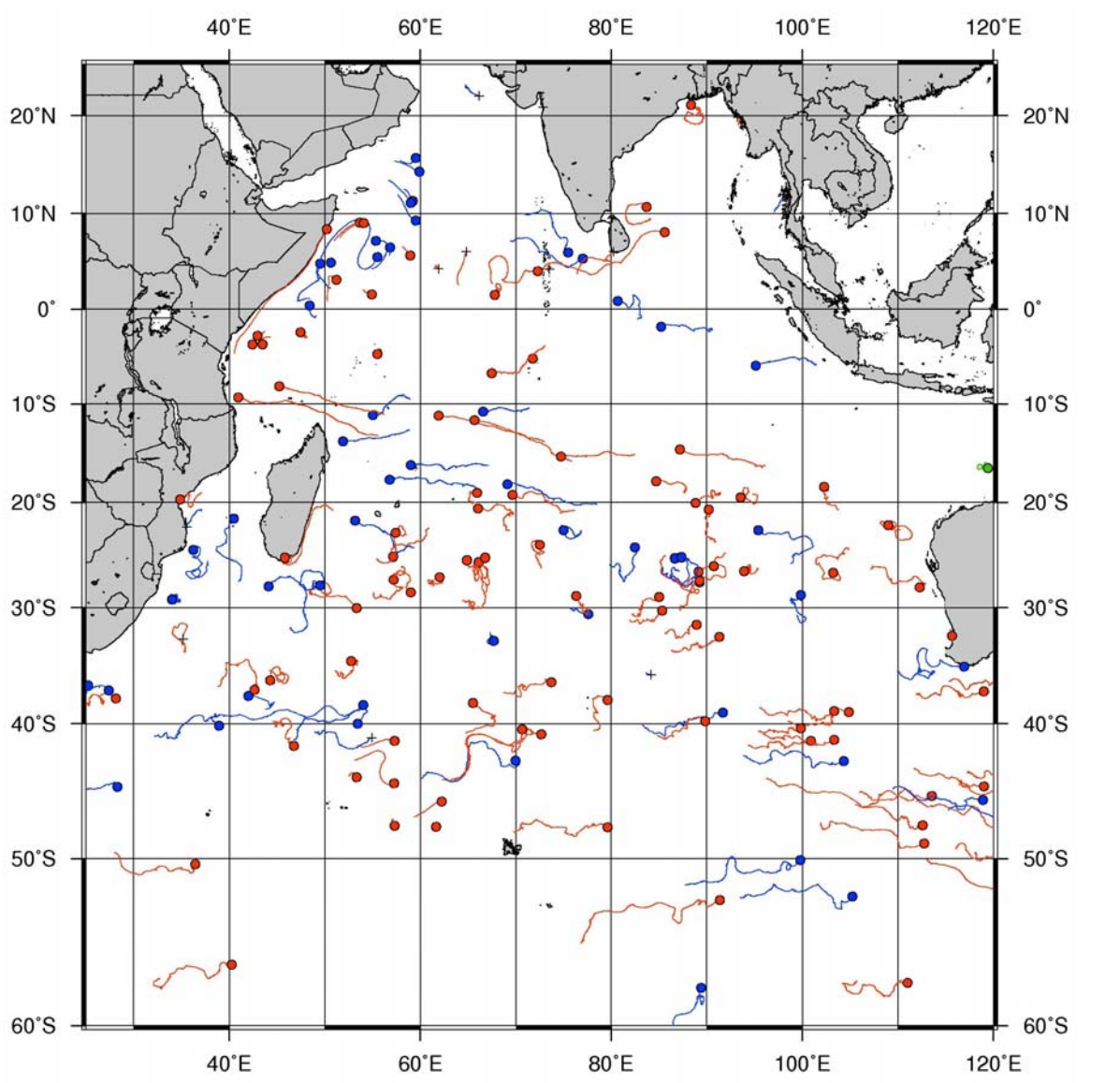


Figure 2. Buoys drifting in the Indian Ocean
August 2007

Appendix E

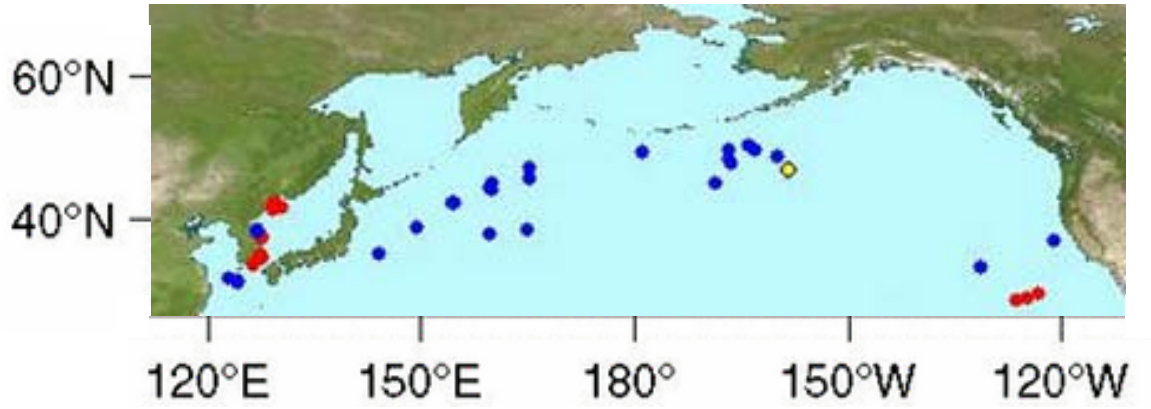
DBCP-PICES North Pacific Data Buoy Advisory Panel (NPDBAP) - 2007
(14 October, 2007)

