

EXPERT TEAM ON WIND WAVES AND STORM SURGES WORK PLAN**#8 Support Climate Services Extreme Wave Data Base (ETMC, NODC lead)**

The ETWS will provide guidance on the establishment of the Extreme Waves Data Base project being led by ETMC and hosted by the US National Oceanographic Center (NODC) for in situ measured data for use in model validation and validation of remotely-sensed waves, where such models and algorithms suffer from lack of sufficient data. This database will be populated with measured wave data where the significant wave height exceeded 14 metres, with appropriate accompanying metadata. ETWS will review the progress on this project and to consider how they can contribute to the population of the data base with information on extreme wave occurrences. NODC will develop a template, which ETWS will review and provide feedback. ETWS will also provide advice on expanding the scope of the extreme wave data archive, to include satellite estimates, as well as data from other sources, such as wave radars WaMoS or MIROS. ETWS noted that much of these altimeter data are already available on line including some cross calibrated data.

Lead – V. Swail, S.Woodruff, C.Sun

- **Expected Outcomes:**
 - Establishment of an extreme wave database
- **Key Activities:**
 - Develop the plan for extreme wave documentation (with ETMC)
 - Request input from countries, through OPA groups & Secretariat
 - Develop plan to extend the DB to include satellite altimeter wave data
 - Review the template proposed by NODC for EWDB
- **Timeline/milestones:**
 - EWDB plan agreed for database hosted at NOAA/ NODC (May'10)
 - ETMC/NODC template agreed (October'10)
 - Request input from countries (ongoing)
- **ETs, Other Organizations and participants:**
 - ETWS, ETMC, NOAA/NODC, DMPA groups

#9 Support Climate Services- Storm Surge Climatology

Following the recommendation from the *First JCOMM Scientific and Technical Symposium on Storm Surges*, the JCOMM-III requested ETWS and ETMC to jointly continue to develop regional and global storm surge climatologies as a measure of risk assessment for marine hazards and assist Members/Member States in developing their own databases and hazard analysis. ETMC-III agreed that this was an important activity and that the ETMC should be actively involved in the development of storm surge databases and resultant climatologies. The value of such a climatology is to help calibrate the models and other tools to better predict future extreme events.

ETWS-III noted that it is important to know who the key stakeholders for this type of data are, and what they really want or need. The Storm Surge Congress (September 13-17, 2010) will provide an opportunity to canvas the opinion at that conference. ETWS will re-evaluate the proposal from the Storm Surge Symposium to more precisely define the requirement, with a target of a proposal for inclusion in the MARCDAT-III workshop in early 2011.

Lead – K.Horsburgh

- **Expected Outcomes:**
 - Establishment requirements for a regional storm surge climatology with ETMC
- **Key Activities:**
 - Develop the plan for a storm surge climatology with ETMC
- **Timeline/milestones:**
 - ETMC (Feb'10) agree on the objectives
 - ETWS (May'10) to propose next steps, decide on timeline
 - SSC2010 (Sep'10) discussion session on SS climatology
 - Plan presented at MARCDAT-III (Feb'2011)
- **ETs, Other Organizations and participants:**
 - ETWS, ETMC, NOC

#10 Implement recommendations from JCOMM SSS

JCOMM-III recognized the importance of global scientific fora for exchange of information on databases, methodologies and techniques, and sharing expertise, which was one of the key recommendations from the 1st JCOMM Scientific and Technical Symposium on Storm Surges. It recognized the value of such exercises to develop technical advice for Members/Member States in fulfilling their services' duties in support of the requirements of users in the whole range of maritime activities and in disaster risk reduction. In this context, the Commission requested the Expert Team on Wind Wave and Storm Surge (ETWS) to continue to co-sponsor and co-organize *International Workshops on Wave Hindcasting and Forecasting and Coastal Hazard Symposia* (see <http://www.waveworkshop.org>), and follow-up event to the *JCOMM Scientific and Technical Symposia on Storm Surge* (<http://www.surgesymposium.org>). The 12th Waves Workshop is tentatively planned for November 2011, a second JCOMM Storm Surge Symposium, likely in 2013. ETWS will also participate actively in the Storm Surge Congress (SSC2010, September 2010, Hamburg), a follow-up to the 1st JCOMM Storm Surge Symposium.

