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DATA BUOY COOPERATION PANEL

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ENGLISH ONLY

REPORT BY THE TASK TEAM ON MOORED BUOYS (TT-MB)

(Submitted by Jon Turton, TT-MB Chair, United Kingdom)

Summary and purpose of the document

This document contains the report by the chairperson of the DBCP Task Team on Moored Buoys.

ACTION PROPOSED

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

Appendices: A. Report by the Task Team on Moored Buoys
B. Terms of Reference of the DBCP Task Team on Moored Buoys

-A- DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

6.3.1 Mr Jon Turton (United Kingdom), Chairperson of the Task Team on Moored Buoys reported on the progress during the intersessional period.

6.3.2 The Panel noted that during the year the metadata content needing to be collected was agreed and has subsequently been published on the DBCP web-site[1]. Recalling that DBCP-27 had agreed that the metadata should be in NetCDF for consistency with OceanSITES and tsunami buoys, the Panel noted with appreciation that NDBC had offered to lead on developing the SIF (standard input format) for the moored buoy metadata NetCDF. Once the SIF is agreed then metadata collection can begin.

6.3.3 The Panel recommended that separate BUFR templates should be defined for drifting and moored buoys. For moored buoys the approach suggested is to split the message into a series of sequences for various aspects (e.g. identification/position/time, standard surface met measurements, ancillary met measurements, basic wave measurements, detailed spectral wave measurements etc.). This will allow to reduce the size of GTS reports when some measurements are not being reported.

6.3.4 Mr Turton reported on the technical developments undertaken by a few DBCP members involved in moored buoy operations, including:

- Environment Canada Moored Buoy Network
- US National Data Buoy Centre (NDBC)
- PMEL Tropical Moored Buoy Array
- PMEL Ocean Climate Stations (OCS)
- Indian Moored Data Buoy Programme
- Met Office moored buoy network

6.3.5 The Panel thanked Mr Turton and members of the Task Team for their efforts in maintaining and improving their moored buoy networks and exchanging their data, and for the inputs provided for this report. It was agreed that Mr Turton would continue as chairperson of the Task Team for the intersessional period. The full report of the Task Team is provided in Appendix A of DBCP-27 doc. 6.3 as well as in the CD-ROM accompanying the DBCP Session final report.

Appendices: 2

1 http://www.jcommops.org/dbcp/data/metadata.html

APPENDIX A

REPORT BY THE TASK TEAM ON MOORED BUOYS

This report details activities and progress made during the inter-sessional period since DBCP-27.

1. Moored buoy metadata

1.1 The initial priority for the Task Team has been on defining the metadata on moored buoy systems that needs to be collected. At present there is little or no systematic collection of the relevant information (metadata) on the various moored buoy systems. Information is needed detailing the systems and what parameters they measure. Such information is needed by data users (e.g. who need to know heights (and depths) of measurements and whether corrections have been made) and moored buoy operators (who have an interest in the sensors and systems being used). Also, on buoys where several different wave sensors are deployed it is important for users to know which are active and providing data. Similarly for wind data if anemometers are at different heights.

1.2. For wave measurements, the sensor type dictates the quality of the wave estimate especially in direction. Users need this information, not only to assess the quality of the measurements (ground truth), but also for long-term trend analysis of the data. Apparent changes in the wave climate may be primarily due to changes in the wave sensor, payload (analysis package), hull type and mooring design, hence such information is critical for wave climate analyses.

1.3 During the year the metadata content needing to be collected was agreed and has subsequently been published (http://www.jcommops.org/dbcp/data/metadata.html) on the DBCP web-site. At DBCP-27 it had been agreed that the metadata should be in NetCDF for consistency with OceanSITES and tsunami buoys and NDBC had offered to lead on developing the SIF (standard input format) for the moored buoy metadata NetCDF. Once the SIF is agreed then metadata collection can begin. An advantage of NetCDF is that it is self-describing so can accommodate additional variables more easily than other coded formats.

