

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC  
COMMISSION (OF UNESCO)

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JOINT WMO/IOC TECHNICAL COMMISSION FOR  
OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)  
SHIP OBSERVATIONS TEAM

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SOT-IV/Doc. V-2.5  
(15.II.2007)

FOURTH SESSION

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ITEM V-2.5

GENEVA, SWITZERLAND, 16 TO 21 APRIL 2007

Original: ENGLISH

### **SOOPIP-VII PROGRAMME IMPLEMENTATION**

#### **Report on IOGOOS & JCOMM Western Indian Ocean XBT Training Workshop**

*(Submitted by Mr V. V. Gopalakrishna, Principal Investigator, Indian XBT Programme)*

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#### **Summary and purpose of document**

This document reports on the outcome of the IOGOOS and JCOMM Western Indian Ocean XBT training workshop which was held in Goa, India, from 5 to 7 October 2005, and hosted by the National Institute of Oceanography.

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#### **ACTION PROPOSED**

The SOOP Implementation Panel is invited to:

- (a) Consider the recommendations from the workshop;
- (b) Consider whether such experiences should be repeated.

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**Appendix:** Resumption of IX08 XBT Operations

## DISCUSSION

### REPORT ON THE IOGOOS/JCOMM WESTERN INDIAN OCEAN XBT TRAINING WORKSHOP HELD AT THE NATIONAL INSTITUTE OF OCEANOGRAPHY (MIRAMAR, GOA, INDIA, FROM 5 TO 7 OCTOBER 2005)

**Venue:** Miramar, Goa, India

**Period:** 5-7 October, 2005

**Hosts:** National Institute of Oceanography, Dona Paula, Goa – 403 004, India

**Funding Agency:** Intergovernmental Oceanographic Commission (IOC), United Nations Educational, Scientific and Cultural Organization (UNESCO) Paris, France.

#### Goals of the Workshop:

- To build the regional capacity to enhance XBT observations in the sparsely sampled western Indian Ocean and to ensure that these operations are sustained;
- To reestablish XBT observations along: (a.) IX-08:Mumbai-Mauritius, (b.) IX-06:Mauritius- Malacca Straits, (c.) IX-21:Cape of Good Hope-Mauritius, and (d.) IX-15 Fremantle-Mauritius;
- To provide SEAS (Shipboard Environmental (data) Acquisition Systems) unit training for regional technical support staff;
- To develop logistical support procedures including the import of scientific instrumentation;
- Develop recruiting procedures for Voluntary Observing Ships.

It is expected that this workshop will significantly enhance *in-situ* ocean observations in the sparsely sampled Western Indian Ocean, provide complementary data to that currently being provided by Argo floats and other existing and planned in-situ networks, fill an existing gap for the Global Earth Observation System of Systems (GEOSS) ten-year implementation plan, and build the desperately needed regional capacity to ensure that these XBT operations are sustained in the Western Indian Ocean.

#### Organizing Committee

|                        |                            |                          |
|------------------------|----------------------------|--------------------------|
| 1. V.S.N. Murty        | -NIO, Chair                | vsnmurty@darya.nio.org   |
| 2. V. V. Gopalakrishna | -NIO                       | gopal@darya.nio.org      |
| 3. T. Srinivasa Kumar  | -IOGOOS Secretariat        | srinivas@incois.gov.in   |
| 4. William Erb         | -IOC Perth Regional Office | w.erb@bom.gov.au         |
| 5. Gary Meyers         | -CSIRO, Chair, IOP         | gary.meyers@csiro.au     |
| 6. Steve Cook          | -NOAA, Chair SOOPIP        | steven.cook@noaa.gov     |
| 7. Clark Candyce       | -NOAA, JCOMM, Paris        | c.clark@unesco.org       |
| 8. Sidney W. Thurston  | -NOAA OCO                  | Sidney.thurston@noaa.gov |

## SUMMARY

The National Institute of Oceanography (NIO), together with US NOAAs Office of Climate Observation (OCO) conducted a three day workshop "IOGOOS / JCOMM Western Indian Ocean XBT Training Workshop at Goa, India from 5 to 7 October 2005. The main objectives of this workshop are: (a.) capacity building for XBT observations in the western Indian Ocean, and (b.) to remedy this revitalizing the dormant IX-8 XBT line and other high-priority XBT lines as determined by the IOGOOS/CLIVAR Indian Ocean Panel.

