SEAS-XBT-TSG AOML Meeting on Coordination of Operations
Miami, FL
May 12-13 2009

Logistics:

- The meeting will be held in the first floor conference room at AOML, 4301 Rickenbacker Causeway.
- Coffee breaks will be served at AOML on Tuesday and Wednesday. Lunch at RSMAS across the street from AOML (not provided by AOML).
- There will be a dinner hosted by Bob Molinari on Tuesday at 6:30pm. Details will be provided the first day of the meeting.
- The agenda is flexible and can be modified at any time.
- Presentations are 1-3 slides, 2-3 minutes unless otherwise stated. Please email FB one paragraph (~10 lines) with the summary of your talk, not later than May 1.
- Gustavo Goni's cell phone: 305-450-5518, office: 305-361-4339.

PRELIMINARY AGENDA - DAY 1 (SEAS / XBT)

Tuesday, May 12 (9:00am - 12:00 noon, 1:30pm - 6:00pm, coffee breaks: 10:30 - 10:45am, 3:30pm - 3:45pm) ****** 8:30am if you need to upload your presentation in the laptop.**

Tuesday, May 12 (12:15pm – 1:15pm): Suggested lunch at Bill Baggs State Park (not provided by AOML) ****** 10:30am: group picture outside AOML.**

REPORTS AND DISCUSSIONS ON SEAS AND XBT OPERATIONS
2-3 minutes (1-3 slides) for each report
Moderator: Francis Bringas

1. Status, plans and goals of LD/FR XBT transects (GG, MB)

2. Status, plans and goals of HD XBT transects (GG, MB)

   NOAA/AOML is currently involved in one or more aspects (probe purchase, deployment, data quality control and transmission) of approximately 90% of the global XBT operations. This presentation will show the international effort to carry out global XBT transects, including the countries and institutions responsible for the deployments. It will then focus on the AOML XBT transects for all three different modes of deployment.

3. Status and recruiting of ATL/PAC LD/FR transects AX08, PX08, AX10, PX50 (JF)

4. Status and recruiting of ATL LD/FR transects AX07 (SP)

5. Status and recruiting of PAC LD/FR transects PX13/09, PX44-10-37 (CW)

6. Status and recruiting of PAC LD/FR transects PX26 (SN)

7. Status and recruiting of International LD/FR collaborations (GG)

   AOML collaborates with institutions in several countries to carry out XBT transects. This collaboration is in the form of probe donation or by sharing the operations. Among them are

France/IRD, Noumea/IRD, Brazil/FURG, ZAF/UCT, Australia/BOM, Argentina/SHN, NOAA/NMFS. This presentation will show the status of these collaborations and where these institutions deploy the XBT probes.

8. Status and recruiting for HD transects AX08, AX18, AX10, AX07 (RR, JF)

9. Status, QC and web pages of AX98 (YD)

AX97 line has started as a result of international collaboration of high density XBT observation program, Ship-of-Opportunity Program (SOOP) when Steven Cook and Bob Molinari were in charge of AOML's GOOS Center. Since then, AOML has provided XBT's to Mauricio Mata of Fundação Universidade Federal do Rio Grande (mauricio.mata@furg.br) to study the Brazilian current off from east coast of Brazil to Trindade Island. This line was called AX98 and changed to AX97 about two years ago. Since August 2004, 16 legs of datasets are available and the total number of XBT is 696 as of April 2009. QC of AX97 line consists of following tests: waterfall plots, speed check, location check, climatology check, and sectional plot. All profiles are visually checked.

10 AX25 logistics, contracts, etc (RR, SG)

11 XBT operations on the Reykjafoss (DS2)

The Reykjafoss hosts 1 scientist 4 trips per year, Iceland to Newfoundland who drops Deep Blue XBTs, and collects water samples. The officers drop T-4 XBTs between Cape Sable and Boston, 14 trips per year. Equipment: Pentium II PC, Sippican hand launcher, MK 12 XBT recorder and the ships Trimble 200 GPS. Software: DOS and AMVERSEAS IV.