2. BUFR formats for buoy data

2.1 At present there is a draft (still unvalidated) template for buoy data which is applicable to both drifting buoys and moored buoys and for the latter includes directional and non-directional wave data. This has the disadvantage that the template is neither optimal for drifters or moored buoys, which are very different platforms, where many elements relevant to a drifter are not appropriate to a moored buoy and vice-versa. Hence it is recommended that separate BUFR templates are defined for each.

2.2 For moored buoys the approach suggested is to split the message into a series of sequencies for various aspects (e.g. identification/position/time, standard surface met measurements, ancillary met measurements, basic wave measurements, detailed spectral wave measurements etc.). Hence, if any of the above measurements are absent the descriptor for that sequence can be given by 1s to indicate it is not being used. This gives the flexibility of being able to include all elements, but also able to avoid long messages that would contain many unused elements when only a subset of measurements are made. Also, sequences for metadata could be defined and added when/if needed. This more flexible approach is consistent with that used for tsunami buoys and sea level measurements. Proposed template to be discussed during DBCP-28.

3. Technical developments

3.1 Environment Canada Moored Buoy Network

3.1.1 Environment Canada (EC) continues to operate a network of ~50 moored buoys, with 23 buoys deployed on a seasonal basis (in-land lakes, or ocean areas affected by ice). All Environment Canada buoys continue to utilize the Watchman100 “payload” provided by AXYS Technologies Inc. Overall network availability was better than 95% for the last 6 months of 2011, but fell to 82% for the first 6 months of 2012 following some system failures, as well as mooring failures on the Atlantic Coast. While repairs have been made in some cases, the Tail of The Bank Buoy 44140 is still adrift ~1200 Km East of Newfoundland (as of July 2012).

3.1.2 The EC moored buoy network has been temporarily expanded on the east coast of Canada with the deployment of 3 new seasonal moorings in the Gulf of St. Lawrence. Two 1.7 M WatchKeeper Buoys along with a TriAXYS wave buoy have been deployed in support of our Marine Weather Science Laboratory to help with the validation/verification of new coupled ocean atmosphere models. There is also a desire to validate the performance of wave model in shallow seas of the Gulf, with the results potentially improving predictions in northern waters such as the Beaufort Sea.

3.1.3 As reported last year, the main technical development or upgrade to the EC moored buoy network is the implementation of SatLink2 GOES transmitters provided by SUTRON. The SatLink2 provides a higher power (40W) transmitter, ensuring reliable data transmission at higher data rates (300 or 1200 bps) with the existing omni-directional antenna (Harsh 14A). Over 70 units have been procured to date, and we expect complete retrofit of all existing moored buoys in the network, along with spare hardware. The performance of the new transmitters has been very good to date, however we continue to monitor potential problems related to using 300 bps transfer rate in rough sea conditions, as there is some evidence of increased parity errors, and loss of data. We continue to examine the data record, and where possible compare the performance of near-by buoys and ship reports to try and correlate increases in parity errors with sea state in excess of ~3 m.

3.1.4 EC has also continued dialogue with the National Data Buoy Centre Engineers in the hopes of increasing the reliability of the Harsh antennas, as these components have been identified as a weak point in our data communications. The antennas are prone to water intrusion, and are often the cause of missing, or intermittent data transfers. There are also instances when the fragile antenna is damaged when a buoy is deployed or retrieved. We have begun work to improve the water sealing (use of silicon to improve seal) and are also evaluating an upgraded version of the Harsh antenna that uses a stainless base. In addition to these efforts, Environment Canada Engineers are considering options to design and build an improved base or collar to hold the Harsh antenna in place, while not interfering with the transmitted signal. We hope to install a prototype into the network for testing by spring of 2013.

3.1.5 EC has continued to deploy and operate 2 Datawell MarkIII wave rider buoys in support of the PP-WET project. In addition to a direct comparison to the operational wave sensor on EC buoys (“strap-down” accelerometer), the moored buoys at Halifax Harbour (3MD 44258) and La Perouse Bank (3MD 46206) have been equipped with a TRIAXYS sensor (provided by AXYS Technologies). All resulting data from the wave observation inter-comparison are delivered to CDIP for analysis as outlined in the PP-WET project plan.