A total of fifty participants from different countries: India, US, Australia, South Africa, Sri Lanka, Malaysia, Indonesia, Seychelles, Mauritius, China, Nigeria and Kenya participated in the workshop. The Intergovernmental Oceanographic Commission (IOC), Paris, France, supported the workshop with complete funding through its Regional Office in Perth, Australia. The Shipboard Environmental data Acquisition System (SEAS) equipment was procured and demonstrated at the workshop. At the end of the workshop, SEAS related equipment was left with NIO, Goa with the hope that NIO would use this equipment while re-establishing the Western Indian Ocean XBT line (IX-8, Bombay - Mauritius) by the NIO personnel.

On 5 October 2005, the workshop was traditionally inaugurated by Dr V. S. N. Murty, Dr Sidney Thurston, Dr Gary Meyers and Dr Steven K. Cook. A few scientific sessions were conducted, discussing the results emerged with the XBT data in the Indian Ocean along various shipping routes. Also discussed were the individual countries R&D activities. Further, representatives from several shipping companies, officials from the Directorate of Customs and Central Excise, departments had a focused discussion on the shipping and customs procedures required for importing XBT equipment and installing XBT equipment onboard cargo ships steaming out of India. On 6 October 2005, Dr Steven Cook demonstrated how to install data transmission system onboard cargo ships, as well as how to use the SEAS software for transmitting the XBT data. The technical staff and Research Scholars were asked to handle the Data Transmission system and given hands on experience. Discussions were also held on the XBT data quality control measures. In the latter half of the day, participants visited the NIO and attended the seminar by Dr Gary Meyers on "*The years of El Nino, La Nina and interactions with the tropical Indian Ocean*". The concluding session of the workshop was held on 7 October 2005, and a draft Goa Plan of Action 2005 was proposed and presented by Dr Sidney Thurston. This plan of action outlined specific milestones necessary to achieve the principal goal of the workshop, which was to re-establish IX-8: Mumbai-Mauritius XBT line recommended by the IOGOOS/CLIVAR Indian Ocean Panel for Climate (IOP) and to present these observational results at the next IOC/WMO Ship Of Opportunity (SOOP) Meeting.

Dr Sidney Thurston presented "*An overview of the workshop*" and briefed a few of the ongoing and emerging partnerships in this part of the world between the NOAA and regional Colleagues such as India, China, Indonesia and Japan. During the course of the discussion it was emphasized that on the global map of XBT lines, the western Indian Ocean is currently under sampled. In conclusion, Dr Thurston mentioned that the NOAA had undertaken a major initiative to implement increased global ocean observations for the GEOSS, and the UNFCCC via the GCOS Implementation Plan (GCOS-92), to include the Indian Ocean, and was looking forward to working in close collaboration with regional Institutes and other regional partners to provide the needed global coverage for not only climate applications but other marine services and extreme events such as weather prediction, global and coastal ocean prediction, marine hazards warning, transportation, marine environment and ecosystem monitoring. Dr Thurston emphasized that there are many opportunities for fruitful Indian Ocean partnerships, the NOAA seeks to engage with regional colleagues and we look forward to building this system together.

Following Dr Thurston's presentation, Dr Gary Meyers presented briefly on, "*The XBT Network-an element of the sustained observing system in the Indian Ocean*". The Indian Ocean Science Drivers are towards improved description, understanding and ability to predict seasonal monsoon, break-periods and ocean-interaction, Monsoon - ENSO- Indian Ocean Dipole interactions and decadal variability and warming trends.