12 Status and plans of ship list (PC, JT)

13 HD riders, cruise plans and reports (RR, UR, SP, SD

14 Greeters and reports (JF, SP, RR, CW)

15 Visit to Sippican and the Fisheries laboratory. (JF) - *10 minutes*

16 Operations, set-up equipment HD transects (RR, AS, JF)

17 Operations, set-up equipment LD/FR Pacific transects (CW, SN)

18 Operations, set-up equipment LD/FR Atlantic transects (JF, SP)

19 New hardware: Extended AL, Iridium package, HD laptop, MK21 prototype (UR, AS, PP, KS1, SP)

This presentation is going to cover the use of the new extended auto-launcher with the deeper XBT probes. Additionally, the pros and cons of different Iridium packages available on the market will be compared, as well as the advantages of using laptops over desktops computers on high density lines. Also, another option for converting the XBT analog signal to digital will be discussed.

20 Equipment and budget recommendations for FY09 and FY10 (UR, SP)

This presentation is going to cover the current equipment inventory and future plans for new equipment, as well as the recommended equipment budget for FY09 & FY10.

21 XBT Operations on the Oleander (DS2)

The Oleander owners have said that they are "very interested in ocean science". The Oleander hosts 1 scientist per month, who drops XBTs, collects water samples, records the Plankton Recorder and XBT logs, and who is expected to keep the TSG and Iridium running. T-4 XBTs are dropped on the shelf and Deep Blues offshore, 1 per hour to the Gulf Stream Southbound and from 35°N Latitude, hourly for 18 hours Northbound. Equipment: Shuttle PC, Trimble 100 GPS, Sippican MK 21 USB, Iridium transmitter. Software: Windows XP Professional and AMVERSEAS2000 for Iridium and TSG.

22 Delayed-time data downloading, FR and HD transects (SP, JF)

23 Upgrades to SEAS (JR, PC, PD)

24 Transmission, SEAS 2000 (JR, PC)

25 Manuals and troubleshooting on SEAS 2000 and equipment set-up for HD mode (PP, JR, PD)

A manual with troubleshooting instructions has been developed for the setup and operation of the AOML Autolauncher and SEAS2K in high density mode. This manual covers typical problems during setup, such as not connectivity between the PC and the Autolauncher, or lack of GPS signal.

26 Manuals and troubleshooting on SEAS 2000 and equipment set-up for FR mode (SP, JR)

27 Migration to Iridium (PC, SP, UR, JR, PP, JF)

28 Iridium costs: Theory vs. Reality (SP, UR, PC, JR, PP, KS1, JF)

29 Data reception, tracking in Silver Spring and AOML (FB, GS)

The data tracking operation is currently being transitioned from NOAA HQ to AOML. The aim of this operation is the verification of data flows from the source (observation platform) to the processing centers, where the data is analyzed, quality controlled, and sent to the Telecommunication Gateway at the National Weather Service (NWS) from where the data is inserted into the Global Telecommunication System (GTS). Since this is a very complex process, the tracking of these data ensure that the information obtained by different observation platforms are received and that they are generated with the correct format so that it can be successfully disseminated through the GTS. Otherwise the data cannot be used or, if communication problems are not detected, lost. The flow of different kinds of oceanographic data, including XBT, TSG, buoys, drifters and TAO/PIRATA arrays is verified. Among the several problems that may occur, the most common are:

- Specified platform type not expected from a specific group of headers.
- Data received from ships with unknown Call Sign.
- Observations transmitted with wrong date/time.
- Duplicate data being sent.
- Data drops: the data is transmitted but it is not reaching its destination.
- General errors in data codification and format.

When a problem is found (in data format or transmission) the type of data and the source is determined and the person responsible is contacted. This is a daily process.