By Shaun Dolk
University of Miami/CIMAS
NOAA/AOML

North Pacific Buoy Deployment Locations

from

1 September, 2006 to 31 August, 2007



2006-2007 Results and Current Status

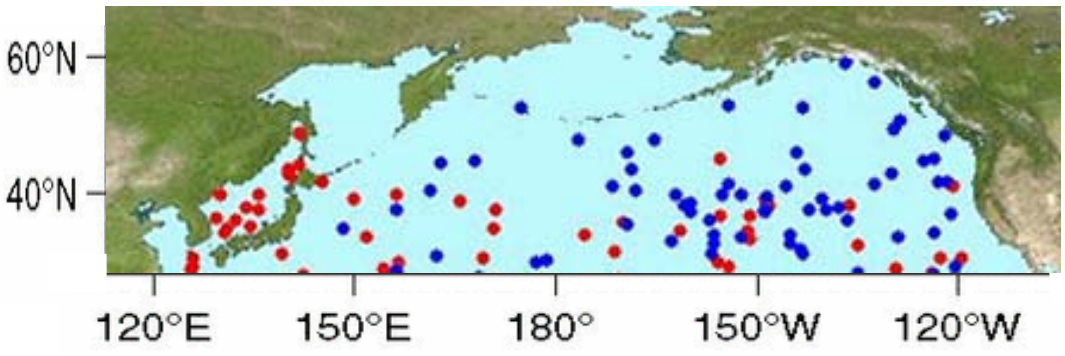
In the months between September 2006 and August of 2007, there were a total of 63 buoys deployed north of 30°N and in between 110°E to 110°W. Of these 63 deployments in the North Pacific, 33 of these buoys were SVP drifters (52%), 1 was a SVPBW drifter (2%) and the remaining 29 buoys were all SVPB drifters (46%).

It is apparent by looking at these results that the goal of having 50 SVPB buoys deployed in this region was not met. In fact, 21 more SVPB buoys needed to be deployed in order to meet the 2007 goal. While it is discouraging to see these figures, it is very important to know how and where we can improve to ensure that we meet future goals.

Current North Pacific Buoy Locations

as of

03 September, 2007



Judging by the current locations of buoys in the North Pacific, it appears there are a large number of buoys still active from previous deployment periods. As a result of this, the coverage is better than expected, when compared to current year deployments alone. However, even with the addition of these “extra” buoys, the Northwest Pacific and North-Central Pacific stand out as areas of interest for deployments in the upcoming year.

Because many of the buoys covering the North Pacific were deployed before FY2007, it is imperative to repopulate this area to ensure adequate coverage and accurate readings. As a result of this, I propose that FY2008 deployments in the North Pacific not only increase in the number of SVPB buoys deployed from FY2007, but increase in the total number of buoys deployed as well. Because only 46% of the total number of buoys deployed in FY2007 were SVPB buoys, it is safe to say that number will increase dramatically with the deployment of an additional 21 SVPB buoys.

2007-2008 North Pacific Deployment Plan

The current plan which calls for the deployment of 50 SVPB drifters in the North Pacific region between September 2007 and August 2008 will not only help populate the area, but also decrease the average age of active buoys.

Northwest Pacific	
120E to 145E	0 SVPB
145E to 160E	8 SVPB
161E to 175E	12 SVPB
Northwest Pacific Total:	20 SVPB

North-Central Pacific	
176E to 175W	6 SVPB
174W to 165W	5 SVPB
164W to 150W	6 SVPB
North-Central Pacific Total:	17 SVPB
Northeast Pacific	
149W to 135W	7 SVPB
134W to 125W	4 SVPB
124W to 110W	2 SVPB
Northeast Pacific Total:	13 SVPB
North Pacific SVPB Deployment Total:	50 SVPB

Methods used for deployment in the Indian Ocean will consist of

Research Vessel (R/V) and Voluntary Observation Ship (VOS) Deployments

Buoys will continue to be deployed by Research Vessels and VOS. The GDP will work to coordinate deployment efforts with Research vessels operated by Canada, Japan, Korea, China, and the United States, in addition to acquiring and maintaining lasting relationships with various VOS vessels that transit the area.

SVPB Upgrade Opportunity

The GDP provides an opportunity for Meteorological agencies to add barometers to SVP drifters deployed in the North Atlantic. More information can be found on the DBCP website under SVPB Upgrade Opportunity link.

• http://www.dbcp.noaa.gov/dbcp/svpb_upgrade.html

Appendix F

INTERNATIONAL ARCTIC BUOY PROGRAMME (IABP)
CHAIRMAN'S AND COORDINATOR'S REPORT

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.

IABP EXECUTIVE AND COORDINTOR

Chairperson: Timothy Goos, Environment Canada, Canada tim.goos@ec.gc.ca
Vice Chairman: Christian Haas, Alfred Wegener Institute, Germany
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IABP 17th ANNUAL MEETING

Members of the International Arctic Buoy Programme met 24-25 May 2007 in Washington, DC. The meeting was hosted by CMDR Ray Chartier (RC), Commanding Office, U.S, National Ice Service and Pablo Clemente-Colón, Chief Science Officer, U.S. National Ice Service. The meeting was chaired by Christian Haas, Alfred Wegener Institute. There were 20 attendees representing 11 of the 23 Participants.