3.1.6 An additional technological advancement which has been undertaken by the EC moored buoy network in the past year has seen the integration of an Iridium Short Burst Modem into the existing AXYS WatchMan100 “payload”. This has been achieved by adding a node of a WM500 processor within the Transmitter module of a standard EC buoy, with the WM500 in place to control the communications with the Iridium modem. Using bidirectional communications, it is possible to deliver commands to the primary WM100 payload via the WM500 (which is controlling the communications). This functionality will greatly enhance the amount of troubleshooting which can be done remotely, making it possible to reset power, reset the GOES transmitter, modify configurations, suppress sensors, change GOES ID etc. The Iridium SBD modem will also provide redundant communications for delivery of weather and wave data in the event of a failure to either the GOES transmitter or antenna. A prototype system has been designed and built, and will be tested in the field in the 2nd half of 2012.

3.1.7 Finally EC is currently undertaking a competitive procurement process with the intention to replace the aging WM100 “payload” provided by AXYS Technologies. The WM100 is presently used in all moored buoy and AVOS (Automated Volunteer Observing Ship) installations. A Request for Information (RFI) was posted on the Canadian Government Tender System in early July 2012. An RFP (Request for Proposals, including pricing) will follow in early 2013. The goal will be to procure a new system that can be easily integrated into the existing EC buoy hulls, and use both the existing suite of sensors as well as future measurement systems. This could include directional waves, current profilers, and potentially biological sensors to meet future requirements.

3.2 US National Data Buoy Centre (NDBC)

3.2.1 The United States National Oceanic and Atmospheric Administration’s National Data Buoy Center NDBC reported that during this period, they operated 115 NDBC moored buoy platforms, 51 coastal marine stations, 39 deep-ocean tsunameters, and 55 Tropical Ocean Atmospheric moored buoys in the equatorial Pacific Ocean. Following extensive testing of replacement sensors and communications to refresh the TAO array, twenty four TAO Refresh buoys have been deployed in the TAO array. The Refresh buoys provide transmit data via Iridium and it is disseminated over the GTS. The TAO array is expected to be totally refreshed in 2015. NDBC deployed two wave gliders for operational station keeping and comparison to moored met and ocean observations and data transmission. Deployment of one of the gliders near buoy 41040 in the northern Gulf of Mexico allowed extensive comparison to the met data collected on the buoy and an assessment of station keeping capability by the buoy. After refurbishment, the buoy was redeployed off Monterey Bay near NDBC buoy 46042 in October 2011 and remained there for testing until July 2012. A second wave glider was deployed and piloted to the vicinity of the Gulf of Mexico tsunameter at 41409, where it was hit by a vessel. While the subsurface unit was lost, the surface unit was later recovered. Reports from these deployments are being consolidated.

3.2.2 NDBC continued an integration effort to test the use of medium frequency acoustic modems on the tsunameter buoys to increase the acoustic cone to allow for stronger moorings. A critical design review for a tsunameter that includes the medium frequency acoustic modems has been completed. The tsunameter and surface buoy will be deployed in 2013.

3.2.3 NDBC continues to monitor three coastal stations enhanced with automated red-tide sensors in Veracruz, Mexico. The stations are part of an Interagency Agreement (IAG) between NDBC and the US Environmental Protection Agency, Gulf of Mexico Program and are located at Sacrifice Island, La Mancha Beach, and Veracruz Harbor (SACV4, LMBV4, and VERV4), Mexico. The installations of these stations were a cooperative effort between NDBC, the Veracruz Aquarium, and the Institute of Ecology in Xalapa, Mexico. This project supports the bi-national expansion of the Harmful Algal Blooms Observing System in the Gulf of Mexico. NDBC continues to provide technical assistance to the Hydrographic and Oceanographic Service of the Chilean Navy (SHOA), the Chilean Tsunami Warning Provider. NDBC continues to process and distribute the data from the Chilean DART.

3.2.4 USACE and NOAA/NDBC are working on a revised US National Waves Plan where we are identifying sentinel buoy locations where the buoy record lengths exceed 20-years. We are trying to make sure these locations have priority if funding pressures get worse. In addition USACE are defining what assets are valuable in meeting their mission. NOAA/NDBC is also soliciting input from NOAA/NWS to determine their priorities.

