THE FIRST TRAINING COURSE ON BUOY PROGRAMME IMPLEMENTATION AND DATA MANAGEMENT

1. At the twenty-second session (La Jolla, October 2006), the Panel received a report from its Task Team on the Future Strategy of the DBCP recommending that the DBCP could develop new initiatives in support of the wider observational community. Key recommendations concerned the exploitation of the DBCP's experience and resources in the development of training materials, and in Capacity Building (CB) in developing nations. Such activities would both promote the wider use of buoy data in support of regional oceanographic, climatological, and meteorological initiatives, and assist the DBCP in achieving and sustaining its objectives for a globally distributed data buoy network.

2. As one initiative within the DBCP's CB efforts, a training course on Buoy Programme Implementation and Data Management was convened at the IOC Project Office for IODE, Ostend, Belgium, from 11 to 15 June 2007. This course was developed in close cooperation with the International Oceanographic Data and Information Exchange (IODE) and the Ocean Data and Information Network for Africa (ODINAFRICA). The majority of trainees were drawn from the African continent, and care was taken to select applicants who showed the best potential to develop data buoy initiatives in the region.

3. The curriculum covered the application and management of data from *in situ* oceanographic and marine meteorological platforms, and trainers were drawn from a wide spectrum of the international data buoy community. To maximize the impact and benefit of this course, practical work and assignments were given to participants at each stage. For example, a drifting buoy was deployed in Ostend harbour, and the whole range of data processing and quality control steps explored, leading to the eventual release of data from the buoy on to the GTS. As a final exercise, the trainers and trainees worked together to create a standard checklist for buoy programme operators, with the aim of documenting best practice in the deployment of drifting buoys (*Annex A*).

4. The course was pursued with great enthusiasm by both trainers and trainees, ably supported by the staff of the IODE Project Office. The list of trainers and trainees, as well as the programme of the course are reproduced in *Appendices B* and *C*. Some training material and presentations are available online at: http://www.ioc-goos.org/DBCPTraining.

5. During the course, trainees' comments were gathered on each programme and lecture of the course. Overall, the course was felt to have been very successful, and many participants expressed their interest not only to join the regional action groups of the DBCP, but also to initiate a dialogue with the Global Drifter Programme in order to participate actively in buoy deployment and data management activities.

Needs for Follow up

6. The Panel's first attempt for the training course turned out to be a success not only in sharing knowledge of buoy implementation and data management, but also in drawing attention of developing countries to the global cooperation (see *Annex D* for trainees' comments). A request from the trainees for more information on mooring buoy programmes – deployment, maintenance, and data management – should be addressed in the curriculum of future courses.

7. It was noted that such CB efforts should be supported on a sustained basis. In doing so, standardized training materials will be developed and kept updated in parallel with the organization of training programmes. Technical and in-kind support (such as donating drifting buoys) should also be considered in order to build upon the training results in a concrete way.

8. It is confidently expected that this and subsequent courses will help strengthen partnerships with regional institutes, resulting both in improved resourced sharing (such as

deployment ship-time) and in a wider appreciation, implementation and use of buoy programmes and their data.

9. To pursue and achieve there activities and goals, it is required to have a small group to lead and actively participate in the CB activities on behalf of the Panel. This proposal with a suggested ToR was presented at DBCP-23.

Appendices: 4

Annex A

Buoy Programme Checklist
(Version 0.1, 20/6/2007)

These are simple instructions for the shipping, checking, setting up, deployment, and data processing and distribution of a drifting more.

a) Buoys have arrived

1. Deal with customs
   1.1. Get copies of shipping paperwork
   1.2. Maybe get official letter from IOC or WMO or DBCP
   1.3. Maybe ship to local UNDP office
2. Who will pay Argos costs?
3. Contact owner to confirm receipt and find out where and when to deploy, and permissible leeway
4. Arrange secure, 24/7 accessible and inexpensive storage

b) Find suitable ship

1. Are there any research vessels in the area?
2. Are there ships of opportunity?
   2.1. Check websites, e.g.
      2.1.1. http://www.sailwx.info/shiptrack/
      2.1.2. WMO website, PMO list, Pub 47 (http://www.wmo.int/pages/prog/amp/mmop/documents/Jcomm-Groups/pmo_cp.pdf, http://www.wmo.int/pages/prog/www/ois/pub47/pub47-home.htm)
      2.1.3. Local ports authority
      2.1.4. Shipping companies
   2.2. Get official letter from drifter donator, WMO or IOC if needed
3. Issue deployment training and written instructions (see http://www.jcommops.org/dbcp/1bdm.html)
4. Translate into appropriate language if needed (WMO and/or IOC can provide assistance if needed)