ETWS will also continue to collaborate with the European Space Agency (ESA) in support of improved storm surge forecasting through the *ESA Storm Surge Project* that aims to develop a comprehensive database of storm surge events, satellite data, NWP outputs and storm surge model outputs that can be used to explore and develop new tools, techniques and understanding of storm surge forecasting.

Lead – V. Swail, Don Resio, Hendrik Tolman, Kevin Horsburgh

- **Expected Outcomes:**
 - **Implement the recommendations from the 1st JCOMM SS Symposium: Support related S&T fora**
- **Key Activities:**
 - **Support SSC2010 (JCOMM experts participation to organization & presentations)**
 - **Support ESA Storm Surge Project(s)**
 - **Organize Wave Workshop and Coastal Hazards Symposium**
 - **Plan the 2nd SS Symposium**
- **Timeline/milestones:**
 - **Sep'10 SSC2010**
 - **ESA Storm Surge project kick off (Dec'10)**
 - **12th Waves Workshop and 3rd Coastal Hazards Symposium (Nov'11)**
 - **May'12 approval on 2nd SS Symposium (after 2012) plan**
- **ETs, Other Organizations and participants:**
 - **ETWS, ESA, IOC, LOICZ, Environment Canada, USACE**

#11 UNESCO pilot project on coastal hazard forecasting

In response to the recommendations from the Storm Surge Symposium, the UNESCO/IOC has established a pilot project to improve storm surge predictability by community models, in view of enhanced support for coastal hazard and management issues. This project was successfully launched for the North Indian Ocean that is the most surge-prone region in the world, through the first expert advisory workshop in New Delhi, India (July 2009) (see <http://www.jcomm.info/SSindia>), in which the mid-term plan for model improvement was consolidated. The Republic of Korea and India have provided their support to this project.

The Team agreed that this project, which is aligned with the ETWS activity and further with JCOMM and IOC work plans, would produce solid outcomes as achievements of the Team. The Team was also pleased to note that the 3-year work plan for model upgrade has been closely followed by participating institutions including the IIT Delhi and INCOIS - the tide-surge interaction component was enhanced within the IIT-D model, and INCOIS has been working on improving WaveWatch 3 model operation in cooperation with NOAA (training workshop in January 2010, Hyderabad). The Team agreed to continue supporting the project through the participating Members, particularly the proposed follow-on workshop scheduled for February 2011.

Lead – K. Horsburgh, S.Dube

- **Expected Outcomes:**
 - **Guide UNESCO pilot project on Enhancing forecasting capabilities in the North Indian Ocean.**
 - **Establish action plans for the next phase of the project**
- **Key Activities:**
 - **SS Experts / ET members participation in NIO workshop**
 - **Review project progress in view of JCOMM work plan implementation**
- **Timeline/milestones:**
 - **May 10: ETWS meeting**
 - **Feb. 11: NIO workshop**
 - **Aug. 11: Action plan developed**
- **ETs, Other Organizations and participants:**
 - **ETWS, IOC/ICAM, IIT (India)**

#15 Wave Measurement Evaluation and Test

A recent workshop co-sponsored by JCOMM/ETWS and the International Association of Oil and Gas Producers (OGP) (New York, October 2-3 2008) on *in situ* wave measurement technology (see <http://www.jcomm.info/WaveBuoys>). noted that: (1) geographical coverage of *in situ* data is still very limited especially as far as any measure of wave directionality is concerned, and most measurements are taken near coasts in the Northern Hemisphere; (2) present *in situ* reports are not standardized resulting in impaired utility; (3) significant differences exist in measured waves from different platforms, sensors, processing and moorings. Three main topics were discussed: (1) how to add wave observing capabilities to drifting buoys; (2) how to assess and improve the quality of observations from the present networks of moored buoys; (3) the addition of wave observation capabilities to future moored buoy networks. JCOMM Technical Report 47 was produced containing the presentations and recommendations. One of the recommendations of the workshop was to establish two Pilot Projects under the JCOMM Data Buoy Cooperation Panel, one to coordinate an evaluation of various wave measurement systems in order to contribute to a description of best practices for wave measurement, and the second to investigate the feasibility of making spectral wave measurements from inexpensive drifting buoys. Details on the two projects can be found on their respective web sites, www.jcomm.info/WET and www.jcomm.info/WMD. The WET project is well underway, with initial comparison results expected to be available on the web by fall 2010. The ETWS contribution to the WMD project is described in Project #30.