Dr P. Sanjeeva Rao and Dr Somasundar, representing the Department of Science & Technology and

the Department of Ocean Development, respectively, described various ongoing sustained observational programs funded by their departments such as, the Indian Climate Research Programs (ICRP), Bay of Bengal Monsoon Experiment (BOBMEX) and Arabian Sea Monsoon Experiment (ARMEX).

Mr Steven Cook described the broad JCOMM structure, wherein the SOOPIP is an activity related to oceans, and mentioned the current SOOPIP participants. The broader goals of SOOPIP are to: 1.) Review, recommend on and, as necessary, coordinate the implementation of specialized shipboard instrumentation and observing practices dedicated to temperature and salinity measurements, 2.) Coordinate the exchange of technical information on relevant oceanographic equipment and expendables, development, functionality, reliability and accuracy, and survey new developments in instrumentation technology and recommended practices, 3.) Ensure the distribution of available programme resources to ships to meet the agreed sampling strategy in the most efficient way, 4.) Ensure the transmission of data in real time from participating ships; ensure that delayed-mode data are checked and distributed in a timely manner to data processing centres, 5.) Maintain, through the SOOP Coordinator, appropriate inventories, monitoring reports and analyses, performance indicators and information exchange facilities, 6.) Provide guidance to the coordinator in his support for the SOOP, and 7.) Annually prepare a report on the status of SOOP operations, data availability and data quality.

Mr Cook further presented the future plans of SOOPIP, which are as follows: 1.) XBT Recorder inter comparison experiment (Summer 2005), 2.) NOAA (Hand & Auto-launcher), 3.) CSIRO (Devil System), 4.) SIO (Autolauncher), and 5.) Sippican (Hand launcher). The science drivers for the support of specific XBT Lines were based on the recommendations from “The Upper Ocean Thermal Network” paper published in the document “Observing the Oceans in the 21st. Century” (published in 2001).

Mr Cook further elaborated the issues concerning the Indian Ocean for XBT observations.

- Line support “Ownership”;
- Logistical problems;
- Shipping Companies and Agents;
- Customs delays;
- Shared expenses.

Dr Regina Folorunsho, a Member of the JCOMM Management Committee (MAN), Nigeria, presented the JCOMM initiatives for the XBT observations in detail, starting with the function of JCOMM, its global organization, its concerned program areas, and XBT activities. The JCOMM provides international, intergovernmental coordination, regulation and management mechanism for operational oceanography and marine meteorological observations, and data management and services systems. One of the activities of global organization of the JCOMM is its major focus on capacity building and implementation assistance for services.

The JCOMM’s Ships-of-Opportunity Programme (SOOP) is the most relevant to the present workshop. The SOOP’s primary goal to fulfill upper ocean data requirements from ships of opportunity (SOO). Its data management is handled through the Global Temperature Salinity Profile Programme (GTSP). Other types of measurements include: pCO<sub>2</sub>, phytoplankton concentration and collection of data using Thermosalinograph (TSG), Expendable Conductivity-Temperature-Depth probe (XCTD), Conductivity-Temperature-Depth probe (CTD), and the Acoustic Doppler Current Profiler (ADCP). The JCOMM supports many other operational needs (e.g., fisheries, shipping, defense, etc.) through the provision of upper ocean data for data assimilation in models and for various other ocean analysis schemes.

### **Scientific presentations on the regional XBT programs**

**Dr Gary Meyers** in his address, presented the scientific results along the IX01 (Perth, Java) and IX12 (Perth, Red Sea) XBT lines in the Indian Ocean, with which data he and his colleagues worked extensively **Dr Lisa Cowen**, Marine Operations Group, Australian Bureau of Meteorology, presented a detailed account on the Australian XBT SOOP. Dr Cowen described the status of the Australian XBT SOOP, including the real-time XBT data transmission. **Dr V. V. Gopalakrishna** presented the highlights of the ongoing Indian XBT program. **Dr Murty** briefly presented the scientific results documented from

the XBT observations along IX-08 (Mumbai, Mauritius). **Captain Praveen Kumar**, the official representative from the Shipping Corporation of India, Mumbai, presented issues regarding shipping procedures and clearances required onboard merchant ships. Mr Mukund Shinde presented the Indian customs procedures for handling and clearance of scientific equipment, including the XBT probes.