3.3 PMEL Tropical Moored Buoy Array

3.3.1 Technology

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

3.3.1.2 Building on the Flex mooring system developed for use on high-latitude Ocean Climate Stations (OCS), PMEL has developed a new mooring system named TFlex, intended to replace the legacy ATLAS moorings in tropical research arrays. TFlex observations are essentially equivalent to ATLAS, using more commercially available components and provide higher temporal resolution data in real time. Prototype systems have been deployed for comparison within a few miles of ATLAS systems near 12°S 93°E in RAMA and near 20°N 38°W in PIRATA. Additional test deployments are planned for the coming year. Under the terms of an IA between the US and Indonesia, TFlex supports both RAMA and the Indonesian Global Ocean Observing System (InaGOOS).

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

3.3.2 Metadata and Information Exchange

3.3.2.1 The Tropical Moored Buoy Implementation Panel (TIP) next meeting is next TIP meeting will be held Oct 23-24, 2013 in Jakarta, Indonesia.

3.4 PMEL Ocean Climate Stations (OCS)

3.4.1 NOAA PMEL Ocean Climate Stations are heavily instrumented moored buoys that contribute to the OceanSITES network of time series reference sites. At present PMEL OCS operates two stations: the Kuroshio Extension Observatory (KEO), located in the recirculation gyre south of the Kuroshio Extension at 144.6°E, 32.4°N, and Station Papa, located in the eastern subarctic Pacific at 145°W, 50°N. Both moorings carry a suite of sensors to monitor the air-sea exchanges of carbon dioxide, heat, and freshwater; wind; upper ocean temperature, salinity, and near-surface currents; ocean acidification; important aspects of the carbon cycle in the surface water; and bottom water temperature and salinity. The KEO mooring is maintained in partnership with JAMSTEC; Station Papa is maintained in partnership with the Canadian DFO Line P Program.

3.4.2 Most of the KEO and Station Papa data are available in near real-time through the project website: http://www.pmel.noaa.gov/OCS/. In addition, a subset of the meteorological data is available in near realtime through the GTS. Their WMO numbers contain the digits "84" identifying them as reference stations (KEO's is 28401 and Papa's is 48400). It is recommended that these GTS reference data should be withheld from all data assimilations so that they can be used as independent validation of the numerical products.

3.5 Indian Moored Data Buoy Programme

3.5.1 During 2011-2012 under this moored buoy programme 61 moored met ocean buoy operations were carried out with 12 cruises of 225 ship days involving 2,500 man days and sailed 20,000 nm of distance in Bay of Bengal, Arabian Sea & Indian Ocean. This enabled for successful maintenance of Buoy Network consecutively.

3.5.2 Deep Sea buoys

3.5.2.1 Establishment and maintenance of subsurface Ocean Moored buoy Network for Indian monsoon (OMNI buoys) in Bay of Bengal. In order to measure sub surface data upto 500m water depth along with met - ocean data to transmit real time for monsoonal studies next generation of moored buoy systems are established in 6 locations in deep waters in Bay of Bengal with one in Andaman Sea. These buoys which were established before the onset of North-East Monsoon THANE Cyclone which gave a new insight into this phenomenon during 2011

3.5.2.2 Met Ocean Buoys. These buoys with meteorological sensors, Sea surface temperature sensors and wave sensors are deployed in Bay of Bengal and Arabian Sea to get the real time metrological data.

3.5.2.2 Tsunami Buoy System. In order to detect and provide early warning to the shore area NIOT was involved in Deployment and retrieval of tsunami buoy systems in Bay of Bengal and Arabian Sea. During this period a total number of 26 operations were done and 13 cruises were executed to maintain the functionality of tsunami detection network. Presently 5 buoys were functional at field.

