Intergovernmental Oceanographic Commission of UNESCO

World Meteorological Organization

DATA BUOY COOPERATION PANEL

A RETROSPECTIVE

DBCP Technical Document No. 56

– 2016 –

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The Data Buoy Cooperation Panel – A Retrospective

(Al Wallace, former DBCP Chair, 30 November 2015)

Note: This report has been compiled by Mr Wallace working as consultant for the DBCP under Special Service Agreement no. 2522-15/REM/PEX with the World Meteorological Organization during the period.1 April to 30 November 2015.

Introduction

The Data Buoy Cooperation Panel (DBCP) is an international organization jointly supported by the World Meteorological Organization (WMO) and the Intergovernmental Oceanographic Commission (IOC) of UNESCO. It operates under the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM). The DBCP has functioned effectively since 1985. This Retrospective will review the history of the DBCP, document its successes and accomplishments, highlight its approaches and acknowledge contributions from organizations and individuals. Please refer to the DBCP web site for information on the background, programmes, data and more at http://www.jcommops.org/dbcp/.

Setting the Stage

Between December 1978 and November 1979, there was support from more than 140 countries for the First Global Atmospheric Research Program (GARP) Global Experiment (FGGE) which among other efforts had a focus on increased observations, including using drifting buoys in the global oceans. The objective of these programs was to improve medium range weather forecasting and improve the understanding of the physical basis of climate.

A report, "Critical Review of the Performance of the FGGE Drifting Buoy System" was prepared in November 1979. It noted that during the FGGE period, 368 buoys measuring at least barometric pressure and sea surface temperature were deployed in the Arctic, North Atlantic, equatorial zones and including 301in the southern hemisphere 20°S to 65°S. Deployment was achieved by 41 ships volunteered from some 15 countries. Airplane deployments were used for some reseeding purposes. The overall evaluation was that the buoy array had performed very well and had more than met all expectations.

In December, 1979 a Joint WMO/IOC Informal Planning Meeting on Drifting Buoy Programmes was held in Geneva, Switzerland. The meeting was in general agreement that for both oceanographic and meteorological and operational and research purposes it would be of benefit to consider international co-ordination and co-operation in the following areas: exchange of information on drifting buoy developments and applications, tracking, and deployments including co-ordinating where possible; exchange of data on an operational basis; an international dialogue between oceanographers and meteorologists, on buoy operations for both research and operational purposes; and, co-ordination and study of matters of legal implications such as buoy recovery, buoy markings, customs clearances, etc. It was concluded that to achieve this international co-ordination it would be desirable to establish an interim international co-ordination group. This was supported by both the meteorological and oceanographic communities in spite of the uncertainty of the value of drifting buoys for oceanographers, as the accuracy of sea surface temperature measurements was unknown, as was the contribution of buoy movement to providing information on currents.

“The meeting noted that buoys will be increasingly valuable as part of composite observing systems for the needs of the World Weather Watch (WWW), the Integrated Global Ocean Services System (IGOSS), international oceanographic programmes, the World Climate Programme, and other applications and research programmes. Experience has shown that for the proper administration, financial optimization and management of complicated global and regional systems (such as the drifting buoys communication through polar-orbiting satellites), there is a need for international co-operation through a consortium of participating Member States. It would be necessary for this body (panel, committee or board) on drifting buoy activities to meet at least once a year for the planning and co-ordination for related operational and research programmes. In addition to the participation of Members authorized to make programme commitments for their respective Member States, other meeting participants may include representatives of appropriate bodies of the WMO, IOC and ICSU, including CBS, CMM, IGOSS and SCOR.”[1]

The meeting was attended to Argentina, Australia, Canada, Chile, France, Germany, Japan, Norway, Poland, Senegal, USSR, USA, and Service Argos, COST-43, ICSU,

IGOSS, IOC, JOC, SCOR and WMO. The meeting was chaired by Dr. John Garrett from Canada.

There were no formal meetings convened for a number of years. The number of buoys declined rapidly after 1979, but then there was a slow but steady in increase in deployments in support of a variety of marine applications and programmes. Under these circumstances, the annual Argos joint tariff agreement meetings had worked well as a forum for informal discussions on buoy topics of mutual interest. By 1985, however, expanding requirements and much more rapid increase in buoy deployments in support of both meteorological and oceanographic programmes have led to the need for more extensive co-operative activities. At is thirty-sixth session, the WMO Executive Council endorsed a proposal to convene a meeting, jointly with IOC, for the purposes of considering the establishment of a drifting buoy consortium to address operational and research programmes. This meeting occurred in 1985 in Geneva.[2] The meeting was chaired by Mr. Henderson from Australia. Argentina, Canada, Chile, France, Iceland, Netherlands, Norway, Saudi Arabia, Spain, USSR, UK and USA also participated. A number of organizations were also present, including WMO, IOC, COST-43, SCOR, and Service Argos.

The meeting reviewed the requirements for meteorological and oceanographic data from drifting buoys. It was noted there was a range and diversity in requirements, but nonetheless coordinating the activities will contribute to the long term objectives of a number of programmes, including the World Weather Watch (WWW) and the World Climate Research Programme (WCRP). The meeting concluded that to meet the foregoing needs a Drifting Buoy Co-operation Panel should be established to optimize international and interdisciplinary co-operation. It should initially of minimal size, complexity and cost, could evolve to accommodate the growth in drifting buoy activity. The Panel should have the services of a dedicated Technical Co-ordinator to ensure that ongoing intersessional tasks are prosecuted vigorously, and to be an active focal point for activities which need to be linked between national and international programmes. The Executive Council of the WMO and the Assembly of the Secretary of the IOC were asked to approve the establishment of the Panel. It was recommended that the first meeting of this new Panel take place in October, 1985 in Toulouse, France where Service Argos extended an invitation to host.