Lead – V. Swail, R.Jensen

- **Expected Outcomes:**
 - guidance on best practices for wave measurement to WIGOS/WIS
- **Key Activities:**
 - Lead DBCP Pilot Project on wave measurement evaluation and test (WET)
 - Review & update wave measurement requirements as necessary
 - Participate in, and provide guidance to intercomparison exercise & analysis
- **Timeline/milestones:**
 - Jan'10 intercomparison website launch
 - Report to DBCP-XXVI (Sep'10)
 - Nov'10 PP 1st phase PP complete, plan for 2nd phase
- **ETs, Other Organizations and participants:**
 - ETWS, OPA/DBCP , Scripps, OGP

#16 Wave Forecast Verification Project.

One of the most important activities of the ETWS continues to be the Operational Wave Forecast Verification Project. A routine inter-comparison of wave model forecast verification data was first established in 1995 to provide a mechanism for benchmarking and assuring the quality of wave forecast model products that contribute to applications, such as safety of life at sea, ship routing, and, in general, the Global Maritime Distress and Safety System GMDSS. The project has expanded to include 13 centres, 10 running global wave forecast systems, with different wave models, different wind forcing, and different model configurations, and the goal is to continue to add new participants, including regional participants, and to expand the scope of the intercomparison as feasible. Some participants are providing observations that are not commonly available on the GTS. This information is also being used to identify wave modeling shortcomings and ultimately it should lead to improvements of future wave models. It is recognized that centres engaged in wave forecasting benefit from this activity in the same way as weather centres benefit from the exchange of forecast verification scores. The project also plans to expand the verification to include 1-D and 2-D spectral quantities, satellite quantities, and to investigate the development of spatial intercomparison techniques for wave forecasts in cooperation with the European Space Agency's GlobWave Project.

Leads – J. Bidlot, H. Tolman

- **Expected Outcomes:**
 - **Enhancement of the Wave Forecast Verification Project in coordination with the ESA GlobWave project**
- **Key Activities:**
 - **Review & update wave measurement requirements as necessary**
 - **Expand number of global and regional participants**
 - **Expand verification scope to spatial, spectral, satellite including coordination with the US National Oceanographic Partnership Program (NOPP)**
- **Timeline/milestones:**
 - **GlobWave meeting (May'10)**
 - **NOPP meeting (July'10)**
 - **Development of additional verification metrics (Oct'11)**
 - **Spatial intercomparison with GlobWave (May'12)**
- **ETs, Other Organizations and participants:**
 - **ETWS, ECMWF, ESA , NOPP, NOC**

#17 Develop and update guidance documents

JCOMM-III recognized the value of the *Guide to Wave Analysis and Forecasting* (WMO-No. 702) and other relevant technical guidance publications in ensuring the provision of high quality, accurate, consistent and timely operational forecast products. At the same time, recognizing the developments and advances relating to wave and storm surge forecasting, the Commission recommended these publications should be maintained as up-to-date as possible, and therefore requested ETWS to keep the contents of these publications under review, as well as cross-referenced with other Manuals and Guides, including the *Manual of Quality Control Procedures for Validation of Oceanographic Data* (UNESCO/IOC M&G No. 26), and advise on the need for future updating as appropriate. Based on the review conducted in the past intersessional period, the Guide to Wave Analysis and Forecasting will be revised during next year with a view to publication before JCOMM-IV in mid-2012.

The Commission also requested ETWS to continue to develop technical guidance materials on wave and storm surge forecasting for inclusion in the dynamic parts of the Guides. Such new material typically includes items such as: specific technical reports produced by the Team, proceedings of meetings such as the Waves Workshop, questionnaire results on Wave Models and Data Bases, descriptions and links to related material such as the online wave atlases.

