SEAS-XBT-TSG AOML Meeting on Coordination of Operations

Miami, FL

April 20 and 21, 2010

Logistics:

- The meeting will be held in the first floor conference room at AOML.
- Coffee breaks will be served at AOML on Tuesday and Wednesday. Lunch at RSMAS across the street from AOML (not provided by AOML).
- The agenda is flexible and can be modified at any time.
- Presentations are 5-10 slides, 5-10 minutes. Please email FB one paragraph (~10 lines) with the summary of your talk, not later than April 12.

DAY 1 (SEAS / XBT)

Tuesday, April 20 (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, April 20 (12:15pm – 1:15pm): Lunch at RSMAS across the street from AOML (not provided by AOML) ****** 10:30am: group picture outside AOML.**

Tuesday, April 20 6:30pm: Diner at Bill Baggs Cape Florida State Park

REPORTS AND DISCUSSIONS ON SEAS AND XBT OPERATIONS
5-10 minutes (5-10 slides) for each report
Moderator: Francis Bringas

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

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

3. (JF): Current status of ATL/PAC LD/FR transects
   a) AX08
   b) AX10
   c) PX08
   d) PX50
   For each of these transects:
   e) recruitment status
   f) equipment set up
   g) greeters
   h) reports
   i) delayed-time data downloading

4. (JM): Status of ATL LD/FR transect AX07: recruitment, equipment set up, greeters, reports and delayed-time data downloading. XBT equipment inventory

Greeters: Communicating with the crew of the volunteer ships assisting in the XBT operations between Barcelona and Port Everglades is vital to the SOOP. Because the crew sometimes tend to forget the required tasks (e.g., frequency of drops), one of the things we make certain is that they stick to their sampling plan correctly. We send them reminders via email and PDF diagrams. During our visits to the ships, we also make certain that XBTs are replenished and the XBT data from the PC are archived. Any issues/problems with data transmission are dealt with by our engineers during these visits. Also, we continue to provide the volunteer crew with book and magazine donations.

XBT Equipment Installation/Setup: In December 2009, new equipments, in conjunction with the pCO_2 group, were installed on the MV Barcelona Express. The iridium antenna and modem were inside the pCO_2 instrument deck box. This would help minimize costs related to data transmission, as costs

could be shared by both groups. In January 2010, we also helped in the installation of the TSG equipment. Photos will be shown in the presentation.

Delayed-time data downloading: We are currently preparing a database using XBT binary data that were downloaded or archived from volunteer ships and stored in the GOOS folder. This data will be available in ASCII format. Ongoing activities include concatenation of XBT data in 2 databases.

Inventory of XBT/TSG/SOOP equipment: There is currently a database that we use for this purpose. It is the PHOD Inventory database (*http://172.16.100.19/realtime/inventory/*). This was created by Pedro Pena of PHOD. It contains information on equipment (CD numbers, Serial numbers, etc).

5. (CW): Current status of PAC LD/FR transects
   a) PX09 / 10 / 37
   b) PX13

   For each of these transects:
   c) recruitment status
   d) equipment set up
   e) greeters
   f) reports
   g) delayed-time data downloading

XBT FSR Pacific Transects PX 13 is continuing with a high turnover of ships. PX 13 is run from Long Beach to New Zealand southbound only. The last ship, the Cap Reinga was online for only 3 months before going offline. PX44/10/37 Horizon Hawk and Horizon Tiger from USWC to China are no longer dropping FSR XBTs, but the Horizon Hawk continues to carry SIO ship riders for high density XBTs four times a year from Oakland to Guam.

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

7. (RR): Status of ATL HD transects
   a) AX07
   b) AX08
   c) AX10
   d) AX18

   For each of these transects:
   e) recruitment status
   f) equipment set up
   g) delayed-time data downloading
   h) HD riders
   i) cruise plans
   j) cruise check list
   k) reports

AX07: We have permission to use all Hapag Lloyd ships on this route, however, we try to use the FR equipped ships, the Barcelona Express, and the Rome Express, for the additional back up gear available from the bridge equipment.