The Data Buoy Cooperation Panel

The first meeting of the Drifting Buoy Cooperation Panel occurred in Toulouse, France in October 1985. This first meeting was hosted by Service Argos. Nine countries (Canada, France, Iceland, Netherlands, Norway, Spain, UK, USSR, and USA) attended, and the session was chaired by John Garrett. The Panel has met annually since that time, and the 31st meeting was in October, 2015 in Geneva, Switzerland where it was hosted by the WMO. Over the years the Panel has met 8 times in France (including French territories), 4 times in the USA, 4 times in Switzerland, 3 times in Australia, 2 times in South Africa, twice in the UK, and in Argentina, Brazil, Canada, China, Greece, India, New Zealand, and South Korea. (See Table 3.) The longevity of the Panel is in itself remarkable. It is self-supporting and self-governed and through cooperation, collegiality and camaraderie has functioned effectively for over three decades. This report will document the evolution of the Panel over this time and reflect on its accomplishments, demonstrate its flexibility and resiliency, and highlight how it evolved to meet changing requirements.

From left to right: Yves Treglos, Peter Dexter, Jean Garreau, John Garrett

At the 8th annual meeting, the terms of reference of the Panel were revised to include moored buoys as part of its purview, and the name Data Buoy Cooperation Panel was approved.

The Panel originally began with only a Chair leading the organization. The Chairs are elected at the annual meeting of DBCP. There have been 7 different Chairpersons over the 31 years that the Panel has operated; three from the UK, two from Canada, one from France and one from Australia (see Table 1). A technical coordinator (TC) has supported the work of the Panel, although there were several significant gaps when there was no TC. The first TC (David Meldrum – Scotland) started work in June, 1987, and was based in Toulouse France at Service Argos facilities (See Table 2). DBCP-3 held in Paris, France (See Table 3) was the first annual meeting where a TC was present. Each of the annual meetings since 1987 have had the TC participate and report. The second TC (Etienne Charpentier - France) began work in June, 1989 in Landover, Maryland. The TC was located at the Service Argos facility, and was employed via contract with the University Centre for Atmospheric Research (UCAR). This TC subsequently relocated to the Service Argos offices in Toulouse, France in May, 1993 and became an employee of the United Nations Educational, Scientific and Cultural Organization (UNESCO) /IOC. When the second TC announced he was leaving his post, action was taken to recruit a replacement. Unfortunately the staffing process experienced delays and there was a gap of 6 months before a new coordinator (Hester Viola – Australia) was in the position. The staffing process for the successor of the third TC also was not completed in time for an orderly transition, and there was a gap of 10 months during which the DBCP was not supported by a TC until the fourth (Kelly Stroker – United States) was working in Toulouse. The process for the recruitment of the fifth TC was begun early, used technology to assist the staffing committee in reviewing candidates and conducting interviews, but still took a time to complete. Fortunately the cooperation of the fourth TC facilitated using contracts while working from a location in Boulder, Colorado, to minimize the gap between TCs and enable a transition process. The current (fifth) TC (Champika Gallage – Canada) reported to the new JCOMM in situ Observing Platform Support Centre (JCOMMOPS) centre in Brest, France.

The Chair of the DBCP was the only “executive” when the Panel began functioning. There have been 7 Chairs over the 31 years that the DBCP has operated. (See Table 1) The length of terms has varied from one year to eight years. A change to the Operating Principles of the DBCP in 2009 has suggested that in principle the maximum length a Chair may serve should be 4 years. Due to the expanding work and scope of the Panel, it was decided at DBCP-4 in New Orleans to create a Vice-Chair position; a second Vice-Chair position was added at DBCP 11 in Pretoria, South Africa, in October, 1985. In revising and updating its operating principles, the Panel decided to institute Regional Vice-Chairs, including one for Asia, one for Europe, one for North America and a fourth for the Southern Hemisphere. It has been the practice to have the Chair also be the Vice-Chair for the region from which he originates. These positions are the core of the Executive Board (EB) which manages the administrative and financial business and activities of the DBCP during inter-sessional periods. (Appendix II) There is a member of the Panel at large appointed by the Chair which is an official member of the EB. The TC, WMO and IOC Secretariats, and a representative of the buoy manufacturing community act as ex-officio members of the EB and contribute information, participate in discussions and contribute to informing the decisions taken.

The Accomplishments

Primary among the successes of the DBCP has been its ability to remain vibrant and be a leader in monitoring of the global oceans. Many individual accomplishments will be documented in the Modus Operandi section to follow. The DBCP delivers a critical component of the JCOMM Observations Programme Area whose aim is to implement and maintain a fully integrated ocean observing system across the entire marine meteorology and oceanographic community. Data buoys measure air pressure, sea surface temperature, ocean current velocity, air temperature, humidity, wave characteristics and wind velocity across all oceans. The DBCP aims to increase the quantity, quality, global coverage and timeliness of atmospheric and oceanographic data. These observations are relayed by satellite and used immediately to improve forecasts and therefore increase marine safety. The primary objective of the DBCP is to maintain and coordinate all components of the network of over 1250 drifting buoys and 400 moored buoys. The scientific design for the global surface drifting buoy array originally called for 1250 buoys to be maintained worldwide in order to calibrate Sea