In addition to Participant Reports, IABP Participants got briefings on science projects in the arctic basin:

- National Ice Centre (NIC) Overview [J. Rice]
- Arctic Observing Network (AON) [F. Korsmo]
- State of the Arctic Ocean [J. Richter-Menge]
- Applied Physics Laboratory Ice Camp [J. Hutchings]
- Sea Ice Drift Speed and Ocean to Ice Heat Flux [T. Kikuchi]
- Using Buoy Data for Ice Forecasts at NIC [S. Helfrich]
- Outlook for Summer Sea Ice Extent [I. Rigor

HIGHLIGHTS

More buoys on ice than ever - Incremental opportunities are important to the IABP. It is the sum of these opportunities that are significant for a program that typically has 30-45 buoys in the field, which at the time of this report had over 92 buoys on ice due largely to IPY activities.

	Ice Mass Balance (also have T + P)	**Ice Tethered Profiling** or **Polar Ocean Profiling** [1]	**T + P**	**T** or **P only** [2]	**JCAD**	**Russian Manned Station**	**Position Only**	**Total Number**
September 2005	**6**		**27**	**5**	**1**	**NP33**	**8**	**48**
September 2006	**6**	**2**	**28**	**4**			**11**	**51**
March 2007	**6**		**18**	**3**			**8**	**35**
September 2007	**6**	**14**	**35**	**18**		**Planned**	**19**	**92**[3]

Notes

1. The number of "sophisticated" buoys such as oceanographic profiling buoys is increasing.
2. SVP buoys have joined the array.
3. Meteorological data from some buoys is not going on GTS.

Buoy array - See attached sample mappings from IABP web site http://iabp.apl.washington.edu

- Buoy map with 60-day track and ice concentration 14 September 2007
- Buoy map with buoys by type 14 September 2007.

Array has limitations:

- Many buoys are deployed in tight arrays (Automated Drifting Stations) such as Applied Physics Laboratory Ice Camp.
- There are some large holes in the array especially in Eurasian Arctic.
- Ice "shrinkage" and a larger area of younger, thinner ice has taken a toll on IABP array, highlighting need for buoys which can survive in open water, survive freeze up, and pack ice conditions (i.e. seasonal ice buoys), especially in the Eurasian Arctic

Annual summer air drop deployment by US Naval Oceanographic Command may be over – The US Naval Oceanographic Office White Trident air drop of ICEX buoys has been the back bone of the IABP annual deployments for several years. However, the 2007 airdrop might have been the last one. Alternatives are being considered.

Seasonal ice buoys – With the ice on the arctic basin showing significant changes in area coverage and thickness by late summer, IABP participants seek cost effective air deployable buoys that are capable of operation in ice and open water through freeze/thaw cycles with sensors/measurements that include surface air temperature, surface pressure, GPS location, and Argos transmitter. Such buoys – and SVP buoys - have the potential to extend coverage of the buoy array into the marginal seas.

Key Issue Persists - A key issue for the Chairman, Coordinator, and Participants of the IABP is getting the science community to put the meteorological and position data from the buoys that they deploy onto the GTS (Global Transmission System) in real time. The Chairman et al also seek to have ocean profile data posted to GTS.