30 SEAS XBT Auto-QC Operational System: responsibilities and required IT skills (RS)

31 Automatic XBT QC at AOML (YD, RS)

The quality control procedures on the real-time data are automatic and its routines derived from the ARGO automatic QC. The QC'ed data are delivered to users within 24 hours. Any profiles that failed the auto QC is visually QC'ed by an operator. There are 9 tests available that are performed in the following order:

- Constant value check
- Gross check
- Impossible Date check
- Impossible location check
- Vertical Gradient check
- Spike check
- Pressure Increasing check
- Climatology check
- Analysis check

32 Current visual QC at AOML (FB)

The Visual Quality Control (VQC) is currently performed at AOML using a MATLAB based software developed at AOML. The objective is to approve or reject XBT profiles that have not met the minimum specified standards of the Automatic Quality Control (AQC) system. Only profiles accepted in the VQC are sent to the GTS. AOML does a VQC for an average of 4 profiles every day, which can vary dramatically if there are high-density cruises being done or communication problems. A useful advantage of the VQC is the real-time ability to recognize systemic and random problems with the XBT operations, such as electrical faults in the XBT hand-launchers, or bad weather carrying the XBT wires to contact the hull of the ship. The AOML VQC system is an upgrade to the previous VQC MATLAB script used in Silver Spring until recently, with additional functions incorporating geographical position, proximity to other profiles in time or location (including observations from CTD and profiling floats), information about the reason these profiles were rejected in the Automatic Quality Control, and an easy to use Graphical User Interface (GUI). The VQC GUI also allows the user to evaluate the profile based on seeing error envelopes for both 5 and 10 standard deviations. Additionally, all flagged profiles in the queue are shown in a secondary graph to easily visually compare physical features. The GUI has user-friendly mouse enabled features such as zoom and profile selection.

33 Current QC of HD transects (QY, MB)

34 RT XBT Data transmission into GTS (PC, JT)

On a regular basis, RT profiles passing the AQC or VQC checks are inserted into the GTS for global distribution. The entire process consists of two main phases: create the report following the FM63 XI Ext. BATHY code form and send it to the NWS Telecommunications Gateway, the communications section of Washington's World Meteorological Center, for worldwide dissemination.

35 DT XBT Data transmission into GTS - Brazil, India, France (JT, PC)

The percentage of RT XBT profiles being distributed through the GTS has steadily increased during the last years. However, a number of XBT measurements don't fit the standard RT processing. These profiles, received at AOML within days or weeks from the date of observation, don't meet SEAS2K format and usually don't include all the metadata required to build the BATHY bulletins. This presentation will describe the procedures developed to process these profiles and the steps required to make them available to the user community.

36 SEAS XBT QC reports (JT)

The overall SEAS XBT QC process involves two main elements: AQC and VQC. Profiles passing one of these tests are marked for transmission to the GTS. Procedures have been developed to quantify the profiles in each stage of the process, including the bulletins collected from the GTS. The objectives are to monitor the performance of the collection and processing systems, and detect anomalies (and report them) in any part of the data flow. Results are available online in tabular and graphical form.

37 AOML Database (PC)

38 NODC Delayed Time Data submission (PC) - *10 minutes*

39 SEAS monthly and annual reports (JT, SP)

This presentation introduces the reports being produced to monitor the operations of the SEAS XBT network. In PDF and HTML formats, in graphical and tabular forms, in per line and per ship representation, these reports summarize the monthly stats during a one-year period. Additionally, the reports provide links to the metadata for each individual profile as required by JCOMMOPS.

40 Metadata and Migration into BUFR format (JT)

WMO requires the migration from the Traditional Alphanumeric Codes (TACs) to Table Driven Code Forms (TDCFs). The latter are more flexible, self-described and support higher resolution and accuracy. This presentation will describe the progress and challenges of migrating from TACs to BUFR, as well as WMO requirements regarding the validation of new entries to BUFR tables.

TAC to TDCF migration implies the definition of a new template for XBT data. This new template incorporates metadata elements that must be managed by the new procedures, including QC flags for the whole profile and for each individual depth. The updating and maintenance of the associate metadata is a real challenge that should be addressed at the same time the migration tools are developed.

41 Brochures and XBT Bibliography (SP)

42 Google Earth (JT)

GE provides a simple, easy and usable interface for displaying environmental datasets. On a daily basis, AOML/PhOD generates GE files showing the status of the GOOS, including global marine and meteorological measurements. The interface allows to animate the time distribution of measurements and provides precise control over the overlay of geographic features.

43 Web pages (QY, PD)

PhOD maintains two websites related to HD and LW/FR XBT lines respectively. These websites present information on the operation of the XBT lines, access to data related to the ocean conditions during HD lines, and important documentation for ship riders.