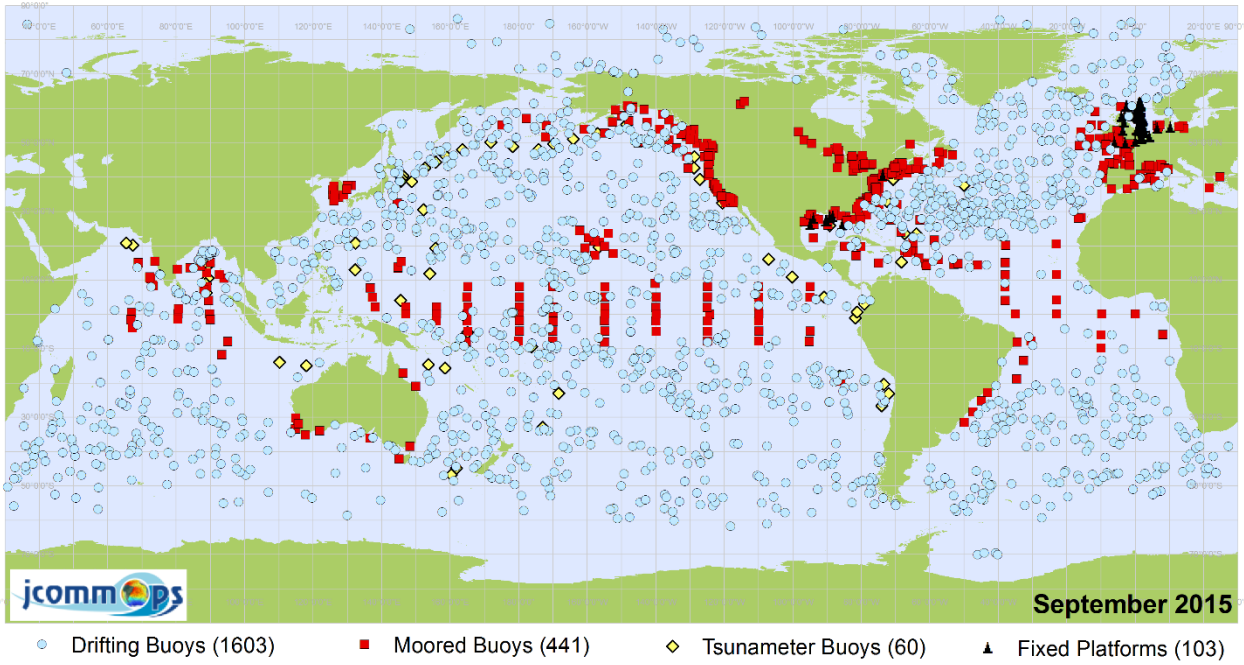
Surface Temperature satellite data. One buoy was necessary, approximately every 500 kilometres over the entire global ocean to calibrate and validate existing and new satellites. 1250 buoys was adopted by the Global Ocean Observing System (GOOS) as the aim for the buoy network, with publication of the Scientific Design for the Common Module of the GOOS and the Global Climate Observing System (GCOS) in 1995. It was essentially a balance of the requirements defined by GCOS and Numerical Weather Prediction applications. This data is useful for Weather and Ocean Forecasts and research and additionally can be used to complement or validate remotely-sensed data and operational models. The DBCP also explores and evaluates new technologies and uses those which prove successful to improve operations.

The DBCP first met its objective of 1250 drifting buoys in the global oceans with the deployment of the ultimate “drifter 1250” during JCOMM II in Halifax, Canada in September, 2005.

Picture 1: Dr Peter Niiler and Mr Mike Johnson deploying “drifter 1250” from Tall Ship Silva off the coasts of Halifax, 18 September 2005

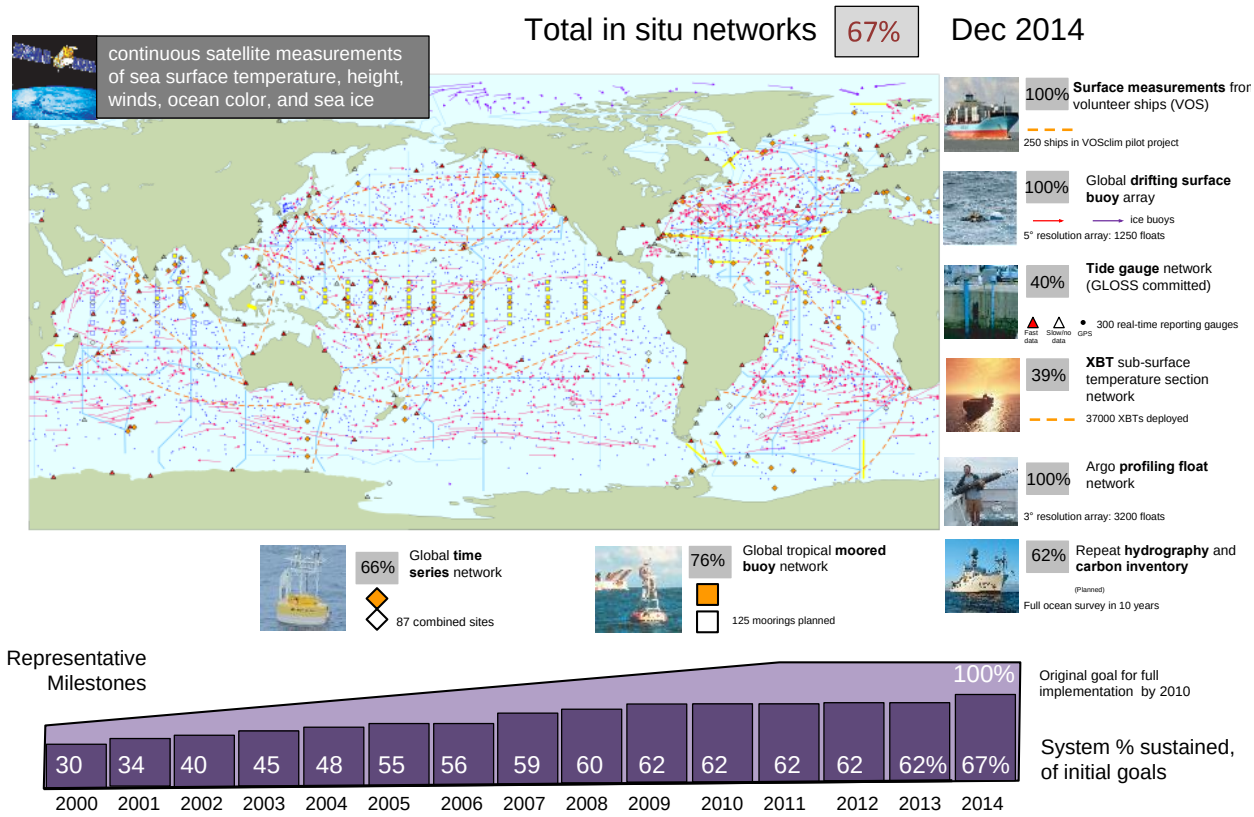
Picture 2: Global Drifting Buoy 1250 signed by participants at JCOMM II

Since that historic deployment, the DBCP has faced many challenges in maintaining the global array both in terms of number of drifters, and their distribution across the oceans. Those challenges arose due to technical issues with the buoy technology and the capability of member countries to maintain their contributions to the programme. Success has been achieved, however, and in September, 2015 there were more than 1600 drifting buoys and more than 400 moored buoys reporting.