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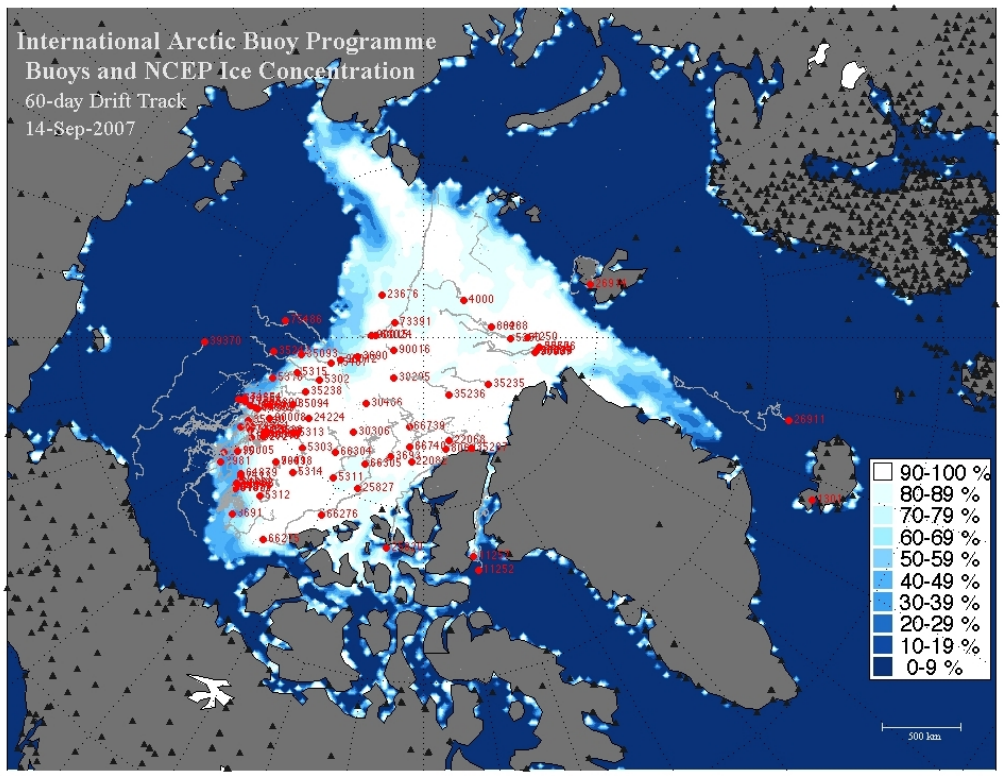
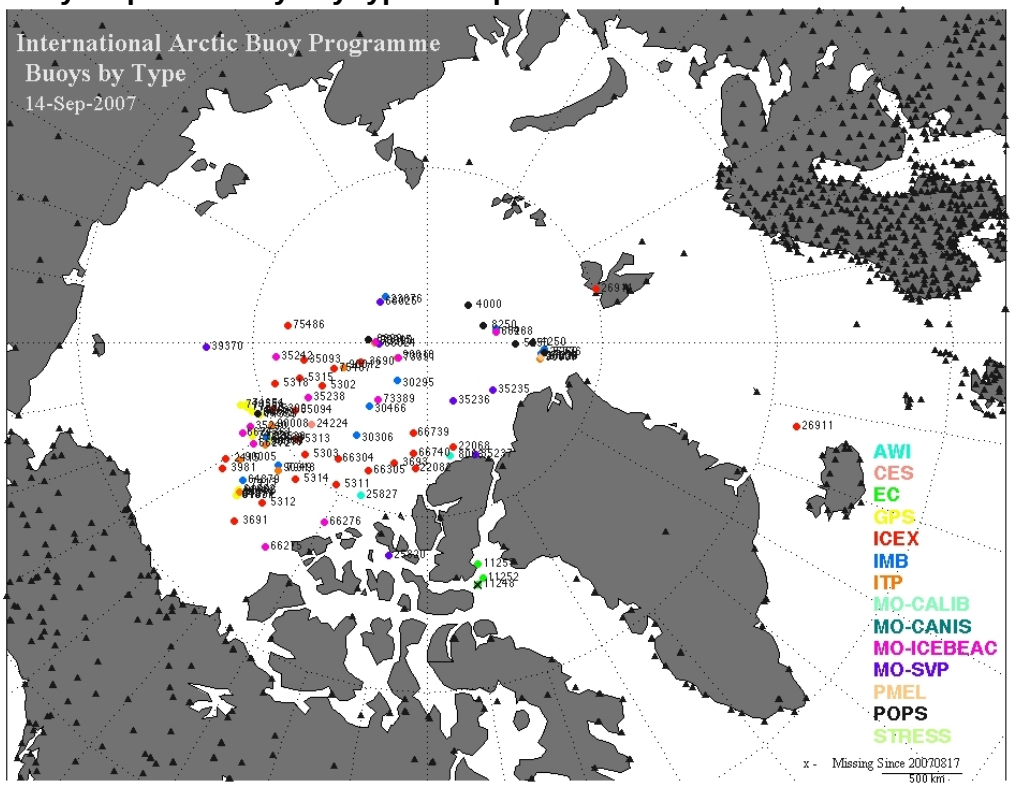
From International Arctic Buoy Programme web page http://iabp.apl.washington.edu

Buoy map with 60-day buoy track and ice concentration 14 September 2007



Buoy map with buoys by type 14Septmber 2007



Appendix G

WCRP/SCAR INTERNATIONAL PROGRAMME for ANTARCTIC BUOYS (IPAB)
CHAIRMAN'S AND COORDINATOR'S REPORT

Participants of the IPAB continue to work together to maintain a network of drifting buoys on the sea ice of the Southern Ocean 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.

IABP EXECUTIVE AND COORDINTOR

Chairperson: Dr S. Ushio, National Institute for Polar Research, Japan (ushio@pmg.nipr.ac.jp)
Member: Dr P. Heil, University of Tasmania, Australia (Petra.Heil@utas.edu.au)
Member: Dr C. Geiger, University of Delaware, USA (cgeiger@udel.edu)
Member: Dr P. Clemente-Colon, US National ice Centre (Pablo.Clemente-Colon@natice.noaa.gov)
Coordinator: Dr. C. Haas, Alfred Wegener Institute, Germany (Christian.Haas@ualberta.ca, now at University of Alberta)

RECENT IPAB MEETINGS

The 5th IPAB biennial meeting was held in Dunedin, New Zealand, on December 2005. A report is published at the IPAB website at http://www.ipab.aq/fileadmin/chaas/MeetingReports/IPAB_5_2005_Dunedin.pdf.
An IPY planning meeting was held during the SCAR conference 2006 in Hobart, Tasmania. The meeting was designed to coordinate and publish plans for IPAB buoy deployments during IPY. It was attended by 12 IPAB participants from 10 countries. A meeting report is still pending.
The next IPAB biennial meeting will be held in 2008, either during the SCAR conference in St. Petersburg or during the next DBCP meeting planned to be held in Capetown.

HIGHLIGHTS

Enhanced buoy coverage during IPY

More than 20 buoys will be deployed during IPY, i.e. in the 2007/2008 seasons. These will yield a unique snapshot of ice dynamics and meteorological conditions of most sea ice regions of the Southern Ocean (see Figure 1). However, even more buoys would be required for a better coverage and longer overlaps between individual observation periods.