AX08: We continue to use 2 ships: Safmarine Oranje & Safmarine Ngami. These 2 also have a bridge set-up for FR.

AX10: Still using the Horizon Navigator.

AX17: We have permission to use 2 Hamburg Sud ships: Monte Azul & Monte Sarmiento. Durban-Rio westbound, Santos-Port Elizabeth eastbound.

AX18: We have just received permission to resume the Cape Town to Montevideo route with Evergreen chartered ships owned by Italia Marittima. The first run will be early June, on the ITAL Fortuna.

Equipment set-up for HD: All riders are assisted setting up in-port by an experienced rider, especially on a new ship. Any operational problems are addressed through email with our PhOD riders.

HD Riders: Usually AX08 & AX18 are staffed by our contractors from Argentina and South Africa, with AOML riders filling in rarely. AX07 & AX10 riders are from our dependable bank of PhOD seafarers.

I provide each cruise with its Cruise Plan, and each rider is responsible to send me the data and reports, which I disseminate.

8. (RR): AX25 logistics, contracts, etc

Contact has been through Dr. Isabelle Ansorge of UCT. Our AX08 contractor sets up the equipment, and instructs the technician on running the transects. This is staffed by UCT personnel aboard the R/V SA Agulhas, and we only provide the equipment and XBTs.

9. (DS): XBT operations on Oleander (AX32) and Reykjafoss (AX02)

NOAA NE Fisheries Science Center and NWS Marine Forecast volunteers ride the Oleander one trip per month. XBTs are launched, 1 per hour from the Ambrose pilot station to 35°N and 1 per 6 hours the rest of the way to Bermuda.

A French scientist volunteer rides the Reykjafoss 4 trips per year. XBTs are launched about 1 per 4 hours, 24, from Reykjavik Iceland to Argentia, Newfoundland. The Reykjafoss officers launch XBTs, 1 per 2 hours from Cape Sable, NS. To Boston, MA, thirteen trips per year.

10. (UR): New hardware for data transmission. Equipment and budget recommendations for FY10 and FY11

11. (PC): Iridium costs: Theory vs. Reality

12. (UR): Status of ARGO3 test for XBT data transmission

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

14. (QY): QC status of HD transect AX07 and AX18. HD QC issues

15. (YD): QC status of HD lines AX08, AX10, AX25 and AX97
    a) HD QC issues
    b) Changes to AOML HD QC
    c) QC recommendations: Comparison between AOML, Argo and CSIRO QC

QC Status of HD XBT lines:

- AX08 6 cruises in 2009 (219 profiles) and 1 cruise in 2010 (21 profiles).
- AX10 4 cruises in 2009 (378 profiles) and 1 cruise in 2010 (85 profiles).
- AX25 2 cruises in 2009 (365 profiles) and 1 cruise in 2010 (153 profiles).
- AX97 6 cruises in 2009 (219 profiles) and 1 cruise in 2010 (21 profiles).

Changes in AOML HD QC: A local climatology has been created for each AX line; this climatology has been applied to improve the HD XBT QC in addition to Levitus climatology. The improved XBT QC displays 25 closest profiles from local climatology to help QC and its locations in the map. This local climatology also has been identified as bad profiles missed from previous QC.

HD QC recommendations: The following tests are recommended to improve the HD XBT QC in addition to current tests:

1) Local climatology
2) Position on land test (ETOPO5)
3) Surface check test (We do not do anything at the moment.)
4) Duplicate test (We need to define time & location criteria as dup.)
5) Hit bottom test (Smith & Sandwell (z) vs. XBT(z))

16. (JM): Current visual QC at AOML. Future plans

Currently, AOML is in charge of the visual quality control (VQC) of near real-time XBT data in the SOOP. Although the VQC software that Juan Delgado had created in Matlab was efficient for the purpose, we decided to improve the graphical user interface (GUI) and streamline the VQC for convenience. In JD's older GUI, we removed items that we thought were redundant. An example is the procedure where the user has to respond to several questions pertaining to the profile being qc'ed before an email is sent confirming if it is a valid profile. We also included ETOPO1 bathymetry data (depth < 1000 m) in both the console and plot, which helped the analysis of observations in shallow regions. ETOPO1 is a global, integrated bathymetric–topographic, digital elevation model with cell size of 1 arc-minute (*NOAA Technical Memorandum NESDIS NGDC-24*). Another improvement that was implemented was the creation of a Matlab script that would easily port the VQC software from one PC to another.

