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SHIP OBSERVATIONS TEAM (SOT)

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REPORT FROM THE SOOPIP CHAIRPERSON

(Submitted by Gustavo Goni (USA), SOOPIP Chairperson)

Summary and purpose of the document

This document includes the report by the SOOPIP Chairperson on activities undertaken during the intersessional period.

ACTION PROPOSED

The Team 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.

- A - DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

8.1.1.1 The Panel Chairperson, Dr Gustavo Goni, opened the Tenth Session of the Ship Of Opportunity Program (SOOP) Implementation Panel (SOOPIP) and reported on his activities on behalf of the Panel during the last intersessional period.

8.1.1.2 He stressed that the SOOP continues being a critical player in the implementation and maintenance of the sustained ocean observing system for climate studies. Most of the observations carried by SOOP are by Expendable Bathy Thermographs (XBT) probes. XBT temperature measurements are used to monitor changes of key surface and subsurface currents, to study meridional heat transport in all ocean basins, and to supplement other observational platforms to assess the variability of the upper ocean heat content. All XBT transects have been justified by their impact of our understanding of how the upper ocean dynamics and thermal structure may be linked to long-term climate signals, extreme weather events, ecosystem assessments, etc. Scientists using XBT data currently produce more than 40 publications annually in peer review scientific publications, in addition to presentations in scientific meetings, and a large number of other applications in which several products for ocean condition monitoring are created.

8.1.1.3 The Team noted that XBT deployments continue to be done along fixed transects selected by the scientific and operational communities. SOOP produces approximately 20% of the upper ocean thermal observations (excluding moorings) with the deployment of approximately 20,000 XBTs per year in a global operation that involves the participation of 25 institutions from 14 countries. A large number of these profiles are transmitted and distributed in real-time through the Global Telecommunication System (Thermosalinographs - TSG) (within 24 hours of its acquisition), thereby providing critical input to weather and climate forecasts models and scientific applications.

8.1.1.4 In addition, ships of the SOOP serve as a platform for the deployment of other observational instruments, such as surface drifters and profiling floats, and the installation of equipment, such as ThermoSalinoGraphs (TSGs) and pCO₂ systems. In particular TSG observations used in conjunction with pCO₂ observations provide critical information to determine frontal regions and mixed layer depths for ocean acidification assessments. Projects originally developed in support of SOOP also serve to help other programs, such as the NOAA SEAS (Ship Environmental Acquisition System), which is used by approximately 1,400 volunteer and scientific ships to acquire and transmit over 1 million marine meteorological observations per year. In addition, the AMVER¹ component of the Shipboard Environmental (data) Acquisition System (SEAS) is also widely used by the U.S. Coast Guard in support of search and rescue efforts.

8.1.1.5 Institutions participating in the SOOP are also involved in activities aimed at the continuous development of new technologies in support of the operations carried out as part of the XBT network. These activities involve the development of new equipment for the automatic deployment of several models of XBTs during cruises with high rate of deployments, as well as the transmission of data in real-time using different satellite networks.

8.1.1.6 Dr Goni particularly reported on the following SOOPIP activities:

- (i) With the full implementation of Argo floats, the XBT network remains mostly concentrated in the implementation and maintenance of High Density transects. A large part of the plan of XBT transects presented at OceanObs'09 are fully occupied, but financial and logistical constraints continue to prevent full implementation on all desired transects;
- (ii) SOOPIP continues to encourage and facilitate the interaction between the scientific and operational communities operating different ship based in multidisciplinary observing platforms, such as pCO₂, Expendable Conductivity Temperature and Depth probes (XCTDs), TSGs, Continuous Plankton Recorders (CPRs), etc.;