3.5.3 Coastal buoys

3.5.3.1 Coral Reef Buoy. On the request of Department of Environment and Forest (DOEF), Andaman & Nicobar**,** Coral Reef Buoy was deployed in Mahatma Gandhi Marine National Park, Wandoor, and Andaman & Nicobar Island during February 2011 to study the global warming and coral bleaching. The buoy was fitted with meteorological sensors, water quality sensor to monitor the coral reef environment. The mooring system experienced severe current.So; the mooring was designed to have double anchor and a shore anchor to withstand high current, wave and wind loading in Andaman Island and is being closely monitored. The buoy was retrieved on February 2012 and its data was analyzed. It was revealed that SST range from 26.8º C in 28 August 2011 during monsoon and 30.6º C in 24 April 2011 and maximum wind gust experienced was 20.8 m/sec in June 2011. The SST range recorded is considered suitable for survival of coral reef ecosystem.

3.5.3.2 Data buoy as a reference platform was deployed Off Agatti, Lakshadweep and was functional from March 2011 to December 2011 with dual mast, redundant wind & humidity sensors for the first time. It was a challenging task to integrate and to deploy such a buoy system. This mooring had shore anchor and experienced severe wave and wind loads. During this period, one of its Air humidity sensors became faulty and redundant Secondary sensor functioned and collected data. These redundant Air temperature and wind sensors data were correlated and its best results proved that sampling and data acquisition methods adopted are good and correct.

3.5.3.3 Kalpasar Buoy. Meteorological and sub-surface parameters are being measured and disseminated for Kalpasar Project for building of dam over the Gulf of Khambhat at Gujarat to establish huge reservoir.

3.5.4 Technological achievements

3.5.4.1 Indian Data Acquisition System was developed through industry and deployed at BD06 location was providing data from July 2010 and collected data during JAL cyclone. Due to subsequent continuous operation of this prototype, the developed CPU was deployed in more than five locations in Bay of Bengal and Arabian Sea. These CPUs were upgraded for wave data measurements also.

3.5.4.2 Best of Practice Method Manual for moored buoys was prepared and is being followed using the inputs from PMEL NOAA and vetted by NOAA NDBC to obtain quality data from moored buoys.

3.5.4.3 Anti-Vandal. As a part of this activity protective hood, hidden antenna and surveillance camera were developed. To avoid vandalism, the old design of hood was modified into conical shaped Hood. In the earlier design, it has flat at the top of the hood, which enables the person to stand over it and break the components of the buoy. In order to overcome the vandalism of Antenna fitted on top of the sensor mast of the buoy it was fitted inside the hood for data buoys and Tsunami Buoys. Three new designs were evolved.

3.5.4.4 Automatic Weather Station / Weather through SMS. The data collection module controlled by a microcontroller is interfaced to a set of sensors to collect weather parameters such as temperature, humidity, wind speed, wind direction, pressure and rainfall. The weather data can be viewed in real-time through a graphical user interface (GUI). The online data can be viewed 24 X 7 from anywhere on request through SMS.

3.5.4.5 Indian drifter buoy was designed by NIOT and deployed off Sri Lankan coast. using Indian Satellite and has been providing data.

3.5.5 Ongoing developments

3.5.5.1 New Generation Met - Ocean buoy has been designed with some additional features. Buoyancy module shape has changed from Discus to Cylindrical and also from bi-modular to single modular construction. This design having less draft with good stability restricts climbing on the buoy. In this, the Life time of the Buoy system has been increased twice the conventional buoy due to the provision of more batteries. To accommodate more batteries, new design of instrument housing was arrived. This New Gen Met - Ocean buoy can sustain for uninterrupted service for 2 years. Also, while designing efforts were taken to avoid vandalism by means of special type of fasteners and protective hood.

3.5.5.2 Automated Data Reception Software has been introduced to facilitate more information on data buoys. It has data dash board with drill down menus. This software provides integration to various platforms like Met – Ocean, OMNI and Tsunami buoys. The Quality Control routines are as per International Standards. The software will also generate alerts on buoy drift, tsunami, watch circle radius, in addition to the Quality Control Routine.