Professor Chris Reason, Department of Oceanography, University of Cape Town, South Africa, presented South African research interests in the Western Indian Ocean. Dr Mitrasen Bhikhajee, Director of Mauritius Oceanographic Institution (MOI), presented the various projects undertaken by the Institute, from the year of its inception in January 2000. Dr Charles Magori, Dr Rita, Mr Xiang, Dr Arulananthan, Mr. Roland Azemia, Mr Ashok Paul made brief oral presentations regarding their activities in their respective institutes.

### **Demonstration of Shipboard Environmental (Data) Acquisition System (SEAS)**

**Dr Steven Cook** provided a presentation on the SEAS and AMVER/SEAS 2000 to the participants. The demonstration for hand on experience was conducted at NIO. Mr Steven Cook introduced the Automated Merchant Vessel Reporting program (AMVER)/Shipboard Environmental data Acquisition System (SEAS) 2000, including details regarding the set up, operation, transmission and archive of the XBT data. The AMVER/SEAS 2000 was the improved version as it was based system to Windows, and provides a method for the real-time transmission of meteorological, oceanographic and AMVER messages from vessels at sea.

### **Concluding session and proposal of the Goa Plan of Action 2005, by Dr Sidney Thurston**

In concluding the workshop session, all members were asked to express their thought and suggestions regarding the workshop proceedings. Dr Sidney Thurston began the discussion by presenting a draft Goa Plan of Action 2005. Dr Thurston emphasized that 24000 XBTs in a year was required for a perfect deployment in the global oceans. As per the Goa Plan of Action 2005, the planning, organization of Western Indian Ocean XBT Training Workshop, Goa, India, and the shipment of SEAS equipment from IOC to NIO, to help revitalize IX-8 in the Western Indian Ocean had been completed. The NOAA also proposed a series of additional milestones (outlined in the Goa Plan of Action 2005) with regard to the commencement of XBT observations along the Mumbai, Mauritius shipping route (IX-8), including: supporting the Inmarsat Communications Costs for data transmission when SEAS was put to use, and the shipment of five cases XBTs to the NIO to support 50% of the XBTs for the IX-8.

The future proposals of the NOAA, with regard to the enhancement of the XBT observations in the Indian Ocean, were presented in the Goa Plan of Action 2005, and included the planned Eastern Indian Ocean Capacity Building Workshop, Use of Ocean Observations to Enhance Sustainable Development, Bali in early 2006, a proposed follow-up on the Western Indian Ocean Training and Capacity Building Workshop in Mauritius in June 2006, and the SOOPIP Meeting at the SOT-4, where the results of the revitalized IX-8 line will be presented along with other Indian Ocean XBT Lines in October 2006.

### **Suggestions**

- (1.) The future workshops should cover a session on the XBT data analysis and techniques for the members who were not familiar with XBT measurements and their utility;
- (2.) A 3-tier XBT training involving the: (i.) use of SEAS software, (ii.) Quality Control (QC) of XBT data, and (iii.) data analysis techniques.

### **Outcome/Recommendations from the workshop**

All participants expressed the immediate resumption of IX-8 (Mumbai, Mauritius) XBT transect for the sustainable XBT observations along this line, that helps to cover the equatorial and Western Indian Ocean in the context of Indian Ocean climate and monsoon variability research.