c) Check that buoy is working

1. Use Argos tester or beeper at least to check transmission
   1.1. Check that transmission is received by Argos
   1.2. Check that GTS technical file has been implemented by Argos
2. Arrange transfer of buoys from storage to ship
   2.1. Check buoy again
      2.1.1. May need to get someone from institute to check Argos
      2.1.2. Consider leaving it switched on so that ship can be tracked etc
   2.2. Personally give buoy and deployment instructions to captain
      2.2.1. Remind captain to send deployment details and weather conditions to operator

d) Monitor buoy data

1. When deployment details have been received from ship:
   1.1. Check that data is of good quality
      1.1.1. Compare with analysed fields etc
      1.1.2. Reply to captain to say thank you!
   1.2. Contact operator/owner (GDC etc)
      1.2.1. Forward deployment details
      1.2.2. Ask the NFP for buoy programmes (or WMO directly if there is none) of the deploying country to assign a WMO ID. NFP obtains series of WMO numbers for the appropriate deployment areas directly from WMO. Details on WMO numbers and NFPs at http://www.wmo.int/pages/prog/amp/mmop/buoy-ids.html
      1.2.3. Request Argos to process the buoy and distribute the data on the GTS and provide Argos with WMO number, and GTS bulletin header
      1.2.4. Advise the Program Coordinator of the appropriate Action Group about the buoy deployment - WMO Id, Argos Id, location, name of deploying vessel. Details on DBCP Action Groups at http://wo.jcommops.org/cgi-bin/WebObjects/JCOMMOPS.woa/wa/menu?abbrev=J_CURR_ACTION_GROUPS
      1.2.5. Check that it really is on the GTS
      1.2.6. Check the QC sites (http://www.meteo.shom.fr/qctools/), monitor drogue status
2. Relax and have a big drink!

_____

Annex B

List of Participants

A Training Course on Buoy Programme Implementation and Data Management
(IOC Project Office for IODE, Ostend, Belgium, 11-15 June 2007)

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DBCP Training Course on Buoy Programme Implementation and Data Management

The why, how and where of data buoy observations and programme management

Day	Theme, topics and sub-topics	Prepared and delivered by	Supporting materials	Practical work and assignments

Mon a.m.	**1. Overview of marine observing systems**
	• Satellites
	  o Active
	  o Passive
		Meldrum	• To be defined	Access to satellite imagery archives

	• Ships
	  o OWS, VOS
	  o XBTs, XCTDs
	  o ASAP
	  o Manual obs
	  o Shipboard AWS
		Ball	• To be defined	

	• Fixed platforms
	  o Oilrigs, lighthouses
	  o Moored buoys
	• Profiling floats
		Turton	• To be defined	

	• Drifting buoys • Tsunameters and tide gauges • Autonomous vehicles • Seabed observatories	Meldrum	• To be defined	
Mon p.m.	**2. The need for buoy observations** • Role of oceans in weather and climate • Limitations of satellite obs • Limitations of ship obs • Value for money considerations	Turton	• To be defined	

	• Specific needs in terms of
	  o Observed variables
	  o Spatial coverage
	  o Temporal coverage
	  o Availability and timeliness
		Charpentier	• WMO and OOPC docs	• Summarise marine observing systems and their underlying requirements

Tues a.m. and p.m.	**3. Buoy hardware: platforms**
	• Fixed platforms
	  o Construction
	  o Mooring
	  o Safety and vandalism
	• Profilers
	  o Profiling engines
	  o Other design issues and calculations
	  o Ballasting calculations
		Turton	• To be defined	

	• Drifters
	  o Hull design
	  o Drogue design and validation
	  o Drag calculations
	  o Submersion issues and calculations
	  o Deployment packages
		Motyzhev	• SVP-B design manual
			• Niiler *et al* drogue studies
				• Practical deployment of tethered drifter in Ostend harbour

	• Marine animals
	• Energy
	  o Sources
	  o Budget calculations
		Meldrum		• Energy budget calculation

Wed a.m.	**4. Buoy hardware: sensors** • SLP and baro port design • T (air and sea surface) • T(z) • Submersion	Motyzhev	• SVP-B design manual	• Practical exercise: review of the sensor suite of the SVPB
	• C and the computation of S • Wind speed and direction • Rainfall and humidity • Location (GPS) • Current velocity • Wave spectra • Ocean depth, sea level • Other (e.g. pCO_2, bio, tracers)	Meldrum		

Wed p.m.	**5. Buoy hardware: sensor processing**
	• Sensor connection and interfacing
	  o Connectors
	  o Networking protocols and technologies
	  ▪ Hard-wired
	  ▪ Radio (e.g. Wi-Fi)
	  ▪ Optical
	  ▪ Acoustic
	• Microprocessors, microcontrollers, onboard memory
	• Timing sources
	• Sampling, averaging, despiking
	• Smart data processing
		Motyzhev	• SVP-B design manual	• Practical exercise: description of the sampling scheme and message format of the SVPB prototype

