



World Meteorological Organization (WMO)



United Nations
Educational, Scientific and
Cultural Organization



Intergovernmental
Oceanographic
Commission

**Intergovernmental Oceanographic
Commission (IOC) of UNESCO**

DATA BUOY COOPERATION PANEL (DBCP)

Thirty-Second Session

La Jolla, USA, 17 to 21 October 2016

DBCP-32 / Doc. 8.1
28 September 2016

REPORT PP-WET AND RELATED WAVE ISSUES

(Submitted by Mr Val Swail (Canada), Co-Chair PP-WET)

SUMMARY AND PURPOSE OF DOCUMENT

The document provides information on the development and current status of the joint DBCP-ETWCH Pilot Project on wave measurement evaluation and test from moored and drifting buoys, and the proposes the establishment of a new Task Team on Wave Measurement (TT-WM).

ACTION PROPOSED

The Meeting is invited to note the information contained in this document when discussing how it organises its work and formulates its recommendations.

Appendices:

1. Proposed Terms of Reference for a Task Team On Wave Measurement (TT-WM)

DISCUSSION

-A- DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

8.2.1 Mr Val Swail (Canada) reported on the development and current status of the joint DBCP¹-ETWCH² Pilot Project on wave measurement evaluation and test from moored and drifting buoys (PP-WET).

8.2.2 As noted during the DBCP-31 session, the Pilot Project has been focusing on the multiple deployments at the buoy farm in Monterey Canyon. The Panel noted with appreciation that this buoy farm continued to provide a wealth of information, with a large number of platforms deployed and providing data either in real time or delayed mode. This was centered around FLOSSIE (Field Laboratory for Ocean Sea State Investigation and Experimentation), a 6m NOMAD buoy instrumented with a large number of present and historical wave sensors and processing systems for both Canadian and US systems. This deployment represents a key cornerstone of the PP-WET objectives. Results were presented Dr. Robert Jensen, PP-WET Co-Chair, at the Technical Workshop preceding DBCP-32, and in the side meeting of PP-WET. Other intercomparisons were also carried out, from other platforms within the buoy farm, dual sensor buoy deployments, and a co-deployment of two identical Datawell waveriders at the Harvest location off the California coast. The Panel expressed its appreciation for the continued contribution, supported by the US Army Corps of Engineers, from the Coastal Data Information Program (CDIP) at the Scripps Institution of Oceanography, in setting up the intercomparison methodology, web site and metadata criteria, and in carrying out individual intercomparisons.

8.2.3 Data was also obtained from a UK waverider, co-deployed with two operational measurement systems, which will be provided to CDIP for analysis and posting to the web site. Other member countries were encouraged to participate in the Pilot Project intercomparison activities by submitting co-located spectral wave data, in an appropriate format, to the Coastal Data Information Program (CDIP) at the Scripps Institution of Oceanography. The Panel encouraged its member countries, and RMIC with marine responsibilities, to participate in the intercomparison activities that were led by this pilot project (**recommendation**).

8.2.4 The Panel noted that evaluation results continue to be routinely added to the intercomparison web site <http://www.jcomm.info/wet> in near real time, if spectral data are routinely transmitted via satellite; if data must be retrieved from logging systems on the platforms, the analysis may be delayed by a year or more. Additional intercomparisons will be added to the web site once the information has been retrieved from the data storage systems on the buoys.

8.2.5 Mr Swail noted that work is also progressing well on the wave measurements from drifting buoys component of the Pilot Project. During the intersessional period, the Lagrangian Drifter Laboratory (LDL) at the Scripps Institution of Oceanography have continued testing the design of the Surface Velocity Program wave drifter (SVP-Wa). One instrument was deployed off the port of Naples, Italy, and was collocated with an upward looking acoustic Doppler current profiler. The comparison of the data obtained with the two instruments is underway.

The LDL has completed the fabrication of 45 SVP-Wa (undrogued). Five instruments have been deployed in the eastern Pacific Ocean, and the entire array will be deployed before the end of 2016; it will be the first large scale pilot array of wave measuring drifters sponsored by the Global Drifter Program.