Lead – V. Swail

- **Expected Outcomes:**
 - Revised Guide to Wave Analysis and Forecasting (WMO 702)
 - Dynamic parts of wave and storm surge guides online
 - Technical Reports
- **Key Activities:**
 - Update wave guide by ET input + consultant work
 - Update dynamic part of guides as necessary (ET input)
 - Technical report on wind forcing
 - Technical Reports on extreme value analysis for waves, surges
 - Provide advice on related guides and manuals of WMO and IOC.
- **Timeline/milestones:**
 - Review WMO Guide #8 (June'10)
 - Sept'10 outline/contents of Wave Guide agreed
 - Publish Technical Reports on Extreme Value Analysis (June'10)
 - May'12 Wave guide publication
 - Review WMO Manuals #471 and #558 (October'10)
 - Review IODE Manuals #18 and #26 (December'10)
- **ETs, Other Organizations and participants:**
 - ETWS

#21 - Update WMO n°471 and 558, for sea state in MSI (ETMSS lead)

There is a significant room for improving the provision of sea state, that should be considered as the most important parameter, in Maritime Safety Information (MSI). At the moment, the majority of Issuing Services preparing GMDSS MSI provide information on the significant wave height only, generally using the Douglas scale. This is very limited in comparison with data available from the NWP and certainly the constraints and needs of ships at sea. Many accidents occurred in coastal or open seas due to sea state, where significant wave heights were far below the thresholds fixed for the vessels, but in situations where the sea state was complex (e.g. cross seas) or unusual (e.g. steep sea, risk of abnormal or freak waves). Key parameters should be proposed to provide more useful information for the safety of ships, especially in complex and dangerous seas. Type of parameters, and the related thresholds if any, should be defined in association with the ship masters, owners and manufacturers. The provision of improved sea state products should then be promoted among the Issuing Services and the WMO recommendations and guidelines updated accordingly.

Lead – H.Savina, V.Swail

- **Expected Outcomes**
 - **Guidelines and recommendations for updating doc #471 and 558 on sea state in MSI**
 - **Promote the provision of improved sea state products among issuing services.**
- **Key Activities**
 - **Review of Documents**
 - **Update key parameters/guidance**
 - **Coordinate with the user survey (#4)**
- **Timeline/milestones:**
 - **ETWS to provide input (Sept'10)**
 - **ETMSS to incorporate inputs into survey (Dec'10)**
- **ETs/others**
 - **-ETWS,ETMSS,ETOFS**

#30 – Participate in the DBCP Pilot Project on wave measurement from drifters (PP-WMD) (DBCP lead)

A recent workshop co-sponsored by JCOMM/ETWS and the International Association of Oil and Gas Producers (OGP) (New York, October 2-3 2008) on *in situ* wave measurement technology (see <http://www.jcomm.info/WaveBuoys>). noted that: (1) geographical coverage of *in situ* data is still very limited especially as far as any measure of wave directionality is concerned, and most measurements are taken near coasts in the Northern Hemisphere; (2) present *in situ* reports are not standardized resulting in impaired utility; (3) significant differences exist in measured waves from different platforms, sensors, processing and moorings. Three main topics were discussed: (1) how to add wave observing capabilities to drifting buoys; (2) how to assess and improve the quality of observations from the present networks of moored buoys; 3) the addition of wave observation capabilities to future moored buoy networks. JCOMM Technical Report 47 was produced containing the presentations and recommendations. One of the recommendations of the workshop was to establish two Pilot Projects under the JCOMM Data Buoy Cooperation Panel, one to coordinate an evaluation of various wave measurement systems in order to contribute to a description of best practices for wave measurement, and the second to investigate the feasibility of making spectral wave measurements from inexpensive drifting buoys. Details on the two projects can be found on their respective web sites, www.jcomm.info/WET and www.jcomm.info/WMD. The WET project is well underway, with initial comparison results expected to be available on the web by fall 2010 (see Project #15).

Lead - D. Meldrum, V.Swail

- **Expected Outcomes**
 - **Feasibilities of low cost wave measurements from drifting buoys**
- **Key Activities**
 - **Review and update wave measurement requirements as necessary**
 - **Contribute to the development of low cost technology for wave measurement from drifting buoys**
- **Timelines/milestones**
 - **DBCP (Sept'10)**
 - **Summary of wave drifter activities /systems in Japan (Sep'10)**
 - **PP 1st phase complete, plan for second phase (Nov'10)**
- **ET/others**
 - **ETWS, OPA/DBCP**

Other Projects

ETWS will also provide support, as requested, to other projects as they evolve and more specific details become available and potential contributions are identified.

- **#12 - Support JCOMM/CHy Coastal Inundation Forecast Demonstration Project (CIFDP)**
- **#13 - Facilitate the development of Storm Surge Watch Schemes (SSWS) for regions subject to tropical cyclones**
- **#14 - Support WMO Severe Weather Forecasting Demonstration Project (SWFDP) with respect to wave and storm surge issues**