3.5.5.3 Mooring analysis. Deep Sea & Shallow Water buoy moorings were analyzed prior to the deployment to find the expected load on the mooring line based on the environmental conditions at the deployment location. The software package used for the analysis is CABLE Program. To gain confidence on the mooring, analysis were carried out by using CABLE Software, also a comparative study was made with the results of the ORCAFLEX analysis. In addition with the above activities, recently one of our buoy mooring was equipped with Tension Recorder to correlate the mooring analysis value with the actual

3.5.6 Challenges

3.5.6.1 Satellite communications through INMARSAT. Data buoys and Tsunami buoys are deployed in Bay of Bengal and Arabian Sea at selected locations. However, the project is suffering various constraints to provide continuous data from the sea bed to Tsunami Early Warning Centre. Important factors that decide the most appropriate satellite communication link to be used for tsunami buoy systems are: (a) power consumption of the transceiver electronics, (b) high data rate and (c) low latency. IRIDIUM satellite terminal supports 2400bps with very low power consumption of 250mW in standby mode and around 2.5W in transmit mode. Compared to this, INMARSAT terminal operates at a low data rate of 600bps with high power consumption of 2W in standby mode and 23W in transmit mode. Hence IRIDIUM communication is used in more than 90 % of the tsunami buoys operating globally. Due to the inherent disadvantages of high power consumption & low data rate it was observed on a number of occasions that (i) the battery on the buoys need frequent replacements, which is very tedious due to non-availability of ship time as well as (ii) high data latency and data gaps while operating in tsunami event mode.

3.5.6.2 Vandalism. A major challenge faced by this project is ‘vandalism of surface buoys’, destruction of solar panels, destruction of transmission units, destruction of sensors mounted on a 3 m tall mast on met-ocean data buoys, etc. Vandalism of these valuable ocean data buoys has been, and remains a significant problem in many ocean areas. Simple acts of vandalism of these buoys, both deliberate and accidental, and problems linked with fishing are major ongoing problems in many parts of the world. For example, incidents of buoys caught in trawl-nets or entangled in fishing lines are fairly frequent. Several efforts were made such as awareness to Indian fishermen, by distribution of pamphlets, Buoy identification through WMO Identification code, Buoys are fitted with beacon lights as per international standard IALA code, Radar reflector as per standard, also special technological changes like slippery smooth, Protective hood to avoid tie-up by boats, Difficult to remove fixtures / fasteners. Also these buoy locations are notified through Mariners notice sent to Naval Hydrographic Organization, Monthly status report are sent to Navy and Coast Guard etc., these buoys are expensive and their set-up in the sea is a time-consuming exercise. Therefore, any loss of the buoys hampers global climate research, meteorological forecasts considerably. Further, it can also undermine the capacity to detect and warn the natural disasters and thus jeopardize the lives of millions of people. To address the issue of safety of data buoys and tsunami buoys, there is an urgent need for regional cooperation and regionally coordinated effort to protect these buoys.

3.5.6.3 Awareness on vandalism of buoys. The efforts to conduct awareness among fishers continued by organizing an awareness programme through a Deep sea Fishermen meet on ‘Call from the Deep sea 2012’ from 16th to 20th July in Southern part of India and subsequently at Chennai from 06th to 08th August 2012. The events and programmes included comprise of seminars, deliberations, discussions, workshops etc. Topics covered included various deep sea fishing issues and challenges. Out This summit was attended by artisanal deep sea fishers with Fisheries Experts, Fisheries Scientists, Marine and Coastal Environmentalists, Academic Scientists, Researchers, Scholars, Professionals in Information and Communication Technology, During this meet a publication by FAO on code of conduct on fishing was released in vernacular language (Tamil). Government officials, Corporate Companies, Fishing Equipment Suppliers, Fish Exporters and Fish Buyers. A successful awareness campaign was conducted with stall posters banners video displays were presented in different locations along the villages this was best opportunity to show cause importance of moored buoys and need to protect them In line with this another workshop from 6 to 8 August was organised in Chennai India

3.5.7 Sri Lanka. Many awareness programmes were organized by Radio broadcasting programs through the "SAYURA radio" regarding the importance and protection of data buoys and also awareness programs for fisheries society along the coastal belt in Sri Lanka. Posters and banners were distributed to all Sri Lankan District Offices and Fishery Harbour Managers. A workshop for our Assistant Directors was organised through out island and educated them regarding this matter. Another awareness programs for Sri Lanka Coast Guard Officers and posters and banners were handed over to them. During October / November 2011 two training programmes for Srilanka, Coast Guard was organized in southern part of Sri Lanka. National Aquatic Resources Research and Development Agency (NARA), Dept, of Fisheries & Aquatic Resources, National disaster management authority supported this campaign