	• Data formats and message handling	Charpentier	• DBCP message formats	

Thu a.m.	**6. Buoy hardware: communications**
	• GSM and radio
	• Satellite
	  o LEOs: Argos, Orbcomm, Iridium, Globalstar
	  o GEOs: Meteosat/GOES/GMS, Inmarsat
	• Acoustics
	• Energy considerations
		Meldrum	• Satcomms overview	• Practical work with satellite transmitters and modems

	7. Buoy and float deployment
	• Strategic issues
	  o High impact areas
	  o Optimisation strategies
	  o Remote areas
	  o Contact with national focal points and high level sponsors
	• Practical issues
	  o Air and sea deployment opportunities
	  o Coordination with other agencies
		Pazos		• See Theme 3

	o Deployment techniques and handling of deployment packages o Pre-deployment tests o Safety issues	Motyzhev		

Thu p.m.	**8. Shore-side data processing, dissemination and archiving**
	• Data reception
	• Location techniques
	• Conversion issues
	  o Transfer functions, calibrations
	  o End-user formatting
	  ▪ GTS formats
	• Metadata
	• Data delays
	•
		Charpentier	• DBCP docs	• Practical exercise: Setting up the technical file of the SVPB prototype

	• Developments by service providers
	  o Argos
	  o Iridium
	  o Inmarsat
		Meldrum		

Fri a.m.	**9. Quality control**
	• Importance of QC
	• Techniques available
	  o Initial calibration and validation
	  o Gross error checks
	  ▪ Sensor values
	  ▪ Location accuracy
	  o Nearest-neighbour checks
	  o Comparison with model fields
	• RMS differences and biases
	  o Météo France real-time QC data
	  o Delayed-mode buoy monitoring statistics
	• Practical implementation
	  o Real-time automatic checks
	  o Identification of steady offsets
	  o Rescaling procedures
	  o Post-calibration tests
		Viola	• DBCP docs	• Practical exercise: analysis of the SVPB prototype data from the demonstration deployment

	• Practical implementation at the GDC
	  o Delayed mode procedures
	  o Importance of metadata
		Pazos		

	10. Data access and consultation • Data access policies • Data systems o WMO Information System (WIS) o Global Telecommunication System (GTS) o Other data pathways ▪ Designated archiving centres: RNODC/DB, SOC/DB ▪ GDP Data Assembly Centre ▪ ICOADS ▪ WDCs ▪ TAO, OceanSITES, Arctic data, Argo ▪ National Centres • Archival mechanisms • o o Operational support centres: JCOMMOPS, OSMC, NDBC o	Charpentier	• DBCP, WMO and MEDS docs	• Report on the availability of buoy data from various sources
Fri p.m.	**11. International coordination** • WMO • IOC • JCOMM and JCOMMOPS • DBCP and its action groups	Lee	• WMO and IOC docs	• Assignment: the relevance of the Law of the Sea to buoy operations
	• Case study : IBPIO, Indian Ocean activities and coordination	Ball		
	• Argo • Other emerging initiatives: GEOSS, EU FP7 • Future visions	Lee		
	12. Conclusions • Feedback on assignments and project reports • User feedback • Next steps o Network creation o Continuation support	Meldrum		

Annex D

Input from the participants of the Training Course
(11-15 June, Ostend, Belgium)

Following comments were made to the request of information on:

- brief descriptions of an ongoing or planned projects in the country/region
- immediate national/institutional needs for buoy observations (where to monitor/what type of buoy/what parameters to measure), if any.
- Immediate and long term benefits of the DBCP training course for yourself, and for your institution/country
- Any comment/suggestion on the future course

Brazil:

We already have a National Buoy Program in Brazil, called PNBOIA (Programa Nacional de Bóias) and we are supposed to deploy 46 drifters in 2007, and we hope we can increase this number for 2008.

At this point, we are deciding the number of SVP-Bs that we will ask to AOML considering the ships availability for 2008. Our main goal is to fill the gaps in the South Atlantic Ocean. We are also planning to increase the number of moored buoys, next year.

Regarding the DBCP training course, it was very well organized and all the presentations were quite interesting. I am sure all the subjects I have learned will improve my activities and skills as coordinator of the PNBOIA. I just would like to suggest you to include in the next courses some lectures about moored buoys.