17. (JR): SEAS 2000 and status of its transition to AOML/Miami

18. (IG): Status of SEAS 2000 XBT development, maintenance and upgrades at AOML/Miami

During 2009 the process to transfer the SEAS2000 software development from NOAA/HQ in Silver Spring to NOAA/AOML in Miami started. This is a difficult process taking into account the complexity of the system. The transfer from the applications Time Position Server, and TSG Server is completed. For the other applications that are part of the software, the transfer and training process is on progress.

As part of the training process the application PC Watchdog was implemented It will be attached to SEAS2000 once the training is completed. Documents that reflect concepts and ideas that can improve design and functionality of the software were written.

19. (JR): Manuals and troubleshooting on SEAS 2000 and equipment set-up for HD and FR mode

20. (PC): RT XBT data transmission into GTS

21. (MH): DT XBT data submission to NODC

This presentation is aimed to the discussion of the following topics:

- Why do we QC Real-time data? (We don't want bad data to go onto the GTS).
- What happens when fixes are applied to RT data stream? GTS? multiple copies. Policy?

- Is there a good reason to QC Delayed mode data? and
- What does NOAA/AOML want in the long term archive?
- How do we complete the SEAS data flow?
- Funding? Proposal to do Delayed-Mode data QC for long term archiving.

22. (JT): DT data transmission into GTS - Brazil, India, France

23. (FB): Data tracking

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

24. (JM): Monitoring of XBT goals

The goal of XBT Monitoring System Software is aimed to account for all the XBT probes released by AOML to its own riders and to various agencies that assist in AOML-supported transects. Close monitoring is required on whether the agencies/volunteer ships assigned to do the respective transects have actually executed or completed the transects, and whether XBTs were deployed at the nominal frequency required for each mode of observation (HD, FR, LD). To efficiently monitor the transects, a software was written using Korn shell scripting, GMT, sed and awk. XBT files (from both good & bad profiles) stored in the 'MET' server (/Wsmounts/d1/MET) were used in the code, where each file contains information on the ship call sign from which the XBTs were deployed, date/time and GPS positions of each XBT drop. Currently, the software is able to identify which mode of observation (HD, FR) ships are doing, and whether these ships are meeting the required frequency of observations by comparing the frequency with a nominal value for each mode. The software is also able to produce monthly reports of the number of XBT observations for each transect (in support of JT's monthly report). My goal is to automate the code on a weekly basis. Another goal is to improve on how the code automatically identifies the XBT transects that need to be monitored. Currently, the monitoring script is written such that the transect being performed is identified via the call sign of the ship plying that route, through a table that contains present and historical transect-ship relationships. In the next two months, I will write a code that not only identifies the transect automatically based on the ship call sign information, but also identifies the transect using information on the proximity of XBT drops of an ongoing transect to the nominal drops of known transects. Screen shots of the software in action will be shown.

25. (JT): SEAS XBT QC reports and SEAS monthly and annual reports. XBT data drops

26. (UR): Plans for AOML XBT database

27. (GS): Contracts: current state of each contract

28. (JT): Status on the migration into BUFR format

29. (YD) HD web page changes

The HD XBT web pages are redesigned and reorganized to have consistent appearance using PHOD template. The improved HD XBT web pages are especially designed to surf easily from one cruise to another. The improved H D XBT pages also show the XBT related pict ures, ship information, sea surface height (SSH) and sea surface temperature (SST) plots and its values. The latest PHOD web template has not been implemented yet.