The LDL is still planning to test the SVP-Wa sensor package inside the hull of a Datawell waverider (gimbaled version) as soon as a unit become available.

The latest results of the project were presented by Dr. Luca Centurioni at the Technical Workshop preceding the DBCP-32 session, and are available on the DBCP web site. The Panel noted this

1 DBCP: Data Buoy Cooperation Panel

2 ETWCH:JCOMM Expert Team on Waves and Coastal Hazard Forecasting Systems

progress with interest, and recommended that this development should continue, in cooperation with the GDP, to further the evaluation of the technology. (**recommendation**).

8.2.6 Mr Swail noted that efforts have continued to outreach the objectives and results of the Pilot Project to end users and data providers alike. Three sessions on wave measurement, two on in situ measurement and one on remotely sensed measurements, were convened as part of the 14th International Workshop on Wave Hindcasting and Forecasting (WW-14, November 8-13, 2015, Key West, USA) to present evaluation results to the end-to-end scientific community and further develop guidelines and participation in the Pilot Project (<http://www.waveworkshop.org>). Presentations were also made to the ocean climate community at the JCOMM Fourth International Workshop on the Advances in the use of Historical Marine Climate Data (MARCDAT-4, July 18-22, 2016, Southampton, UK), the international wave modeling symposium WISE (22-26 May 2016, Venice, Italy), and the Regional Marine Instrumentation Center (RMIC) wave workshop (February 29 to March 2, 2016, Gulfport, MS). A section on wave measurement is also being written for the WMO Guide to Wave Analysis and Forecasting (WMO No. 702).

8.2.7 The overriding sentiment expressed by users at these meetings was that the primary user requirement was for high quality data. The requirement for the First-5 criteria for directional spectral measurements, or high quality frequency spectra, validated against a known reference, as documented in the US National Waves Plan, OceanObs'09 and the Pilot Project documentation, was considered to be more important than the deployment of new moored assets. The users expressed concerns that national agencies were increasingly sacrificing wave quality in favour of additional measurements on moored buoys, and deploying modified or new wave measurement technologies with limited or no testing and evaluation, in violation of GCOS principles. Mr Swail urged the wave measurement agencies to ensure that high-quality wave data was measured for the benefit of a wide range of users, and not to sacrifice quality for quantity (**recommendation**). At the same time, Mr Swail supported the position reported by the Task Team on Moored Buoys (TT-MB), that wave metadata, and in particular historical metadata, remains in an abysmal state in many agencies, a point also raised by the recent MARCDAT-4 meeting (**recommendation**).

8.2.8 The Panel agreed that the wave measurement evaluation part of this pilot project was now essentially mature and had achieved its goal of developing a continuous evaluation and testing program. It has contributed to the identification of wave user requirements, in particular noting the need for measurements which meet the First-5 criteria for directional wave measurements, the need for evaluation of any new systems proposed for wave measurement, and developing and providing to the community the analysis tools to carry out such evaluations. Information on best practices will be documented in appropriate media, including journal papers, WMO Guides and general information. The wave measurement from drifters is still in a pilot development phase, but rapidly moving towards the evaluation stage and eventual implementation; the Lagrangian Drifter Laboratory is the principal investigator in this activity, with collaboration as required for the evaluation process.

8.2.9 Mr Swail also reported on recent discussions of wave measurement issues, including the reviews of wave requirements in the GCOS Implementation Plan, the OOPC Essential Ocean Variables and the Tropical Pacific Observing System 2020 plan, as well as conversations between the PP-WET Co-chairs, the Co-President of JCOMM (N. Pinardi), the Chair of the Observations Programme Area (D. Legler) and the Secretariat on the broader issues involving wave measurement. Concerns were expressed about the lack of coordination and communication across the three JCOMM Programme Areas (Observations, Services, Data Management), and with GCOS/GOOS, OOPC and others with respect to in situ wave measurement.