Picture 3: Monthly status of the global buoy network, September 2015
(http://www.jcommops.org/dbcp/network/dbcpmaps.html)

The DBCP met its objective for the GOOS, and continues to form an essential part of the integrated observing system. Not all components of the system have met their objectives, but contributions to the success of the program continue. The graphic below describes the contributions of the various observing systems. Note that the global drifting buoy surface array has mat its target, as have the Volunteer Observing Ship Network, and the Argo Profiling Float Array.



Picture 4. Status of the global ocean observing networks, December, 2014

Modus Operandi

Over the more than three decades that the DBCP has functioned, it has demonstrated resiliency, dynamism, and an organic approach that has enable it to evolve in a complex environment characterized by growing and changing user requirements, expectations by member countries and international organizations, changes in technology, changing science and the need to meet to support an expanding range of research and operational programmes.

The DBCP started as a very simple organism, led by a Chairperson, supported by the WMO and IOC Secretariats, and by the participation of a small number of countries. The Panel has evolved organically and added Technical Coordinators, an Executive Board, Action Groups, Task Teams and Pilot Projects in response changing needs, and technological and scientific advances.

The format of the annual meeting of the DBCP have has changed over the years to reflect the needs of the Panel and its growth and evolution. The meetings were

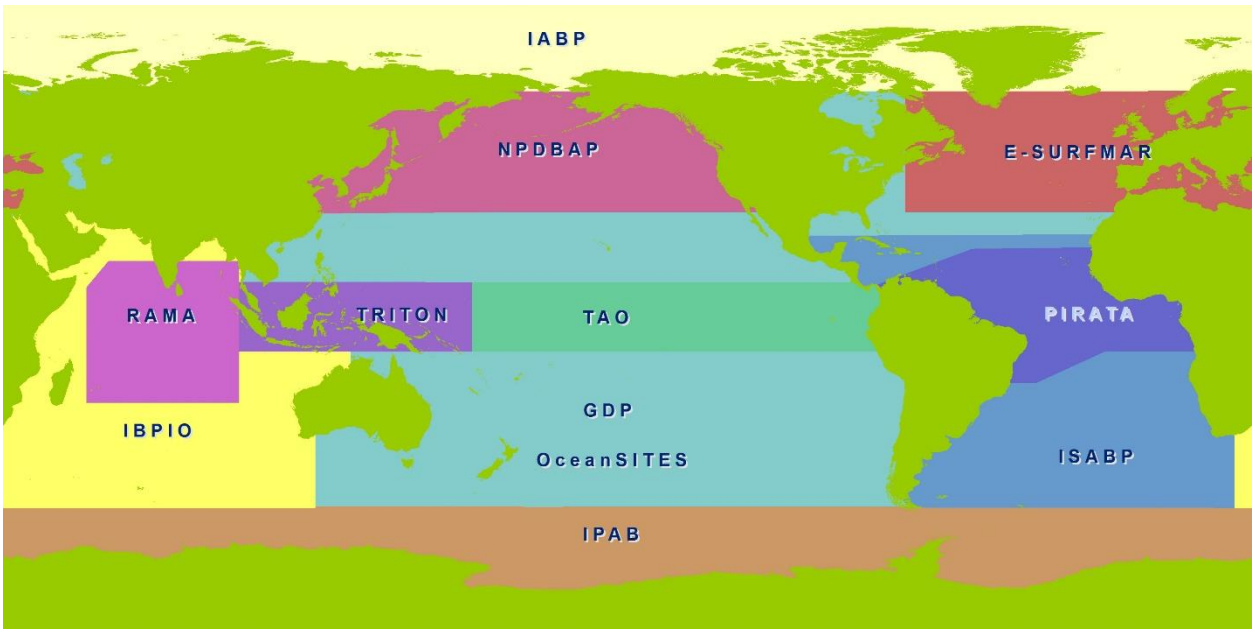
originally four days in length and dealt with programme and administrative matters. Meeting locations varied (see Table 3), with member countries hosting on a voluntary basis. Eventually a tradition developed that had the meetings alternating between the Northern Hemisphere and the Southern Hemisphere. At DBCP 11 in Pretoria in 1995, first full day Science and Technology workshop was held in conjunction with the annual meeting. Continuing the workshops on an ongoing basis was confirmed at DBCP 12 held in Henley on Thames. Over the years members began presenting national reports on activities related to their buoy programmes. The requirements to accommodate the additional agenda items resulted in the meeting length expanding five days. As Action Groups were established, Task Teams established, and pilot projects initiated, their members required time to meet, and many of these sessions were held in contiguously with the DBCP annual meeting. The groups convened on the weekend prior to the annual meeting, or in the evenings after the day's agenda was concluded. At DBCP 23 in Jeju, the Panel decided to make some fundamental changes to the structure of the annual meeting, primarily to both help manage costs for both WMO and IOC, and for member countries sponsoring meetings. The meeting length was restricted to 4 days, including the Science and Technology Workshop and all side meetings. Further, every second year, the meeting would be help in either Geneva or Paris, on an alternating basis. At DBCP 27 in Geneva in 2011, the meeting format was again revised. The Science and Technical Workshop was held on the first day; the second day was reserved for meetings of action groups, task teams, and pilot projects; and the business of the DBCP was conducted over the following three days. This structure for the session proved to be quite effective with excellent participation.