3.5.8 Proposed workshop - DBCP-NIOTBOBP IGO *Regional workshop on The Best of Practices for Instruments and Methods of Ocean Observation in Chennai India*, from November 19 to 21, 2012. This workshop would also concentrate on present and future trends in ocean observation systems, methods, standards that are followed worldwide and the calibration techniques offered by

OEM's. The expected outcome of this workshop will generate awareness on new ocean observation systems and shall bring up new ventures and business solutions. It is expected nearly 45 – 50 participants would attend this workshop from Indian Ocean rim of Countries.

3.6 Met Office moored buoy network

3.6.1 The Met Office moored buoy network presently includes 7 operational deep ocean buoys to the west of the British Isles from the north of Scotland to Biscay (K7, K5, K4, K2, K1, Brittany and Gascogne). The two buoys in Biscay (Brittany and Gascogne) are operated in collaboration with Meteo-France. These buoys are funded through the Public Weather Service Programme, apart from K7 which is mainly funded by the offshore oil and gas industry. A further 2 inshore buoys are operated off the coast of South Wales for the Milford Haven Port Authority and QinetiQ.

3.6.2 All the buoys have dual sensors (other than the wave sensor), dual control electronics and dual satellite transmitters, with systems cross-linked for maximum resilience. As the ageing Meteosat DCPs are increasingly unreliable and difficult to maintain all the buoys now have a single DCP and an Iridium system. The plan is to replace the old DCPs with new Sutron DCPs that are upgradeable for high rate transmissions. Also all these buoys now have dual WindSonics for wind measurements.

3.6.3 At present K7 is off-station having been recovered in January 2012 after going adrift and a replacement is ready for deployment. Although the buoy's position is in international waters, it was on the Denmark/Faroese side of the 'Denmark Faroes Island/UK demarcation line' as shown on Admiralty/mariners charts. This has caused confusion and misunderstanding on occasions, when Faroese merchant vessels have wrongly identified the buoy as being 'adrift' within Faroese waters. The replacement buoy will be deployed in a new location on the UK side of the demarcation line so will be under UK jurisdiction. The replacement will be a Hydrosphere DB-8000 with dual Watchmans and Triaxys spectral wave capability and with the extra battery capacity/more solar panels hourly spectral measurements may be possible.

3.6.4 Autonomous Triaxys spectral wave sensors have been deployed on K5, Brittany and Gascogne buoys reporting the 'first-5' parameters (as recommended by PP-WET) over a reduced number (32) of frequency bands (although the system on Gascogne has stopped). Spectral wave data is reported every 6 hours from K5 and every 3 hours from Brittany due to energy budget/solar charging limitations. The spectral data are now being reported to GTS in BUFR. These buoys also have a Datawell heave sensor reporting hourly wave data. A comparison of the Triaxys and Datawell wave measurements at K5 is currently being worked up. During spring 2012 a Datawell Mk2 waverider buoy was purchased to facilitate wave measurement comparisons against the 'industry standard' (although not yet deployed). The data will be a contribution to the JCOMM Pilot Project on Wave measurement Evaluation and Testing (PP-WET).

3.6.5 A pre-operational surface moored buoy was deployed in June 2010 in collaboration with the National Oceanography Centre (NOC) at the OceanSITES Porcupine Abyssal Plain (PAP) site (WMO#62442). The buoy was a modified K-series buoy with a single meteorological system (hence was much less resilient) alongside a NOC designed system to return sub-surface oceanographic data in real-time from an instrument frame on the mooring at 30 m below the surface. In April 2012 the buoy was replaced with a new system based on a single Axys Watchman 500, Triaxys and with extra solar panels/batteries to provide more power for the oceanographic sensors. However, due to the different transmission format the data are not yet on GTS but are available through the PAP mooring web-site (http://www.noc.soton.ac.uk/pap/). In August it is planned to deploy an additional 1.9m Hydrosphere/Mobilis buoy adjacent to the PAP site to provide half-hourly met data in support of the NERC Ocean Surface Boundary Layer programme. The measurement campaign (moored buoy and moorings) is expected to last for 12 months to summer 2013. In the longer term it is planned to replace the PAP moored buoy with a 3m

Hydrosphere/Mobilis buoy with dual Axys Watchman 500s. This should deliver improved reliability and much more power for sensors.

