World Meteorological Organization | **Intergovernmental Oceanographic Commission (of UNESCO)**

JOINT WMO-IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)

THIRD SESSION
Marrakech, Morocco,
4 to 11 November 2009

JCOMM-III/BM. 6.3
Submitted by: WMO Secretary-General and UNESCO/IOC Executive Secretary
Date: 29.IX.2009
Original Language: English only
Agenda Item: 6.3

IN-SITU AND SATELLITE OBSERVING SYSTEMS

SCIENTIFIC AND TECHNICAL DEVELOPMENTS FOR OCEAN OBSERVATIONS

BACKGROUND MATERIAL

SUMMARY

Reference: **JCOMM-III/Doc. 6.3**

CONTENT OF DOCUMENT:

Appendix:

- Background material

BACKGROUND MATERIAL

Cost-effective global in situ wave observing technology

1. In October 2008, JCOMM, through a joint undertaking of its Data Buoy Cooperation Panel and the Expert Team on Wind Waves and Storm Surge, organized a Technical Workshop on Wave Measurements from Buoys (http://www.jcomm.info/wavebuoys). This Workshop recognized and supported the recent work carried out in the development of the US Integrated Ocean Observing System (US IOOS) Operational Wave Observation Plan, and recommended that appropriate elements of that plan be adapted and extended to an international context within JCOMM to enhance global wave observation programmes.

2. The Workshop examined the issues surrounding the derivation of quality wave spectral data from data buoys in general, both moored and free-drifting. Based on the recommendations by the Workshop, the DBCP at its 24th session (Cape Town, October 2008; http://www.jcomm.info/DBCP24) agreed to initiate a Pilot Project to examine the feasibility of making open ocean 2-D wave spectral measurements from inexpensive drifting buoys. In particular, the need was expressed for the validation of wave spectral outputs from both satellite observations and numerical models, and it was felt that inexpensive and suitably instrumented free-drifting buoys offered the best way forward. In this context, it was noted that a un-drogued spherical drifter (e.g. the SVP) exhibited good wave following properties, and that relatively simple GPS techniques had been demonstrated for the inference of 2-D wave spectral data. Consequently, the DBCP Pilot Project on Wave Measurement from Drifters (PP-WMD) was established at the DBCP session in late 2008 with the aim of investigating the validity of GPS techniques and, if encouraging, to proceed to the construction, evaluation and deployment of a small fleet of GPS-equipped wave drifters in support of model forecasts and satellite observation of 2D wave spectral data. The project will run for a maximum of three years, under the control of a scientific steering committee, which met at Scripps in May 2009 to draw up and implement an action plan for the first phase of the project.

3. One of the key recommendations of the workshop was that continuous testing and evaluation of wave measurement systems is an essential programme activity, of equal importance to the deployment of new assets; multiple locations are required to evaluate appropriately the performance of wave measurement systems given the wide spectrum of wave regimes that are of interest. A Pilot Project on Wave Measurement Evaluation and Test (PP-WET) was proposed and subsequently endorsed and supported by the 24th Session of the DBCP for an initial period of two years. The objectives of the Pilot Project included the development of an international framework for the continuous testing and evaluation of existing and planned wave buoy measurements, coordination of buoy inter-comparison activities, development of technical documentation on wave measurement systems, training material and contribution of appropriate material to the JCOMM Catalogue of Best Practices and Standards. A Steering Committee comprised of a wide representation from end-users, wave experts, buoy manufacturers, and buoy operators was established. In May 2009, the PP-WET Steering Committee established the protocols for intercomparison activities, and developed a contribution to the Community White Paper on wave measurement for the OceanObs09 conference in Venice. A special session on wave measurement was organized as part of the 11th International Workshop on Wave Hindcasting and Forecasting (Halifax, Canada, October 2009) to further develop guidelines and participation in the Pilot Project (http://www.waveworkshop.org).

4. Status reports of the two pilot projects were presented to DBCP-XXV (Paris, September 2009) and can be downloaded at http://www.jcomm.org/DBCP25.

Data Telecommunication via Satellites

5. A number of pilot activities have been initiated by the Observations Programme Area during the intersessional period concerning satellite data telecommunication, resulting in significant positive results. The DBCP has established two Pilot Projects to evaluate and test: (i) Iridium satellite data telecommunication; and (ii) Argos-3 technology, and the SOT has been testing Iridium. Both Iridium and Argos-3 technologies provide for the downlink capability. From these activities, it is expected to improve data throughput, and timeliness, as well as better control of the drifter on-board data processing for troubleshooting and diagnostic or for setting some metadata fields remotely (e.g. barometer height on a ship), to provide better data and increase the instruments life-time.

6. Since the inception of the DBCP Iridium Pilot Project in early 2007, more than 130 Iridium-equipped SVPB drifters have been deployed, of which approximately 80 were still active in mid-2009 and reporting hourly data on the GTS. In order to stimulate the rollout of the project, the Panel has from the beginning offered to cover the nominal costs (USD 500) of upgrading a traditional Argos-equipped buoy to Iridium + GPS. To date, nearly 50 buoys, supplied by four manufacturers, have benefited from this upgrade offer. Overall, the Panel is very satisfied with the progress of the project, both in terms of the number of platforms deployed, and the progress that is being demonstrated in reducing satellite usage costs and improving data timeliness and quantity. A number of agencies, principally Météo-France and CLS Argos Toulouse, are performing GTS formatting and insertion of the data although NOAA NDBC has also demonstrated capability in this area. At its twenty-fourth session (Cape Town, October 2008) the DBCP agreed to extend the project for a further year to allow the geographic coverage of the deployments to be extended, thus permitting a truly global evaluation of Iridium-equipped buoys. For further information about the project, including interactive maps, refer to http://www.jcommops.org/dbcp/iridium-pp/.

7. The Argos-3 Pilot Project was initiated at the twenty-fourth DBCP Session following an offer from CLS to commit complete drifters to the Argos-3 Pilot Project. The DBCP has also been providing some financial support for upgrading Argos-3 buoys with barometers. Ten Argos-3 prototypes have been deployed at sea as of mid-2009, in various conditions and regions.

8. The SOT has also been evaluating the Iridium satellite data telecommunication system for the collection of data from VOS, SOOP, and ASAP ships. In addition, the SOT has produced a spreadsheet, which compares the relative cost advantages and limitations of Inmarsat, Iridium, and Meteosat transmission systems proposed for Automatic Weather Stations. Short Burst Data (SBD) transmission costs associated with the Iridium system currently offer notable savings when compared to other systems. The Iridium, with a two-way communication ability and global coverage, is now being used for a number of different shipborne AWS systems. The E-ASAP decided to change the satellite communication from Inmarsat-C to Iridium. First implementations and tests showed promising results, and for transmission of high-resolution BUFR data.

9. It is generally acknowledged that the Iridium is increasingly being used and proved to be cost-effective and reliable for transmitting buoy and ship observations compared to systems traditionally used such as Argos (for drifters) and Inmarsat (for ships).

_____