INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

DATA BUOY COOPERATION PANEL

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ITEM: 9

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INTERNATIONAL TSUNAMETER PARTNERSHIP

(Submitted by Mr Ken Jarrott, Chairperson of the ITP and Vice-chairperson of the DBCP)

Summary and Purpose of the Document

This document reports on recent discussions and decisions from the International Tsunameter Partnership and how it relates to DBCP activities.

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.

Appendix: Report by the International Tsunameter Partnership

- A - DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

9.1 The Panel received a report by Mr Ken Jarrott, Chairperson of the ITP and Vice-chairperson of the DBCP, on the tsunami warning systems and the issues arising from the discussions of the International Tsunameter Partnership (ITP). The full report (Appendix A) is reproduced in the accompanying CD-ROM.

9.2 The Panel noted that the sixtieth WMO Executive Council (EC-LX) requested JCOMM to promote cooperation between the DBCP and the International Tsunameter Partnership (ITP) with a view to better formalize, improve and understand the synergies in incorporating the tsunami warning buoys into the WMO co-sponsored Global Ocean Observing System (GOOS).

9.3 From that perspective, and recalling the discussions in this regard at the previous DBCP Session, many of the present activities of the ITP relate directly to the role that the DBCP has exercised since its inception, and to its current expertise base and communal data tools. A stronger engagement with the DBCP would accelerate the ITP's work in the near term, and would continue to be advantageous in the longer term, with clear and persistent common interests. Conversely, the wider ocean observing community should find value in the ITP members' experience with mission-critical real-time data dissemination, with new observation platform developments and with additional capacity for deploying and servicing deep ocean stations.

9.4 The Panel agreed that practical means for engagement and interchange between the ITP and the DBCP over the next 12 months should be identified. The ITP governance and reporting issues should be considered in the context of international tsunami waning systems moving out of their establishment phase and into a longer-term sustaining and evolution period.

9.5 The Panel therefore decided to set up a small task group, comprised of Ken Jarrott (lead), and other Panel Members to address these issues and report at the next Panel Session.

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Appendix: 1

INTERNATIONAL TSUNAMETER PARTNERSHIP

(Ken Jarrott - Chairperson, ITP)

Background

The International Tsunameter Partnership was established under the auspices of the IOC International Cooperation Group for the Indian Ocean Tsunami Warning and Mitigation System (IGC / IOTWS). Its purpose is to support the establishment, effectiveness and on-going viability and enhancement of tsunami detection and warning systems using deep ocean monitoring stations (tsunameters).

The ITP's mission closely parallels the DBCP's mission for other ocean observing platforms. Technical and operational synergies between tsunameters and other open ocean observatories are expected to become more important once the priorities of tsunami warning system establishment monitoring are addressed.

Developments

The ITP met briefly in April 2008, coincident with the IOC ICG / IOTWS meeting in Malaysia. As with prior meetings, there was good representation from national operators, suppliers and developers of tsunameters, particularly from Indian Ocean and neighbouring Asian countries and from the USA. This reflects the intense efforts underway in the Indian Ocean and Pacific Ocean basins to establish or expand tsunami observation networks.

To date the ITP has:

- Issued a *Tsunameter Equipment Performance Standards and Guideline*s document and a set of measures to assist inter-comparisons of data delivery performance;
- Provided guidance on message content for tsunameter sea level data transmissions and metadata. A CREX / BUFR coding template was presented to the WMO Expert Team on Data Representation and Codes in August 2008, as a precursor to real-time international data exchange on WMO's GTS system;
- Commenced the compilation of best practice materials for tsunameter test processes and for qualification of new tsunameter products;
- Fostered exchange of technical and operational experience between operators and suppliers; and
- Initiated work to assess the long-term challenge of sustaining deep ocean tsunami observation networks (particularly but not exclusively in the Indian Ocean).

Issues for Discussion

1. Rapidly Expanding Networks Using Relatively New Products. The Indian Ocean faces a dramatic expansion in national tsunameter deployments, with most national tsunami warning systems in the region aiming to achieve credible warning capability by end 2008. By July 2008, IOTWS member countries had deployed over 20 tsunameters, only half of which were declared to be active at that time. By mid-2009, nearly 50 stations are planned. Refer to the annex for maps of planned and completed deployments by the IOTWS member states and the broader context of international tsunameter networks (excluding cabled sensor networks).

Excluding cabled sensor networks, this aggregation of national tsunami buoy networks in the Indian Ocean supplements the existing larger global networks that have so far been established in the Pacific Ocean and in the Caribbean and western Atlantic. In July 2008, there were 39 deep ocean tsunami buoys stations in the US network, and one Chilean station. All of these were variants of the DART^{TM} product developed originally by NOAA / PMEL. See the annex for map of these deployments.

The 50 stations planned by IOTWS member states will incorporate seven tsunameter product types. Only one of these products existed four years ago. The rapid expansion of operational networks with new product types presented a retrospective challenge to establish instrument standards and to confirm the performance of deployed operational stations. The cost of pre-operational trials and the infrequency of tsunami events limit opportunities for instrument inter-comparisons, although one tsunami event in 2007 was recorded by six tsunameters. The Indian Ocean provides the best global opportunity for such inter-comparison work to be done, but this work must compete with national priorities for network establishment.