¹ Automated Mutual-Assistance Vessel Rescue System - <http://www.amver.com/>

- (iii) A strong scientific and operational collaboration has been enhanced in the international community, by sharing the costs of implementing and maintaining XBT transects and participation in international efforts to assess XBT biases and other scientific studies using XBT data;
- (iv) XBT observations are being used in scientific studies for variability of western boundary currents, undercurrents, heat transport, and heat content. A first draft of a global XBT bibliography is being maintained on the NOAA Atlantic Oceanographic and Meteorological Laboratory (AOML) web page;
- (v) SOOPIP continues to support additional XBT Fall Rate Equation (FRE) experiments, such as during the Prediction and Research Moored Array in the Atlantic (PIRATA) Northeast Extension cruises, and is currently supporting additional experiments in water tanks, swimming pools, and shallow ocean regions to investigate in more detail the descent of the probes in the upper 30 meters;
- (vi) SOOPIP supports the development of climate quality XBT probes in collaboration with Lockheed Martin Sippican, Inc. During 2012 and 2013 two tests were performed during PIRATA Northeast Extension cruises of prototype of new XBT probes with upgraded temperature sensors and pressure switches;
- (vii) SOOPIP continue the testing of BUFR² format for XBT data transmissions. Starting in 2012, AOML has started the operational transmission of XBT data into the Global Telecommunication System (GTS) in real-time in BUFR format, in parallel with data transmission on BATHY³ format;
- (viii) A science and technical presentation on the SOOP operations was made at the Global Temperature-Salinity Profile Program (GTSP) meeting, held in Ostende (Belgium) in April, 2012;
- (ix) Two U.S. Ship Of Opportunity workshops, hosted by NOAA at AOML were held in the spring of 2012 and 2013, to bring together several U.S. components of the U.S. scientific and operational components of the SOOP and VOS;
- (x) With the support of the NOAA's Climate Program Office, the XBT pool for SOOP international partners was maintained to continue the strong international partnership in the XBT network. These partners currently receive approximately 2200 probes per year. Major international NOAA partners receiving XBT probes include South Africa (University of Cape Town), France (Institut de Recherche pour le Développement – IRD, and the University of Paris), Brazil (Federal University of Rio Grande), and Australia (Bureau of Meteorology – BOM). In addition, Italy received XBTs to carry out XBT transects in the Mediterranean Sea. A new partnership was started in 2012 to also support one XBT transect in the Pacific Ocean in collaboration with Japan (Tohoku University);
- (xi) SOOPIP continues a strong interaction with the VOS panel, particularly with aspects of the logistics, recruitment, and operations of several XBT transects; and to maintain and upgrade the SEAS software;
- (xii) SOOPIP continues a strong support of data acquisition and transmission systems, which are used by other programs (e.g. VOS) and projects such as the Global Ocean Surface Underway Data (GOSUD) Project (GOSUD);

² FM 94–XIV BUFR: Binary universal form for the representation of meteorological data

³ FM 63–XI Ext. BATHY: Report of bathythermal observation

- (xiii) SOOIP continues supporting the monitoring of data collected from different platforms, such as surface drifters (BUOY⁴), TSGs (TRACKOB⁵), and sea stations for CTD, Argo floats and ADCP⁶ (TESAC⁷); and
- (xiv) The critical contribution of several shipping companies to the SOOP was acknowledged with the award of plaques.

8.1.1.7. The meeting made the following recommendations:

- (i) Continue the enhancement of capabilities for real-time transmissions and encourage all countries to transmit data in real-time, to enhance the value of assimilating data in models and to reduce risk of loss of data;
- (ii) Continuing the strong working relationship with other scientific and operational communities and continue communicating the value of XBT observations, including the support of the newly formed XBT Science Team;
- (iii) Continue active participation in international meetings, technical, operational and scientific;
- (iv) Maintain and promote a strong international collaboration for the implementation and maintenance of XBT transects as recommended by the scientific and operational communities;
- (v) Supporting the continuation of experiments to evaluate XBT biases. Explore the possibility to implement a new fall rate equation (FRE) if/as recommended by the scientific community;
- (vi) Strongly support the creation of an XBT prototype probe, with improved temperature sensor and pressure switches in order to obtain high precision temperature profile suitable for climate studies;
- (vii) Increasing the international participation by supporting training of technicians and scientists in developing countries;
- (viii) Supporting the maintenance of the Global Temperature Salinity Profile Program (GTSP) and the World Ocean Atlas (WOA); and
- (ix) Enforcing the creation of a global XBT metadata pool. This dataset will be used in conjunction with information from other available sources (Coriolis, GTS, GTSP, Scripps Institution of Oceanography – SIO) to create global reports displaying the activities of the various programs obtaining XBT data.

8.1.1.8. The meeting decided on the following action items:

- (i) SOOIP members to strongly support the maintenance of the XBT network currently in place by dedicating financial resources, sharing logistics and equipment, for its implementation (**action; SOOIP members; ongoing**);
- (ii) AOML to continue the collaboration with Sippican in the development of an improved XBT prototype with upgraded temperature sensor and pressure switches

4 FM 18–XII BUOY: Report of a buoy observation

5 FM 62–VIII Ext. TRACKOB: Report of marine surface observation along a ship's track

6 Acoustic Doppler Current Profiler

7 FM 64–XI Ext. TESAC: Temperature, salinity and current report from a sea station

(action; AOML; SOT-8);

- (iii) Institutions participating in the SOOP with the deployment and transmission of XBT data to provide metadata containing information of the XBT operation in order to make possible the creation of reports for the monitoring of the global activity of the program **(action; SOOPIP members; ongoing);** and
- (iv) AOML (a) to continue the tests for a full implementation of XBT data transmission to the GTS in BUFR format; and (b) to provide support as requested by other institutions for the implementation of BUFR transmissions operationally **(action; AOML; SOT-8).**

Appendix: None