Coordinated, international meso-scale buoy arrays

During two IPY icebreaker voyages, three deformation arrays will be deployed to observe meso-scale ice dynamics and deformation, and relate it to the prevailing meteorological and tidal conditions, and to changes of the sea ice mass balance. Two arrays will be deployed during the current Australian Sea Ice Physics and Ecosystem Experiment (SIPEX) of RV Aurora Australis in September and October 2007 (http://www.sipex.aq). One array will be deployed during the US campaign Sea Ice Mass Balance in the Antarctic Seas (SIMBA) of RV Nathaniel Palmer, also in September and October 2007 (http://www.polartrec.com/simba-antarctic-sea-ice).

Analysis of ISPOL buoy array data

The data of IPABs 2004 array during the German pre-IPY Ice Station Polarstern (ISPOL) expedition (http://www.ispol.de) have been readily analysed, and results were published in a ISPOL, special Issue of Deep Sea Research II (Heil, P., Hutchings, J.K., Worby, A.P., Johansson, M., Launiainen, J., Haas, C., Hibler III, W.D. Tidal forcing on sea-ice drift and deformation in the Western Weddell Sea in early austral summer, 2004. DSR II ISPOL, special issue, 2007 in the press). Figure 2 shows most interesting drift tracks of four buoys, which were left on the ice after completion of the experiment.

Ice dynamics retrieval from satellite radar imagery

IPAB has been granted free synthetic-aperture-radar (SAR) imagery from the European Space Agencies (ESA) Envisat satellite, following submission of a joint proposal to ESA's special IPY call. The proposal, titled "Sea ice motion, deformation, thickness, and lead dynamics in the Antarctic" will provide complementary SAR imagery over the two main IPY study regions (see above) allowing the

extrapolation of buoy data, the development of new ice tracking algorithms, and the validation by means of buoy data.

Key Issue Persists

A key issue for the Chairman, Coordinator, and Participants of the IPAB is getting the science community to put the meteorological and position data from the buoys that they deploy onto the GTS (Global Transmission System) in real time. The Chairman et al also seek to have ocean profile data posted to GTS.

CHALLENGES

- There are some large holes in the array, both spatially and temporally. More buoys would be required to allow synoptic observations of the complete Southern Ocean.
- Due to the seasonal and divergent nature of Antarctic sea ice, the lifetime of most buoys is only very short. IPAB participants seek cost effective (and possibly air deployable) buoys that are capable of operation in ice and open water through freeze/thaw cycles with sensors/measurements that include surface air temperature, surface pressure, GPS location, and Argos transmitter. Such buoys – and SVP buoys - have the potential to extend coverage of the buoy array.

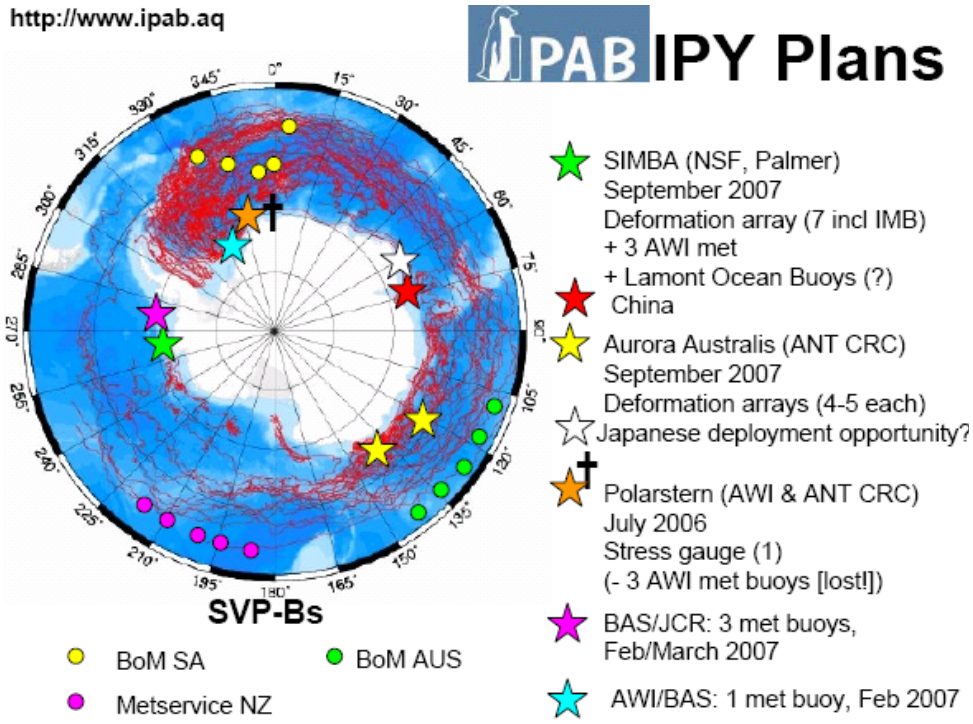


Figure 1: IPAB deployment plan for IPY.