With the exception of India and Indonesia, there was also little operational experience with moored buoys in this region prior to the investment in tsunami monitoring networks. This has stimulated a need for international cooperation. In addition to the new relationships established through donor arrangements (e.g., between Indonesia and Germany), a number of bilateral cooperation agreements have emerged between IOTWS member states and with the USA to build technical capacity or to cooperate on vessel usage or deployment / maintenance services.

2. Promoting International Data Dissemination. Access by warning centres to continuous real-time data from all available deep ocean stations is vital. To date, most tsunameters in the Indian Ocean deliver only a local data feed to their national warning centre. US-sourced DART buoys distribute data via the NOAA / NDBC website http://www.ndbc.noaa.gov/dart.shtml and via the WMO's GTS using an existing NOAA / PMEL data format.

The lack of international standards for the exchange of sea level data from tsunameters (and from coastal "tide gauge" stations) has inhibited national investments in data dissemination and ingestion capability at a time of many competing priorities. The technical maturity of new tsunameter products and other national sensitivities may also have contributed to slow progress in this area. Further, in many countries, tsunami warning and data dissemination roles are assigned to agencies other than national meteorological office. The lack of direct GTS access and experience within these agencies has presented another obstacle to data exchange.

The recent formulation of a draft CREX / BUFR standard for tsunameter sea level data has created the opportunity for collective investment in a common data exchange method. In parallel, bilateral exchanges will be pursued using FTP, web or other means. These processes are to be pursued before end 2008.

3. Global Data and Metadata Repositories. With the focus on establishing networks, and in the absence of effective international data exchange, there has not been any significant investment at a conceptual or practical level in global data and metadata repositories and access mechanisms whether distributed or centralised, or to related data management practices. Some exemplar practices exist in countries with long-established tsunami waning functions (e.g., USA) but this remains an area for development and for international standards or guidelines to be set. With a natural tendency for ocean observing platforms to host multi-role sensor suites (e.g., meteorological or other ocean / environmental sensors) the data storage, management and access schemes should be formulated in the context of broader ocean observation requirements rather than just as a specialised tsunami hazard warning application.

4. Sustainability. The establishment or expansion of tsunami observation networks has been achieved through special project funding sponsored by national governments and international donors.

A challenge for all such networks is to sustain their designed capability long after project funding ends and long term operational custodians assume responsibilities. The challenge varies from country to country, but most warning centres rely on the contributions from the composite regional sea level observation network their region. This mandates a community approach to network design and multi-nation cooperation to identify priorities and to ensure that vital communal assets are sustained. Factors that have a bearing on the sustainability of the emerging Indian Ocean network include:

a. Market longevity of tsunameter suppliers and products;

b. Transition from initial donor funding to long-term funding sources;

c. Tsunameter product innovations that can reduce life cycle costs;

d. Losses through vandalism (see below);

e. Maintaining political will and funding priorities between tsunami hazard events;

f. Potential for sharing platform cost (and value) across multiple stakeholders (multi-role sensor payloads);

g. Maintaining technical expertise and other operational capability after the dispersion of initial development teams; and

h. Sustaining levels of international cooperation and exchange after dispersion or restructuring of initial action groups such as the ICG / IOTWS Working Groups.

An author group within the ITP is developing a discussion paper on tsunameter network sustainability. Input from other ocean observing communities such as the operators and users of the TAO / TRITON array or developers of new generation moored buoy platforms could be of value to this exercise.

5. Counteracting Vandalism. Moored buoys in the Indian Ocean have a history of high levels of vandalism (willful or unwitting damage of buoys). Tsunameters deployed by three countries have already been subject to loss or damage through vandalism, particularly through interaction with fishing operations. Counteracting vandalism requires appropriate product design, and concerted strategies at local, national and international levels.

Plans for 2009

1. The next ITP Meeting is provisionally scheduled in Bali in November 2008, coincident with a planned international tsunami warning conference;

2. A draft proposal for *New Tsunameter Acceptance Processes* is to be developed prior to end 2008;

3. A discussion paper on *Sustaining Tsunameter Networks* will be developed prior to end 2008;

4. Demonstration of effective continuous real time data exchange between tsunami warning centres to be pursued before end 2008, whether through GTS or other channels;

5. Trial exchanges of real-time tsunameter data to be undertaken by end 2008, with a view to exercising the draft standard, *BUFR / CREX Template for Deep-Ocean Tsunameter Data,* prior to its consideration for formal release in March 2009;

6. Performance analysis of newly deployed stations and new product types to be pursued progressively as new stations come on line in the Indian Ocean region; and

7. Formulation of requirements for international data and metadata repositories and data access mechanisms.

Main Issues for Discussion

Many of the present activities of the ITP relate directly to the role that the DBCP has exercised since its inception, and to its current expertise base and communal data tools. A stronger engagement with the DBCP would accelerate the ITP's work in the near term, and would continue to be advantageous in the longer term, with clear and persistent common interests. Conversely, the wider ocean observing community should find value in the ITP members' experience with mission-critical real-time data dissemination, with new observation platform developments and with additional capacity for deploying and servicing deep ocean stations.

Practical means for engagement and interchange between the ITP and the DBCP over the next 12 months should be identified. The ITP governance and reporting issues should be considered in the context of international tsunami waning systems moving out of their establishment phase and into a longer-term sustaining and evolution period.

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