3.6.6 In July 2011, a new moored buoy was built up by the Met Office and deployed in Weymouth Bay in support of the 2012 Olympics sailing events, funded through LOCOG (the London Organising Committee of the Olympic and Paralympic Games). The buoy is built on a XJF Plastics DB300 (3m) hull with dual Axys Watchman 500 systems each returning observations every 30 minutes (offset by 15 minutes) with a single Triaxys sensor returning directional wave measurements every 30 minutes. The buoy should be operated through to the completion of the Games.

3.6.7 In April 2012, funding was approved for the replacement, over the coming 3 years, of all our ageing operational K-series buoys with new systems based on 3m Hydrosphere/Mobilis hulls with Axys Watchman 500 electronics. As noted above the first new system will be deployed at K7. We area also working with Plymouth Marine Laboratory to jointly build up a 3m Hydrosphere/Mobilis buoy with dual Axys Watchman 500s as a replacement for the Western Channel Observatory E1 buoy and a replacement in 2013 for the PAP system. Both E1 and PAP will have meteorological and oceanographic capability.

3.6.8 The Met Office continues to collaborate with the Irish Marine Institute and Met Eireann on the operation of the Irish Buoy Network. However, only M6, which is in deep water to the west of Ireland is a K-series buoy, the other buoys having been replaced with Fugro-Oceanor systems. We also facilitate the delivery to GTS of data from the buoy operated by the Jersey Met Department.

APPENDIX B

TERM OF REFERENCE OF THE TASK TEAM ON MOORED BUOYS
(as adopted at DBCP-XXIV)

The DBCP Task Team on Moored Buoys shall:

1. Review and document operational moored buoy systems and their underlying requirements;

2. Liaise with the different communities deploying moorings, including TIP, OceanSITES, seabed observatories, as well as national moored buoy programmes (coastal and global), and promote the development of multi-disciplinary mooring systems;

3. Liaise with the GOOS Scientific Steering Committee (GSSC) and its technical sub-panel for Integrated Coastal Observations (PICO) to facilitate synergy between advances in GOOS implementation and the development of operational capabilities, in particular, for sustained coastal observations, analysis and related services by using mooring systems;

4. Liaise with the JCOMM Expert Team on Wind Waves and Storm Surges (ETWS) regarding the need for in situ wave observations;

5. Compile information on opportunities for the deployment and / or servicing of moored buoys;

6. Monitor technological developments for moored data buoys and liaise with the Task Team on Technological Developments on satellite data telecommunication aspects;

7. Review all relevant WMO and IOC Publications on Instrument Best Practices (e.g., JCOMM, CIMO) to make sure they are kept up to date, address WIGOS issues, and comply with Quality Management terminology;

8. Provide the DBCP Executive Board or the DBCP with technical advice needed for developing moored buoy programmes, including the issues above; and

9. Report to the DBCP Executive Board and the DBCP at its biennial Sessions, with periodically updated Workplans supporting implementation.

Membership:

Membership is open to all Panel members. Present members are as given below. The Chairperson is appointed by the Panel.

Mr Jon Turton, UK Met Office (TT Chairperson);
Mr Richard L. Crout, NOAA / NDBC
Dr Robert Jensen, USACE
Mr Chris Meinig, NOAA / PMEL
Mr R. Venkatesan, NIOT, India
Dr Uwe Send, SIO
Dr Bill Burnett, NOAA / NDBC
Mr Paul Freitag, NOAA / PMEL
Mr Chris Marshall, Environment Canada
Mr Ariel Troisi, SHN
Mr Al Wallace, MSC

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