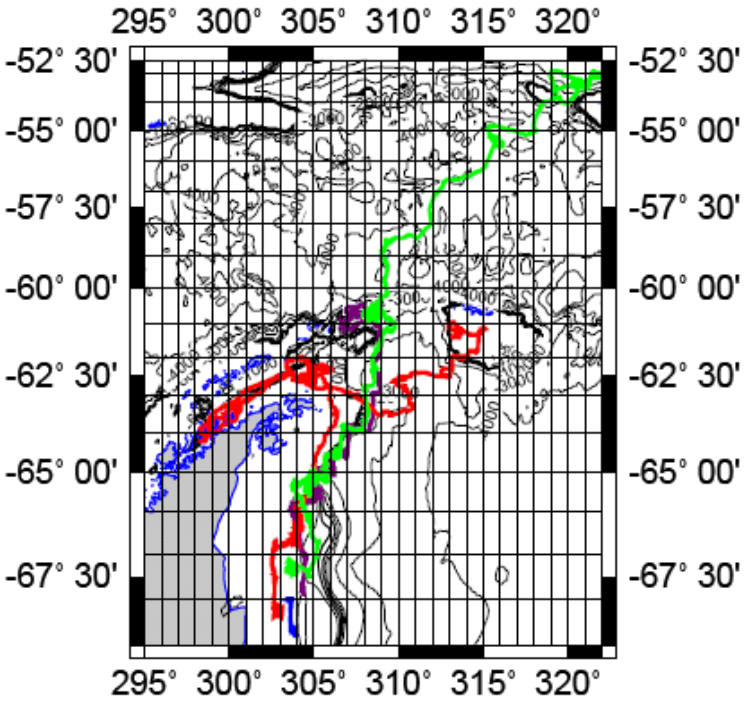


Figure 2: Drift of four remaining buoys in the Western Weddell Sea from late December 2004 through to mid June 2005 (from Haas & Heil, 2007: Sea-ice flux in the Weddell Sea: New insights from an International Program for Antarctic Buoys drift experiment during Ice Station Polarstern in 2004. WCRP Fluxnews Issue No. 4).

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Appendix H

1. INTRODUCTION

The International South Atlantic Buoy Programme (ISABP) was established in 1993 at a meeting in Buenos Aires, Argentina, in order to address the problem of data sparseness in the South Atlantic Ocean. 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.

2. PARTICIPANTS TO ISABP

The following are organisations or institutions participating in the programme:

• Servicio Meteorológico Nacional	Rep- Argentina
• Servicio de Hidrografía Naval	Rep- Argentina
• The Met Office	United Kingdom
• Atlantic Oceanographic and Meteorological Laboratory	USA
• National Data Buoy Centre	USA
• Naval Meteorology and Oceanography (Navoceano)	USA
• The Meteorological Service	Namibia
• INPE	Brazil
• Diretoría de Hidrografía e Navegaçao	Brazil
• Instituto Nacional de Meteorología (INMET)	Brazil
• South African Weather Service	South Africa
• Marine and Coastal Management	South Africa
• MEDS	Canada
• CLS/Service ARGOS	France/USA
• Caribbean Meteorological Organization	Caribbean
• Meteo-France	France
• Marine Hydrophysical Institute of National Academy of Science of Ukraine	Ukraine
• Marine Fisheries Research Division	Ghana
• Fisheries Department	Tristan da Cunha

The programme is open to any institution interested and committed to the objectives and operating principles of the programme. It is self-sustaining and supported by voluntary contributions from participants in the form of equipment (buoys) and/or services such as communications, storage, deployments, data archiving and co-ordination.

3. PROGRAMME MEETINGS

Following a decision taken in 2001, the Programme Committee meets every two years, preceded by a technical workshop. The next ordinary meeting will be held in 2008 and the plans include a Capacity Building chapter during the technical workshop.

4. OPERATIONAL PROGRAMME

4.1 Data Coverage

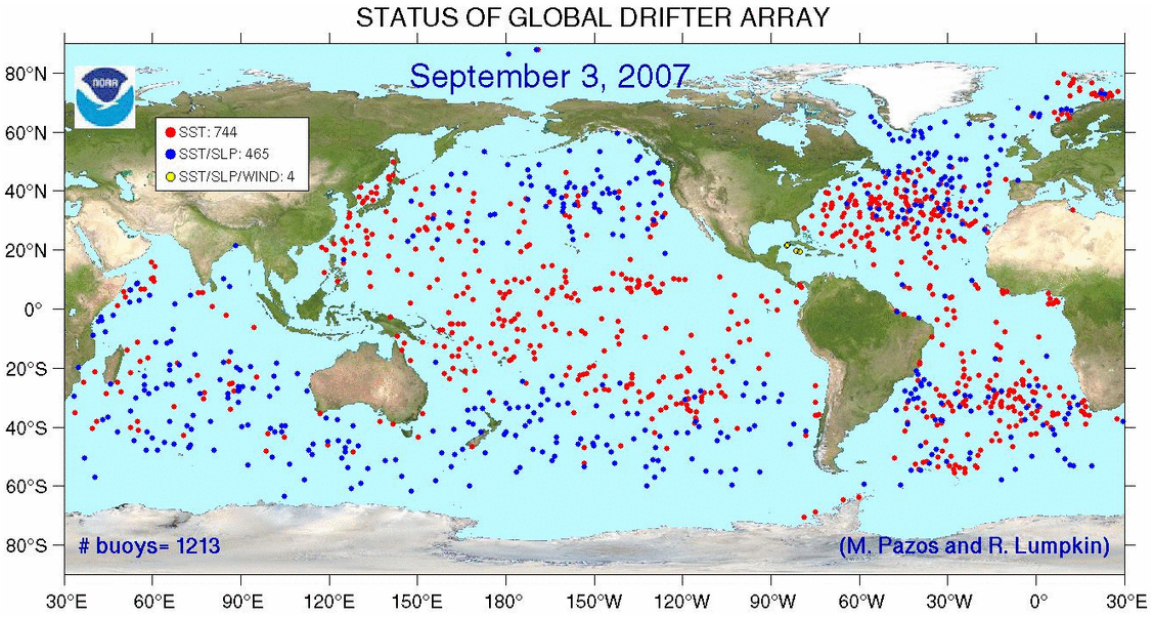

Figure 1. Global Drifter array

The figure shows the status of the drifter array as of September 3, 2007. Coverage of SVP drifters in the ISABP area is good, though gaps remain in the area of interest specially the Gulf of Guinea, Angola Basin, Equatorial Atlantic and particularly dynamic areas as the SW Atlantic. The low amount of SVP-B is also noted.