8.2.10 In view of these broader issues, and the need for more widespread involvement and discussion across the three JCOMM Programmes, it was recommended that a Task Team on Wave Measurement (TT-WM) should be created, to encompass not only the ongoing efforts in wave measurement evaluation and the continuing pilot on wave drifters, but to enable a broader dialogue for in situ measurement of waves, including interaction across the three Programme Areas of JCOMM, with the OOPC, GCOS/GOOS, and other relevant bodies. The Task Team would have a Chair and Vice-chair, and an open membership; the Terms of Reference would be developed from the existing program plan of the Pilot Project, with added responsibilities to promote and engage in broader discussions (Appendix A) (**recommendation**) (**action**).

8.2.11 The Panel recognized that the proposed Task Team would contribute to JCOMM in developing standards and best practice, as well as to the relevant WIGOS exercise, and encouraged the its members to actively outreach these relevant activities, in relevant scientific and technical fora. **(recommendation)**. In particular, it requested the new TT-WM to assess the interest and feasibility of convening a DBCP workshop on in situ wave measurement issues, including review of user requirements, measurement evaluation, best practices and emerging technologies, and develop a workshop proposal for consideration **(action)**.

8.2.12 The Panel thanked the PP-WET co-chairs, Mr Val Swail and Dr. Robert Jensen, and Pilot Project members for their work on advancing this activity.

8.2.13 The meeting made the following recommendations:

- (i.) Urge the wave measurement agencies to ensure that high-quality wave data is measured for the benefit of a wide range of users, and not to sacrifice quality for quantity — action all DBCP members
- (ii.) Encourage member countries, and RMICs with marine responsibilities, to participate in the ongoing intercomparison activities;
- (iii.) Continue the development of wave measurements from drifting buoys, in cooperation with the GDP, to further the evaluation of the technology
- (iv.) Establish a Task Team on Wave Measurement (TT-WM), to encompass not only the ongoing efforts in wave measurement evaluation and the continuing pilot on wave drifters, but to enable a broader dialogue
- (v.) Encourage TT-WM members to actively outreach these relevant activities, in relevant scientific and technical fora, and to JCOMM and WIGOS in developing standards and best practices;
- (vi.) Encourage responsible national agencies to address the ongoing deficiencies in wave metadata, and in particular historical metadata.

8.2.14 The meeting decided on the following action items:

- (i.) Establish a Task Team on Wave Measurement (TT-WM) as a focal point within DBCP for in situ wave measurement discussion, with a Terms of Reference to be developed **(action: DBCP Panel; PP-WET co-chairs, Secretariat; November, 2016)**;
 - (ii.) Assess interest and feasibility of convening a DBCP workshop on in situ wave measurement issues, including review of user requirements, measurement evaluation, best practices and emerging technologies, and develop a workshop proposal for consideration (action: Chair, TT-WM; Chair OPA; Secretariat; December 2016)
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APPENDIX A

**PROPOSED TERMS OF REFERENCE FOR A
TASK TEAM ON WAVE MEASUREMENT (TT-WM)**

1. Continue to coordinate, on an ongoing basis, intercomparisons of wave measurements from different platforms, on an opportunistic basis, in particular from the Monterey buoy farm and FLOSSIE, and the GDP wave drifters
2. Continue to support the development of high quality spectral wave measurements from drifting buoys, including the SVP-Wa buoys;
3. Publish ongoing intercomparison results on the Wave Measurement and Evaluation web site;
4. Promote widely discussions on in situ wave measurement, including user requirements, evaluation, best practices, and emerging technologies, with responsible national agencies, and international programmes including GCOS/GOOS, OOPC, and other relevant bodies;
5. Contribute to training material to educate users about appropriate wave measurement procedures and uses of the data, including the need for high quality information for all users;
6. Contribute, as appropriate, to the JCOMM Standards and Best Practice Guides, including a recommended approach to making reliable, high-quality spectral wave measurements, including directional spectra;
7. Outreach the wave measurement developments and analyses to DBCP and other scientific fora, including the International Wave Workshop, and organize special workshops on wave measurement as appropriate and necessary.
8. Report on activities of the Task Team at the annual DBCP Panel meetings.

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