Action Groups

At DBCP 3 in Paris, the first Action Group of the DBCP – the European Group on Ocean Stations (EGOS) – was approved. EGOS was the successor to the European Cooperation in the field of Scientific and Technical Research 43 project which had been established in the late 1960s to evaluate the possibility of operating meteorological and oceanographic buoys in the North Atlantic Ocean. EGOS deployed drifters in the North Atlantic and operated until 1998 and subsequently transformed to the European Surface and Marine Operational Service (E-SURFMAR). (http://www.eumetnet.eu/e-surfmar). The Action Groups of the DBCP are depicted in the

graphic below, and have defined Terms of Reference (ToR), which are published on the DBCP web site at the following URL:

(http://www.jcommops.org/dbcp/overview/actiongroups.html).



Picture 5. Action Groups of the DBCP, October, 2015

At DBCP 9 in Athens there were discussions about forming 2 additional Action Groups – the International Arctic Buoy Program (IABP) and the International South Atlantic Buoy Program (ISABP). Both of these were subsequently approved at DBCP 10 on La Jolla. Additional information on the IABP and its objectives and activities can be found at their web site (http://iabp.apl.washington.edu/). Similarly the ISABP web site is (http://www.jcommops.org/dbcp/isabp/index.html) is a reference for its program. At DBCP 12 in Henley on Thames, the Action Group, the International Buoy Program for the Indian Ocean (IBPIO) was established (http://www.meteo.shom.fr/ibpio/). At the 2002 DBCP 18 meeting in Martinique, the North Pacific Data Buoy Advisory Panel (NPDBAP) was acknowledged as an Action Group (http://dbcp.jcommops.org/npdbap/). There were a significant number of other international bodies who managed or coordinated buoy activities on a global scale. Both they and the DBCP recognized the value of enhanced collaboration and cooperation and these organizations were formally adopted as Action Groups. These included:

- IPAB: International Programme for Antarctic Buoys (joined in 1994)

(http://www.ipab.aq/)

- GDP: Global Drifter Program (joined in 1996)
  (http://www.aoml.noaa.gov/phod/dac/index.php)
- TIP: Tropical moored buoy Implementation Panel (joined in 1998)
  (http://www.pmel.noaa.gov/tao/)
  (http://www.pmel.noaa.gov/pirata/)
  (http://www.pmel.noaa.gov/tao/rama/)
- OceanSITES: OCEAN Sustained Interdisciplinary Time series Environment observation System (joined in 2005)
  (http://www.oceansites.org/)
- ITP: International Tsunameter Partnership (joined in 2008)
  (http://ioc-unesco.org/index.php?option=com_oe&task=viewGroupRecord&groupID=271)

The Southern Ocean Buoy Programme (SOBP) is not a DBCP Action Group as it involves work from many of the other Action Groups. It is directly included as part of the DBCP implementation strategy and coordinated at the DBCP level.

Task Teams

The Panel identified a need to create groups of specialists to review specific technical and scientific issues, and make recommendations for resolution of issues. Pre-dating the formal task teams was an Evaluation Sub-Group that was formed at DBCP 15 in Wellington. Its purpose was to review recent problems with buoy life time and performance. At DBCP 16 in Victoria, the sub-group reported on a study of drifter mortality rates. A number of factors influenced life expectancy, including message length, transmission repeat period, battery capacities, type of barometer and manufacturer. There had been improvements, including greatly reduced infant mortality, 100% air deployment success rate, and decrease in Argos message length, elimination of gross errors and increase of data available onto the GTS. At DBCP 17, in Perth in 2001 the Panel broadened the terms of references and renamed it as the “DBCP Evaluation Group”. This group functioned until 2007, and provided evaluations on buoy performance and lifetimes, strain gauges and submergence sensors, wind sensors, etc.

The Panel established an ad hoc Task Team on the Future Strategy for the DBCP. At DBCP 22 in La Jolla in 2006, the Task Team reported on its discussions and the following recommendations were accepted:

- To exploit the Panel's experience and resources in the development of training materials and the active participation in Capacity Building in developing nations;
- To actively pursue technology evaluation initiatives, e.g. the establishment of pilot projects for the assessment of satellite communication options such as Iridium;
- To engage with other observing systems and assist them with coordination, support and data management issues, particularly the free exchange of data in near-real-time.
- The requirement for wave observations, particularly from drifters, was introduced to the Panel, and it was agreed to explore technologies to address this need.
- The Panel endorsed Capacity Building activities within its scope and would consider opportunities for workshops as a delivery mechanism. An example would be the DBCP data users and technology workshop (Reading, 27-28 March 2006).

The Panel regularly updates its implementation strategy (http://www.jcommops.org/doc/DBCP/DBCP_Impl_Strategy.pdf) to reflect global requirements for buoy data in support of operational meteorology and oceanography, major research programmes including the World Climate Research Programme (WCRP), and the Global Ocean Observing System (GOOS), Global Climate Observing System (GCOS) and Global Earth Observation System of Systems (GEOSS). The review also encompassed implementation aspects such as the deployment strategy, and the number of barometer drifters to be deployed worldwide, including in the tropical regions, and in the Southern Ocean (now 300 units), as well as development of appropriate technology to meet the expressed requirements. In the period 2003 to 2005, DBCP implementation strategy was revised in conjunction with JCOMM Observations Programme Area (OPA) phase-in in implementation plan. As a consequence, size of operational drifter array increased substantially from about 700 operational buoys to about 1250. Only about 330 drifting buoys reported air pressure in August 2006. The new JCOMM OPA strategic workplan calls for installing barometers on all of the 1250 drifting buoys by 2009.In particular, the DBCP is willing to explore the

development of cost-effective wave observations from drifters and OceanSITES in support of satellite wave products and wave modelling validation.

At DBCP 23 in Jeju, Republic of South Korea, the Panel agreed to establish Task Teams to manage inter-sessional business in the areas of:

(i) data management,
(ii) quality management,
(iii) technological developments,
(iv) capacity building, and
(v) moored buoys.

Terms of Reference and membership for each of the teams was proposed and are documented in the Operating Principles. These task teams take general direction from the DBCP, conduct their work during the inter-sessional period, meet during the annual sessions of the DBCP and report at the DBCP annual meeting. The work of the Evaluation Group was subsumed by then task teams.