44 Scientific projects (BM, GG, MB)

The large number of manuscripts published using temperature profiles from XBT transects highlights the importance of this project. Key scientific results obtained from XBT observations, mainly from high density XBT transects, will be presented here.

45 Future of XBT transects, OceanObs09 (GG)

(Tuesday May 12, 6:30pm: Dinner hosted by Bob Molinari)

PRELIMINARY AGENDA - DAY 2 (SEAS / TSG)

Wednesday, May 13 (9:00am - 12:00 noon, 1:30pm - 6:00pm, coffee breaks: 10:30 - 10:45am, 3:30 - 3:45pm) ****** 8:30am if you need to upload your presentation in the laptop.**

CONTINUTATION OF XBT DISCUSSIONS

REPORTS AND DISCUSSIONS ON SEAS AND TSG OPERATIONS
2-3 minutes (1-3 slides) for each report
Moderator: Francis Bringas

1. TSG Operations, plans and goals (GG)

   This presentation will show the status of the current TSG operations, with emphasis on ships and transects that have AOML equipment. There is currently one cargo ship (the Oleander) with a TSG installed, two cruise ships (SAS Explorer and RCCL Explorer of the Seas), several projects for installation (Skogafoss replacement, Pacific ship, Bernard Houssay), several projects to transmit already installed TSGs (Walton Smith) and the collaboration with OMAO to transmit the data from ships of the NOAA fleet.

2. Status and plans of operations in Oleander (DS2, JF, JR)

   The importance of TSG observations has been shown in several manuscripts produced by the scientific community, mainly France. The future of the TSG operations depend on a) how well we can accomplish our goal of maintaining several repeated transects, b) how well we can maintain the operations to make TSG observations a successful data source for scientific and operational research. One key goal at this moment is to also make the broad scientific community aware of this effort and of its value.

3. Status of Oleander TSG tapes (DS2)

   Seabird 21 TSGs were installed on the Oleander in about 1994 using David Bittermans Fortran TSG software the latest being TSG-2004.exe. The data collected before the year 2000 became missing after the AOML and Narragansett staff who ran the program left the 2 labs. Recently several obsolete optical disk cartridges were found labeled as TSG disks. They were sent to a data retrieval contractor who copied the data onto a DVD. A copy has been FedExed to AOML. An orderly arrangement of TSG files will be attempted.

4. Status and plans of operations in Reykjafoss (DS2, KS2)

   Reykjafoss is presently hosting a French U. Paris scientist 4 trips per year Reykavik to Argentia, NFL, who will be able to collect TSG calibrations. Continuous Plankton Recorders equipped with Vemco TDR temperature recorders are towed at 10 M, Cape Sable to Boston, 14 trips per year. Rik Wanninkoff has requested permission from the owners to install a TSG and pCO_2 system. The owners have not yet responded.

5. Water sampling: Skogafoss, Oleander, and M/V Explorer (DS2, EW)

   24 water samples per month have been collected from the Oleander and Skogafoss, one set of 6 from low salinity coastal water and 3 sets of 6 from open ocean higher salinity water. Oleander samples are collected 12 trips per year. The Skogafoss samples were collected 4-5 trips per year until June 2007. The Reykjafoss will not collect any unless a TSG is installed.

6. Status and plans of operations in Pacific (CW)

7. Status and plans of operations in Explorer of the Seas (DP, KS2, SC, EW, RZ)

8. Status of operations in M/V Explorer – operations manual (SP, UR, PP, KS1, GG)

9. Status and plans of operations in ships of the NOAA fleet (TS) - *10 minutes*

10. TSG Data downloading (JF, CW, DS2)

11. Equipment and inventory - hull mounted temp sensor (SP, CW)

12. Test equipment at AOML (PP, SP, UR)

13. Seakeepers (GM) - *10 minutes*

Seakeepers operates a fleet of 55 platforms including 5 NOAA Marine Sanctuary vessels, 5 cruise ships; two research vessels, a USCG ice breaker, commercial ships, several piers and more than 35 private yachts. The AVOS-like systems collect met data, with TSG, and other modular sensors, most typically DO, pH, Chlorophyll, CDOM and turbidity. The data is logged every minute; composite data samples are transmitted every 3 hours. This decade-long initiative has been funded by private donors. The current economic crisis threatens to end the private support, putting at risk the data collected, as well as the network of systems, with their potential for continuing cost effective data collection for both research and operational applications.