This workshop targeted a wide range of participants from Operational Managers and Technical Support staff from regional (Indian Ocean) XBT programs. Additionally, shipping agents, scientists, transportation officials, ship crews, port ship greeters, Port Meteorological Officers (PMO) and other personnel will be trained in logistical and implementation topics such as receiving XBT shipments, facilitating their clearance through customs, delivering the shipment to the appropriate in-country agency and then forwarding it to ports for deployment, coordinating with port authorities, installing equipment on ships, XBT deployment, SEAS Training and other operations and logistics related to XBT operations.

**Following are the proposed milestones by Dr. Sidney Thurston for the 'Goa Plan of Action 2005'**

- 1 March 2006: Eastern Indian Ocean Capacity Building Workshop, Use of Observations to Enhance Sustainable Development, Bali
- 1 April 2006: IX-8 Operational, Unrestricted Data Available in Real-Time Over GTS and the Internet
- 1 June 2006: Follow-up Western Indian Ocean Training and Capacity Building Workshop in Mauritius
- 1 October 2006: SOOPIP Meeting at SOT-4, IX-8 Results Presented along with Other Indian Ocean XBT Lines

**List of Participants to the workshop**

Dr Sidney Walter Thurston III (Office of Climate Observation, NOAA)  
Mr Steven Kenneth Cook (OAR, AOML)  
Dr Gary Albert Meyers (IOC Indian Ocean Panel – Chairperson)  
Dr Regina Folorunsho (Institute for Oceanography and Marine Research, Nigeria)  
Dr Alui Bin Bahari (Director of Marine Meteorology and Oceanography, Malaysia)  
Ms Anastasia R T Dwi K (Research Center for Maritime Territories and Non-living Resources, Jakarta)  
Dr K. Arulanathan (National Aquatic Resources Research & Development Agency, Sri Lanka)  
Dr Christopher James Charles Reason (University of Cape Town, South Africa)  
Dr Lisa Cowen (Bureau of Meteorology, Melbourne, Australia)  
Dr Mitrasen Bhikajee (Mauritius Oceanography Institute, Mauritius)  
Mr Roland Thomas Azemia (Seychelles Fishing Authority, Seychelles)  
Mr Baoqiang Xiang (The First Institute of Oceanography, China)

**Indian Participants**

Dr S. R. Shetye  
Dr V. S. N. Murty  
Dr V. V. Gopalakrishana  
Dr N. B. Bhosle  
M. D. Rajagopal  
Raju Armugam  
Captain Praveen Kumar  
Jagdish Narayan  
Y. K. Somayajulu  
A. J. Luis  
Shailesh Naik  
Prabhudesai  
Prasannakumar  
MSS Sarma  
Arif Sardar  
Gracias  
Sanjeev Rao  
K. Somasundar

Commander Sarangapani  
15 research students.

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## APPENDIX

### RESUMPTION OF IX-8 XBT OPERATIONS

One of the major recommendation offered during the IOGOOS & JCOMM Western Indian Ocean XBT Training Workshop held at Goa, India, was resuming XBT operations along the IX-8 (Bombay – Mauritius transect) as soon as possible. Since then, Dr Gopalakrishna, Principal Investigator of the Indian XBT Program, has pursued this issue with several relevant shipping companies. After much discussion, Ms Reederei Alnwick (Harmstorf & Co. Hamburg), has agreed to provide free passage onboard their container vessel ***M. V. Delmas Kaveri***. This container vessel regularly makes round-trips from: Bombay-Maldives-Seychelles-Mauritius- Madagascar-Dutban-Mambasa-Bombay. The round-trips typically take approximately 35 days. Though this seems like a very long period of time, one can deploy the XBTs during the onward and backward journeys.

The first XBT voyage is planned for 5 March to 10 April 2007, and two scientific personnel from the Indian XBT Project are joining the vessel at Mumbai on 5 March 2007. During the IOGOOS Workshop, though it was recommended to transmit the XBT data in real-time, this will tried to be done from the second voyage onwards. The MK21-USB kit provided to the NIO during the workshop, is not currently operating, noting that there are electronic issues to be fixed. Also, the Indian XBT Project personnel are determined to continue these XBT measurements along the IX-8 transect in the future.