Capacity Building

The WMO and IOC have placed an emphasis on capacity building, and the DBCP embraced the concept and dedicate resources to developing and fulfilling a mandate in this important initiative. The intent is to assist The National Meteorological and Hydrological Services, and National Oceanographic Services especially those of developing countries, in their efforts to contribute, to the development plans of their countries and their efforts partners in global collaborative efforts. This includes the development of people through training, workshops and the provision of educational material. The objectives of the DBCP's capacity building are to improve the understanding and use of marine (meteorological and oceanographic) data, and its measurement, instrumentation, standards, quality control; and, the meteorological, oceanographic and climatological operational and research programs that use the data for analysis, forecasting and modeling. Inherent in the expected outcomes of the capacity building is the development of a self-sustaining and renewable capability among participants. Supporting these efforts the Panel has produced technical publications and training materials on the buoy technology and related data management procedures. Additionally the DBCP has organized and sponsored a number of workshops including:

- Since 1995, the organization of annual scientific and technical workshops that are held as part of the DBCP Annual Meetings. The presentations are published as part to the technical document series;
- The DBCP organized a data users and technology workshop in the UK in March, 2006. The Panel supported the attendance of a number of participants from developing countries. The goals for the workshop were to re-examine the basic principles behind data buoy observations, explore new avenues for the next decade, and optimize buoy design, deployment strategies and data management to maximize the usefulness of buoy data, both in terms of their impact on model forecasts and their value for money. Additionally there was the need to develop and validate new generations of sensors and observing platforms to address future requirements in terms of spatial and temporal measurement densities, improving the impact of buoy data, smart in situ data selection, communications options, data processing and overall value for money.
- Organization of in region Capacity Building workshops following the PANGEA concept (those are currently focusing on the Western Indian Ocean region) to promote the implementation of buoy networks regionally, and provide information on data use to developing countries;
- The DBCP delivered a training course on buoy and fixed-platform data management in June 2007 in Oostende, Belgium, in close cooperation with the Ocean Data and Information Network for Africa (ODINAFRICA). Training materials were developed to that end. The primary goal for the workshop was to provide training to buoy operators and researchers in African nations on the application and management of the data from in situ oceanographic and marine meteorological observations.
- The pilot project hosted a DBCP-WMO workshop “Evaluating impact of sea level atmospheric pressure data over the ocean from drifting buoys” Sedona, Arizona in May, 2012. The specific goal was to start a discussion on the impact of the barometer drifter data on NWP, assess the state of the art on the subject, and determine if further investigations are needed for a quantitative assessment. Another question put forward for discussion was: what are the correct metrics
- to assess the overall impact of the drifter observations on NWP? The opinion of the experts is needed to
- best answer this question. Another goal of the meeting, that was extensively reviewed in the session,
- was to evaluate the potential to summarize the state of the art on the subject in a manuscript that could

- be submitted to a peer-reviewed journal such as BAMS.
- Organization of specific technology workshops as the need arises;
- Drifter donation to developing countries.

Pilot Projects

Pilot Projects off an effective method for initiating, testing and evaluating new ideas and concepts including new technology, for the development of technology, and for enhancing international cooperation. The Panel receives and reviews proposals for pilot projects, and then decides which to accept and what level of financial support will be provided. In principle, the DBCP only supports projects with defined objectives, a costed work plan, a schedule including end date, and a final product. The following are a list of pilot projects that have been supported by the DBCP.

META-T Pilot Project

The Water Temperature metadata Pilot Project (META-T PP) was established by the JCOMM/OCG workshop, Reading, United Kingdom, 28-29 March 2006. Its objective was to provide a standardized framework for collecting sea surface temperature (SST) and water temperature profile instrumental metadata from a number of marine observational systems, including drifting and moored buoys, observing ships, sea level stations, sub-surface profiling floats, ocean reference stations, and ODAS.

The Pilot Project was targeting a number of applications including (i) Numerical Weather Prediction (NWP), (ii) SST analysis and GODAE High Resolution SST Pilot Project (GHRSST), (iii) data assimilation and ocean field analysis, (iv) ocean modelling, (v) ocean modelling validation, (vi) climate forecast, (vii) seasonal to decadal climate variability, (viii) satellite calibration, (ix) satellite validation, (x) operational activities (e.g. weather forecasters, disaster response), (xi) quality assurance activities serving above applications, and (xii) diagnostic by platform operators.

The Water Temperature Metadata Pilot Project (Meta-T) ended in 2011. The following conclusions and recommendations were made:

(i) The concept of a single point of access to all JCOMM metadata that operates independently from the platform data management process is not sustainable, especially in a low funding environment.

(ii) Organizing the metadata development effort around a geophysical variable, temperature in this case, was less effective than organizing around platforms.

(iii) JCOMM is organized into panels that have common platforms and data processing systems. Exploiting this organizational infrastructure will likely be more effective, at least initially, than creating a separate metadata service that aims to integrate across panel activities and is developed independently. On the other hand, such cross-panel metadata services (e.g. the ODAS Metadata Service operated by China) may also still end up having important downstream integrating and permanent archive roles.

(iv) Data content and data representation standards are enabling technologies that can serve to integrate the platform-focused activities of the panels.

(v) A key strategy recommended by Meta-T is to include as much metadata as is practically available at the time of GTS encoding in the BUFR templates. Therefore, of primary importance to the overall management and distribution of data and metadata, is the design of BUFR templates.

(vi) Exploring web based technologies, including web-services that provide deeper functionality than the GTS can currently deliver. A network of servers which adhere to industry standards for data exchange and representation will be easier to develop and likely more effective than a single metadata-only service that deals with metadata separately from the operational dataflow of the ocean observing platform.

DBCP Iridium drifter Pilot Project

At its twenty-sixth session, La Jolla, USA, 16-20 October 2006, the DBCP agreed to actively pursue technology evaluation initiatives. A proposal to establish an Iridium Pilot Project was presented to the session and agreed upon. The Pilot Project ran for a period of two years as of November 2006. In the first instance, the goal of the Pilot Project was to evaluate and demonstrate the operational use of Iridium satellite data telecommunication technology for the real-time collection of drifter data in support of the WWW, GOOS, and GCOS applications, and the WMO Natural Disaster Prevention and Mitigation Programme. In addition, the Pilot Project aimed to evaluate whether this can be realized in a cost effective way, on a global basis, and under various ocean conditions. Deployment of drifters in data sparse areas of interest to developing countries was also targeted.