4.2 Drifting Buoys

In the intersession period 1 September 2006 to 31 August 2007, 174 drifters were deployed in the ISABP area of which 110 were SVP and 64 SVPB drifters. The deployments were carried out by GDC, Navoceano, Brazil, Argentina and South Africa mainly from research vessels and ships of opportunity and in the case of the Tropical Atlantic (30N – 20S) some were deployed from US Navy aircrafts.

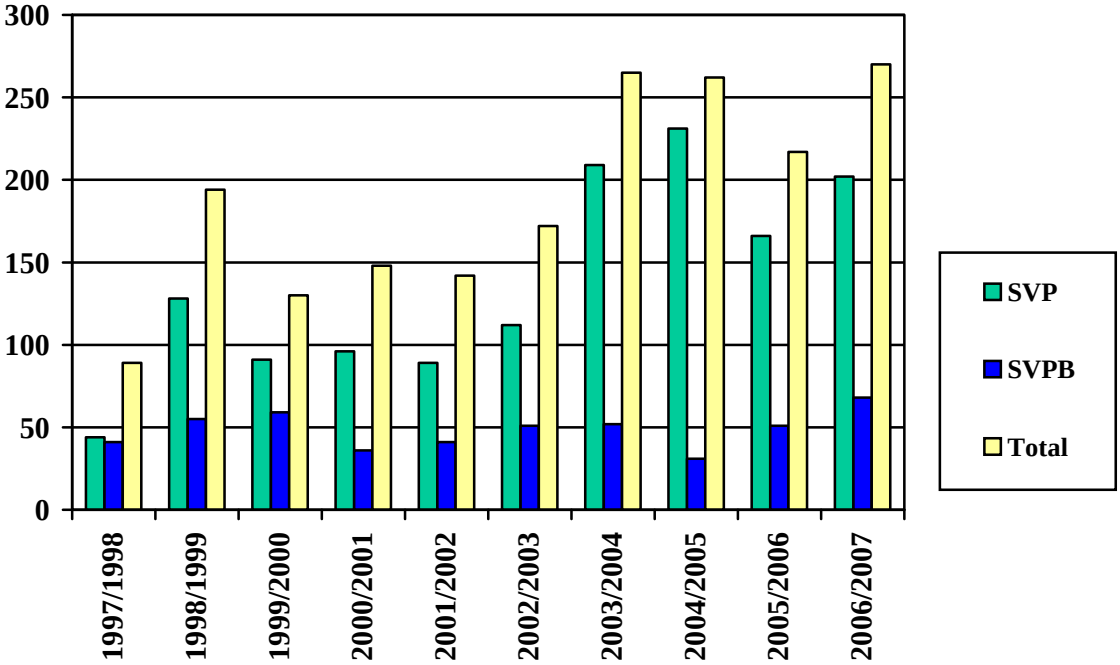

Figure 2. Buoys deployed since 1997 (periods from 1 Sept to 31 Aug)

The number of drifting buoys reporting on the GTS in the ISABP area during the intersessional period oscillated between 255 and 286 per month as indicated in MEDS monthly statistics, with an unusual - yet unexplained- month (Oct 2006) registering 559 platforms reporting on the GTS.

Year	Month	# Messages	# Buoys	Avr_Obs_per_buoy
2006	07	158501	265	598.12
2006	08	166925	277	602.62
2006	09	157643	286	551.20
2006	10	154199	559	275.85
2006	11	145941	264	552.81
2006	12	160139	262	611.22
2007	01	156653	270	580.20
2007	02	133689	257	520.19
2007	03	146016	255	572.61
2007	04	153249	263	582.70
2007	05	162137	276	587.45
2007	06	146987	272	540.39
2007	07	166039	273	608.20

Table 1. Monthly statistics of the number of drifting buoys reporting on the GTS in addition, the number of messages archived at MEDS from these buoys

4.3 Fixed Stations

The Argentine Navy is maintaining two moored buoys in the Southwestern Atlantic, while the South

African Weather Service continues maintaining fixed platforms on Gough, Marion, Tristan da Cunha and Southern Thule Islands. The drifters used as fixed stations on Tristan da Cunha and Southern Thule were be replaced by ICEX automatic weather stations and the SVP-Bs redeployed. The Brazilian Navy is maintaining one moored buoy in the vicinities of the Rio Grande Harbour and the INMET is operating an automatic weather station at the São Pedro e São Paulo Archipelago and had installed recently a new automatic weather station at Trinidad Island and 20 AWS in the coastal areas of Brazil.

4.3 Data reception and dissemination

Some communication inconvenient persists in the area. The South African Weather Service is currently tending to the problems with Gough and Marion Islands stations, investigating the possibility of replacing the LUTs.