SeaKeepers is proud to have demonstrated that:

- An AVOS-like system can handle other data parameters, most notably ocean data.
- The total cost to build, deploy, operate, and maintain such a network is very inexpensive due to the vessels / platforms of opportunity concept.
- The variety of parameters measured and the accuracy are limited only by the ever-changing technology
- The “plug and work” integrating sensor platform, utilizing common: flow through seawater; data bus; power; and telemetry, offers significant efficiencies in the overall cost of multi-parameter data acquisition and distribution.
- A compact system can serve operational as well as research needs, and that data need not be compartmentalized into met, ocean, or climate.

SeaKeepers invites both institutions and governmental agencies to support the continuation of this initiative. Commercial companies are similarly invited to assume responsibility for the on-going engineering and manufacture by way of a license agreement.

14. Water sampling archiving (SP, FB)

15. SEAS 2000 for TSG, including MV Explorer Iridium transmissions (JR, PC)

16. Transmission of data in real-time, NOAA fleet (TS, FB)

17. Transmission of data in real-time, cargo ships, Iridium costs (PC, JR, SP, CW)

18. Iridium costs: Theory vs. Reality (PC, SP, UR, JR, PP, KS1, JF) - *10 minutes*

19. TSG Data Management at NODC (CP) - *10 minutes*

There are many benefits to archiving TSG data (such as, it allows the oceanographic community to use a project's data long after the project ceases to exist). The NOAA National Oceanographic Data Center (NODC) preserves and disseminates ocean data, including TSG data, in their Ocean Archive System (OAS; http://www.nodc.noaa.gov/Archive/Search), which follows the *Reference Model for an Open Archival Information System (OAIS)*. NODC (the *archive* in the OAIS) is at various stages of the archival process with the following projects and organizations that hold TSG data (the data producers in the OAIS): NOAA/OMAO, GOSUD, NFRDI, SAMOS, NOAA/AOML, NOAA/PMEL, and SeaKeepers.

In addition, NODC maintains the Shipboard Sensor Database (SSD) product, which currently holds and disseminates underway surface meteorological and TSG data from NOAA/OMAO. NODC's tentative plans call for including underway data from other projects and organizations in the SSD.

NODC would like recommendations from the participants at this meeting on which directions to take with respect to TSG data (e.g., what other data and information to archive and recommendations for developing a useful TSG data product).

20. Data quality control in real-time and delayed-time and insertion of NOAA fleet and SOOP data into the GTS (FB)

During the last three months AOML has received TSG data from two ships of the SOOP (MV Explorer and Oleander) and ten ships of the NOAA fleet. After properly downloaded, these data is quality controlled (QC) through several procedures based on the ten GOSUD (Global Ocean Surface Underway Data Pilot Project) real-time control test. Among other parameters, the QC procedures check the data for errors in date, location, platform identification, ship speed, global and regional temperature and salinity ranges compatibility, gradient and the presence of spikes. The TSG data is also compared with a monthly climatology (Levitus 2005) and against the NCEP (National Center for Environmental Prediction) weekly analysis fields. The data approved in the QC tests is then reduced to one point every three minutes, transformed in TRACKOB messages and inserted into the GTS. This new system is fully functional in real-time and will be also processing data in delayed-time during 2009, providing important tools to automatically detect problems in data transmission, equipment calibration and marine operations of the NOAA fleet in general.

21. TSG Data Tracking, QC reports and Web Pages (FB)

22. Metadata and Migration to BUFR (JT, FB)

Current TRACKOB transmissions to the GTS use the FM 62 VIII Ext. TRACKOB code form. Within the mandatory WMO migration to TDCFs, AOML is implementing tools to encode BUFR bulletins from TSG measurements, using delayed replication and the BUFR template for TRACKOB data approved by CBS Ext. 6.

24. Future of TSG work (GG, DS2, TS)

List of Participants

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