The Pilot Project evaluated the feasibility of Iridium technology for real-time telecommunication of drifter data, relating to:

(i) Operating a global observing system (over 50 units were deployed worldwide);

(ii) Network reliability and survivability;

(iii) Data throughput in terms of quantity and timeliness;

(iv) Data management, especially data formatting and insertion on the GTS;

(v) Operational shipment and deployment, including rapid response options (e.g. ahead of tropical cyclones);

(vi) Cooperation with developing countries in terms of drifter deployment and Iridium technology transfer;

(vii) Collaboration with manufacturers to promote free availability of Iridium modems and drifters

(viii) Demonstrating overall cost effectiveness (manufacturing, transmission, data processing, life-time);

The Pilot Project was successful, demonstrating that iridium is a cost effective satellite telecommunication technology. Iridium drifters provided high quality and in near real time to the GTS. A number of countries have now started deploying Iridium drifters operationally.

Argos-3 Pilot Project

At DBCP 24 in Cape Town, a Pilot Project for the evaluation of Argos-3 technology was initiated. This project received significant financial support from CLS. The objective was to evaluate the effectiveness of the Argos-3, 2-way PMTs plan to deploy 50 drifters equipped with Argos 2-way PMTs. The Panel agreed to make additional funding available to the project so that all drifters might be equipped with barometers.

Pilot Project on Wave measurement Evaluation and Test from moored buoys (PP-WET)

(Note that this project and the pilot project for wave measurement from drifters have been combined)

Based on the recommendations arising from the JCOMM Workshop on Wave Measurements from Buoys (New York City, New York, USA, 2-3 October 2008), the Panel agreed at its twenty-fourth Session to establish a Pilot Project on Wave measurement Evaluation and Test from moored buoys (PP-WET) for a period of three

years, and to allocate adequate finances in 2009 and succeeding years so that the project might get under way as soon as possible. The project is a joint cooperation between the DBCP and the JCOMM Expert Team on Wind Waves and Storm Surges (ETWS). It has initiated the inter-comparisons of different in situ wave observing networks from moored buoys. This Project, while being implemented by the participating countries/programmes such as USA, Canada, and E-SURFMAR, has collaborated with the DBCP Task Teams and other related programmes in developing the metadata list for wave data collection. The results would contribute to JCOMM standards and best practice, as well as to the relevant WIGOS exercise.

Pilot Project for Wave Measurement from Drifters (PP-WMD)

(Note that this project and the pilot project for on wave measurement evaluation and test from moored buoys have been combined)

At its twenty-fifth Session (Paris, France, 28 September – 1 October 2009), the Panel established a Pilot Project for Wave Measurement from Drifters (PP-WMD) with the aims of reporting inexpensive deep ocean 2D wave spectra in support of satellite and model cal/val activities. This pilot project is complementing the PP-WET. At its twenty-seventh Session (Geneva, Switzerland, 26-30 September 2011), the Panel decided that (i) PP-WMD chair and membership should be reviewed, and possible incorporation within PP-WET should be considered by the DBCP EB; (ii) the GPS sensor developed by the Scripps Institution of Oceanography for wave measurements should be deployed within the PP-WET evaluation and inter-comparison exercise; and (iii) early consideration should be given to a protocol for characterizing the performance of the sensor when incorporated within a SVP drifter hull.

Pilot Project for the measurement of High Resolution Sea Surface Temperature (HRSST)

At the twenty-fifth DBCP Session (Paris, France, 28 September – 1 October 2009), the Panel endorsed a new Pilot Project for the measurement of High Resolution Sea Surface Temperature (HRSST) from drifters, with the objective of addressing the requirements expressed by the Group for High Resolution SST (GHRSST) and better integrate in situ and satellite SST data. Within this Project, a number of drifters equipped with HRSST sensors (+/- 0.05C accuracy), GPS and Iridium communications are to be deployed in the test region, and the Pilot Project Team to evaluate the impact

of in situ HRSST on the quality of satellite SST retrievals. The project was suspended awaiting more input from the satellite community regarding calibration and validation.

Pilot Project for the Evaluation of the impact of Sea Level Pressure from drifters on NWP

At its twenty-seventh Session (Geneva, Switzerland, 26-30 September 2011), the Panel agreed to initiate a two-year pilot project with objectives to (i) quantify the impact of Sea Level Atmospheric Pressure (SLP) data from the existing SVPB network on Numerical Weather Prediction (NWP); and (ii) provide a scientific/operational rationale for designing the temporal and spatial resolution, as well as the optimal geographical distribution of the SVPB array, taking into account all sources of data (e.g. moorings, ships). The pilot project hosted a workshop on the impact of sea level pressure over the ocean from drifting buoys on numerical weather prediction in Sedona, Arizona in May, 2012. The project sponsored an OSE through the European Centre for Medium Range Weather Forecasting (ECMWF) which demonstrated the value of sea level pressure measurements from drifting buoys for numerical weather prediction data assimilation. The results of the pilot project will be presented in a submission to the Bulletin of the American Meteorological Society.

Technical publications

The DBCP has produced a number of technical publications useful for Member Countries to develop their national activities. Useful DBCP technical publications include publications No. 2 (Argos GTS sub-system reference guide), No. 3 (Argos guide), No. 4 (SVPB drifter design), No. 8 (moored buoys), and No. 15 (implementation strategy), No. 37 (real time quality control), No. 41 (vandalism on data buoys), and 42 (quality control of salinity data). See Table 4.