Italy:

<u>Project with buoys:</u>

- 15 costal buoy of RON (National ondametric buoy network) run by APAT (www.apat.it) has around 15 moored buoys (3Axis) along Italian coast. By the time 5-7 of them are working on problems in maintenance, the network will be updated on 2008 and maintained. The system measures wave and SST.
- 4 moored buoys (2 waverider, 2 mambo) of Civil Protection of Friuli Venezia Giulia (www.protezionecivile.fvg.it), maintained by OGS (www.ogs.trieste.it): the system is active and measures meteo, wave, SST, currents and salinity
- 1 offshore ODAS ITALIA 1 buoy run by CNR-ISSIA (www.issia.cnr.it) is located in Ligurian sea and measures meteo, wave, SST, sea temperature, currents and salinity.
- 1 costal buoy run by ARPA-ER (http://www.arpa.emr.it/) measures waves in Adriatic sea near Cesenatico
- drifters and Argos deployed by OGS

<u>Planned project with buoys</u>

- 1 off-shore buoy must be deployed by OGS (www.ogs.trieste.it) in central Adriatic to

measure deep-sea currents, salinity sea temp

- 1 costal buoy must be deployed during 2008 by ARPAL (www.arpal.org) near Savona (Ligurian sea) to measures meteo, waves, SST and surface currents

- CF of Tuscany (www.cfr.toscana.it) must deploy 2 costal buoys during 2008 in Elba sector to measures waves and SST.

In oceanography many project are run by

- INGV (www.bo.ingv.it/mfs or www.bo.ingv.it/gnoo) for evaluation of salinity, currents, and sea temperature. Prof Nadia Pinardi supervises all the projects.

- CNR (CNR-ISMAR, CNR-IAMC)

- ENEA-CRAM (La Spezia)

International representation

- Aeronautica Militare, Servizio Meteorologico (www.meteoam.it) is the national weather service and represents Italy in international panels. Gen Capaldo is the chief

- INGV was delegated in scientific areas. Nadia Pinardi is the coordinator.

Benefits of the DBCP for my institution ARPAL:

- very successful

- it will help a better definition of our project of a costal moored buoy

- it will help in running it and maintenance

- it will help and encourage us to collaborate with other countries and distribute our data (in GTS)

Subjections for next course

- more details on moored buoy (materials, designs, deployment, maintenance)

- introduce and focus also on wave measurements techniques

Mozambique:

Regarding to the DBCP training course, I would like to say that it helped me to understand many issues related with buoys, and as a follow up of the workshop, we have planned a deployment of 3 drifter buoys on Indian Ocean by Mozambican staff. This will take place in September/October 2007 using Norway research vessels. The buoys are been supplied by Global Drifter Program. We have been working with Mayra Pazos (she was present on June workshop) and other GDP personnel.

After this first launching, my institution will work with the National Institute of Meteorology in order to design a national buoy observation program.

Some contacts have been made with the chairperson of IBPIO in order to include

Mozambique in this group but we still need to work on this issue.

Slovenia:

We have one moored oceanographic buoy in the Slovenian Sea (please see website http://buoy.mbss.org/portal/index.php?lang=en).

We continuously measure:

- air temperature and humidity
- wind
- sea currents
- sea surface temperature and salinity
- sea floor temperature
- sea waves

The post-processed data are submitted to web page every 30 minutes.

The Oceanographic Buoy Piran is a core of the project ISMO that is INTERREG project: http://ismo.mbss.org/index.php?lang=en

A new buoy is planned for the next year, which will replace the old one.

The national needs for the buoy data: fishery, mariculturists, tourism organisations, public utility companies, the Office for the Protections of Coastal Waters, public administration, the Maritime Office, civil protection agencies, the maritime police, research institutions, schools and the mass media.

It should be appropriate to include more information about moored buoy on the course.

Tanzania:

First, it is better to know geographical location of Tanzania. Tanzania is located on east Africa, it is surrounded by lakes Victoria, Tanganyika and Nyasa, and eastern side is West Indian Ocean. Unfortunately, there is less buoy observation activities in the region. In fact, buoy observations in the tropical western Indian Ocean region through drifters and moorings are important and highly required for monitoring oceanographic and meteorological parameters such as sea surface temperature, ocean waves, sea level pressure and surface wind direction and speed.

Previous DBCP course

In general, the previous DBCP training course was extremely valuable and meaningful, comprehensive, educational thorough in the field of meteorology and oceanography. The topic/material contained were high standard, which I have found very instructive and interesting. The course provided me with an opportunity to meet with other meteorologists, and oceanographers from different DBCP Action Groups in different environment and shared experience, which helped me a lot personally and professionally. Actually, from that course I gained overall knowledge on ocean observing systems and the need for buoy observations.

Institutional needs for buoy observations

Particularly, moored buoys (with meteorological and oceanographic sensors) are much

needed for monitoring sea waves, coastal surface wind and other parameters over Tanzania coastal region and surrounded lakes zones.

Buoy observations (mooring) provide data for both real-time operational requirements and research purposes that can be used as main reference point for daily weather forecast and improve local research activities in the region. This may leads to understand Tanzania weather, climate, and its variability.

Suggestion

The next DBCP training course should be conducted in regional scale according to action groups of the DBCP in order to be more familiar with buoy activities, sharing experiences in the region.