4.4 Other developments

The Global Drifter Centre continues with the comparison study of SVP drift buoys built with mini drogue, called Atlantic Demonstration Buoys (ADB) where performances are being compared (transmitter failure rates, submergence or strain sensor performance, drogue lifetime, SST thermistor performance, etc.). The preliminary results of this study were presented and discussed during the workshop preceding the 21st DBCP as well as during the XI ISABP.

It was agreed that the ARGO program was a clear contribution to the ISABP goals and was to be considered an integral part of the observational effort, recognizing the benefits of cooperation and collaboration. This led to the inclusion of floats as monitoring platforms in the program's objectives and operating principles

5. FUTURE PLANS

Participants are constantly encouraged to increase their contributions of buoys and to fund especially the upgrade of SVP drifters to barometer drifters. The program should try to increase the barometer drifter deployments. The GDP will continue its support to the programme activities.

During XI ISABP, the group highlighted the need to increase observations and deployments in the SW and SE Atlantic, Drake Passage, Gulf of Guinea and Angola Basin. The group also raised the need to advertise the benefits of participating in the ISABP to other countries in addition to Brazil, Argentina, South Africa, and the USA.

It was suggested that the GOOS Africa, Regional Ocean Observing and Forecasting System for Africa (ROOFS) coordinators and participants of the Reading DBCP Buoy Technical/Metadata base Workshop of March 2006 should be contacted as to attract the attention of African countries towards ISABP.

Because of these efforts, last 19th July, the Marine Fisheries Research Division of Ghana submitted a letter of intent, becoming since then a full member of ISABP. During the intersessional period, the Fisheries Department of Tristan da Cunha also joined the group. The Servicio de Oceanografía, Hidrografía y Meteorología de la Armada (SOHMA) of Uruguay has recently expressed its will to become a member.

Argentina will continue to maintain two moored buoys as well as providing deployment opportunities in the SW Atlantic and Antarctica.

Brazil will acquire one fix buoy to coastal waters and one moored buoy to be deployed offshore at south or southeast coast to support the Severe Weather Virtual Centre (between the NMS of

Argentina, Brazil, Uruguay and Paraguay) and as well as providing deployment opportunities in the Tropical Atlantic and in Antarctic cruises.

The South African Weather Service is coordinating with the community on Tristan da Cunha the deployment of buoys at regular intervals.

In total, it is expected that 250 drifters will be deployed.

The dates and venue of the XII ISABP Meeting are not set yet though the possibility of holding the meeting in South Africa in 2008 is being analyzed.

6. INFORMATION ON THE ISABP

ISABP information is available on the web site at ***http://www.dbcp.noaa.gov/dbcp/isabp***. The pages give a description of the programme, its objectives, and links to the DBCP. The page is also available in Spanish.

Appendix I

Report by the OceanSITES

Submitted by Uwe Send

Status and update on OceanSITES

In the past year, the global timeseries project OceanSITES experienced a phase of stagnation. To some extent, this is due to funding difficulties and due to new initiatives still being developed (but not fully approved or implemented yet).

At the implementation level of individual sites, we believe that most existing stations have been maintained, and some new ones have proven themselves. Noteworthy are the NOAA operated/funded KEO site in the Kuroshio extension and the recent deployment of a mooring at station PAPA in the northeast Pacific (Gulf of Alaska). Existing sites like the air-sea flux stations NTAS or STRATOS, transport sites like MOVE and RAPID, and others around the world are being successfully continued. A new initiative funded by NOAA to develop a boundary current observing capability under the CORC consortium, has started the technological developments needed to occupy boundary current regimes operationally with moorings, gliders, and PIES (inverted echosounders with bottom pressure). On the other hand, some locations like moorings at Hawaii and Bermuda are in serious peril and may be discontinued since funding from the US National Science Foundation (NSF) appears to come to an end.

Major initiatives that would contribute to OceanSITES in the future are ORION/OOI in the US and EuroSITES in Europe. Both are still in the negotiation phase and not certain at this time. EuroSITES would integrate 11 existing timeseries sites in the North Atlantic and the Mediterranean; coordinate the technology, operation, data management, and exploitation. This would significantly enhance the value, visibility, and chances for sustained funding in a future in the European ocean observing system. The US Ocean Observatory Initiative (OOI), which would be the basis of the ORION project, has a global observatory component, which has been significantly reduced, in terms of the number of sites to be occupied. The present plan is to install ambitious and “transformative” infrastructure at 4 locations: the south Pacific off Chile at 55S, station PAPA in the northeast Pacific, Irminger Sea (subpolar North Atlantic), and the mid-Atlantic Ridge in the subtropical N. Atlantic. Partial implementation would begin as early as 2009.

For the OceanSITES network/pilot project, the lack of project office and data management support has made progress very difficult. We do not have the student in Kiel anymore who had maintained contact with operators, and had updated tables, site descriptions, and maps. Therefore, also the website lacks updated material and input. Other projects like ARGO and IOCCP have 2-4 staff helping their coordination efforts, while OceanSITES currently has none. This situation urgently needs to be addressed. Part-time technical support from JCOMM being discussed might fill this gap partially, but it is not the same as the tasks carried out by a project office.

The data management team and system for OceanSITES needs assistance from the US side. Coriolis remains willing to be one partner, but cannot do the job alone and needs a counterpart, like was done for ARGO. As a result, Coriolis does not have the manpower to chase after timeseries operator for data delivery, validate the conformance with the format and requirements, and submission of data is sparse at present. We are trying to remedy this with some renewed initiative from the science analysis side, but a US partner for the OceanSITES data management system is urgently required.