Summary

The success of the DBCP has been demonstrated over more than three decades of operation. The benefits include:

(i) shared benefits; the individual national contributions result in a global data set for use by all;

(ii) shared responsibility; the DBCP has always been a self-supporting Panel with all members contributing to the necessary Panel logistics and infrastructure according to their nation's ability to contribute;

(iii) the concept of the DBCP regional Action Groups has been a model for implementation bodies such as the GOOS Regional Alliances;

(iv) the Technical Coordinator and platform support centre and JCOMMOPS are recognized as a successful and effective mechanism for coordinating national implementation efforts;

(v) the DBCP actively promotes science, technology development and user feedback; and 6) the DBCP continues to look to the future to optimize the effectiveness of the Panel;

(vi) the DBCP actively supports Capacity Building and has provided ten workshops across the globe to promote observations, technology and science

Recommendations

Overall, the DBCP operates effectively, and conducts its business efficiently. The Panel is inclusive in its decision making, engages members, makes appropriate use of supplementary group contributions from Action Groups, Task Teams, and Pilot Projects, and manages its limited financial resources responsibly. More specifically:

1. The format and organization of the annual meeting has proven its effectiveness. It is recommended that the meeting continue to be 5 days in length. A full day Science and Technical Workshop should be conducted on the first day, while the second day should be used to hold meetings of Action Groups, Task Teams, Pilot Projects, and other groups as required. The last 3 days of the annual meeting should be reserved for the business meeting, including national reports and concluding with review and approval of the annual report.

2. The Executive Board of the DBCP functions well. However, it is suggested that these changes be considered:

   2.1. All Vice-Chair positions be filled. Historically, the Chair also serves as Vice-Chair for the geographical region from which he originates. The Chair has a full agenda with managing the full business of the DBCP which may result in difficulty representing the area for which he is also Vice-Chair.

   2.2. Consider organizing a semi-annual, or quarterly call with the EB. This would provide an opportunity to exchange information and provide updates on action items, and also

discuss any new business. Electronic communication has proved effective in the past, but the availability of low cost video calling provides an effective venue for discussion.

2.3. Consider regular (perhaps monthly, but at least quarterly) and formal contact (telephone or video) with the TC for information exchange, updates on action items, review of priorities, and assigning or revising tasks and activities.

3. The Technical Coordinator is critical to the daily operations of the DBCP and its ongoing success. I have developed a number of recommendations that are listed below:

3.1. Retention of a TC is fundamental to the DBCP, and essential if the Panel is to continue functioning effectively. It is recommended that EB and the Panel implement a better system to address the human resource requirements of the TC. This is particularly relevant should the TC become a regular UNESCO or WMO employee. The Panel should be viewed as an employer of choice, and provide a healthy work environment for staff. This actions should include, but not be limited to: career counseling within the UNESCO and WMO organizations; provision of career development opportunities; training; and, formal performance review and evaluation.

3.2. Employment security can be an issue for the TCs. Options to provide certainty of employment need to be further explored. High qualified and capable individuals reasonably expect to not be employed on a year to year basis. The stability of the DBCP trust fund may provide an opportunity to offer a longer term employment.

3.3. It is recommended that a formal mid-year review and end of year review be held with the TC. This would permit the Chair to review progress with the TC, modify priorities as required, and revise tasks and activities to reflect changing requirements of the Panel.

4. The TC recruitment process needs to be reviewed and streamlined so that the staffing can be completed in a shorter time period. In spite of the innovative use of technology by the hiring committee, and respecting time deadlines, the delay in the completion of the process resulted in a gap in the TC position in recent years. The flexibility of the previous incumbents minimized the gap, but such extraordinary measures cannot be relied upon. The issue seems to be with the UNESCO human resources department (HRD) so it is recommended that early action be taken with that group to identify issues, address them early in the process, and also that the HRD identify and respect their staffing standards so the associated administrative work has a timely completion.

5. It is recommended that the day to day functioning of JCOMMOPS be reviewed, and that some form of management structure be developed. The JCOMMOPS group has operated well as a team that directs its own work, and manages its internal interactions. The Argo TC has shown an interest and talent in administration, and perhaps that could be formally recognized and reflected in his duties. However, this work may jeopardize addressing his primary objectives and activities and the Argo Steering Team would need to agree. The DBCP situation is further complicated by the sharing of the TC's time between DBCP and OceanSITES. Conflicts regarding priorities and activities of those two programs is inevitable. Setting the priorities for the IT and communications staff may not involve consultation with the TCs and so is a potential source of conflict.

   A management structure would facilitate shared decision making, alignment of common objectives, resource allocation, and human resource requirements such as training, leave scheduling, and ensuring staff coverage to enable ongoing operations in the event of unplanned events including sick leave, etc. It would also enable a formal process for setting priorities for IT and communications support. It is recommended that JCOMMOPS report to a Manager or Management Team external to their group. This could be the OCG Chair or Vice-Chair, or the committee itself.

6. The financial stability of the Panel is essential if its ongoing work is to be supported, and most critically that salary and other costs for the TC are secured. It is recommended that the Chair and the Secretariats target individual countries to begin contributing. The Panel recently elected a Vice-Chair for Asia, and this should provide an opportunity to have that country begin contributing. Similarly, other Asian countries (e.g. Japan, Republic of South Korea) should be requested to provide funding. India is the only Asian country that provides annual financial contributions for the work of the DBCP. Brazil has been an active participant at DBCP for many years, and should also be approached regarding financial support. It is recommended that the EB and its financial advisor devise a mechanism to recognize in-kind support provided by various members.

7. The DBCP must take care to avoid "mission creep" and not over-extend. Each new request or opportunity should be reviewed in the context of the objectives of the Panel and its strategy. The success of the Panel to deliver on new initiatives and projects may encourage others to attempt to have the DBCP take on new work which is either marginal or non-related to its core mission. The Panel, however, has shown its capacity to evolve

and expand and manage effectively which does support being open to new non-traditional opportunities.

Acknowledgements

The author wishes to acknowledge all of those who contributed knowledge, information and history to enable this paper to be compiled. He wishes to express special appreciation to Etienne Charpentier, David Meldrum and Johan Stander.

DOCUMENT REVISION HISTORY

Date	Modification	Who	Version

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