30. (JT): Google Earth and Google Maps applications

31. (JM): Brochures and XBT Bibliography. The Oleander Project web page.

Brochures/XBT Bibliography: We currently have a brochure that we use for recruitment/educational purposes. Numerous scientific papers utilizing XBT data have been published. In early 2010 alone, 3 papers have already been published. (*http://www.aoml.noaa.gov/phod/goos/bib/index.php*)

Oleander Project web page: In December 2009, I started revising the web page information, by producing new plots. One problem that I had was how to correct the outliers (spikes) in the raw XBT temperature profiles fro m the AX32 transect. I wrot e a code (using Matlab and Korn shell) that removed the extreme outliers by comparing each raw temperature profile with climatological temperature profiles. The results of this pr ocedure can b e viewed in the followin g web p age: *http://www.aoml.noaa.gov/phod/goos/oleander/index.php*, where the XBT temperatu re profiles from 2000-2010 are grouped by month and by longitude. In this w ebsite I also produced other figures such as the map sh owing the location of MV Ol eander historical XBT de ployments, and the sea surface temperature (SST) for January 12, 2010 su perimposed on the regional bathymetry between New Jersey and Bermuda. One cont ribution to the web p age that I have in sight is producing a temperature contour plot using the latest XBT data between New Jersey and Bermuda.

32. (MB): Scientific projects

33. (CW): The Scripps High Resolution XBT Network

A primary scientific goal of the HR- XBT network is to determine whether interannual variability in t he transport of heat by ocean currents is a major contributor to the heat budget of the ocean and he nce to air-sea interactions and feedbacks in the climate system. Specific scientific objectives of the HR-XBT program are to:

- Measure the seasonal and interannual fluctuations in the transport of mass, heat, an d freshwater across transects which define large enclosed ocean areas.
- Determine the long-term mean, annual cycle and interannual fluctuations of t emperature, geostrophic velocity and large-scale ocean circulation in the top 800 m of the ocean.
- Obtain l ong time-series of temperature profiles along precisely repeating transects in ord er to unambiguously separate temporal from spatial variability.
- Determine the spati al and temp oral statistics of variabili ty of the temperature and geostrophic velocity fields.
- Provide appropriate in situ data (together with Argo profiling floats, tropical moorings, air-sea flux measurements, sea level etc.) for testing ocean and ocean-atmosphere models.
- Identify perman ent boundary currents and fro nts, describe their persistence and r ecurrence and their relation to large-scale transports.
- Estimate the significance of baroclinic eddy heat fluxes.

34. (GG): Future of XBT transects, OceanObs09

DAY 2 (SEAS / TSG)

Wednesday, April 21 (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
5-10 minutes (5-10 slides) for each report
Moderator: Francis Bringas

1. (GG): TSG Operations, plans and goals

2. (DS): Status and plans of TSG operations on Oleander
    a) water sampling
    b) data downloading
    c) equipment calibration

    Status: The TSG pump seal failed and was leaking. The Chief Engineer removed the pump and disassembled it and gave the seal to Dan. The local supplier is flooded. A replacement has been ordered.

    Plans: The Chief Engineer will repair and install the pump when the replacement parts arrive. The TSG and external temperature probe will be swapped with a recalibrated unit.

3. (KS2): Status and plans of TSG operations on Reykjafoss
    a) water sampling

4. (CW): Status and plans of TSG operations in the Pacific
    a) equipment
    b) data downloading

    TSG data has been acquired for PX13 and PX 44/10/37 in concert with PMEL pCO_2 installations. The Albert Rickmers PX13 has just gone offline with equipment uninstalled in Australia. The OOCL Tianjin on the USWC - China run went to dry-dock and offline in February 2010 and a new installation will be put on a sister ship on the same run this summer.

5. (SC): Status and plans of TSG operations on Explorer of the Seas
    a) equipment
    b) water sampling
    c) data downloading

    The Explorer of the Seas oceanographic and meteorological data collection is being transformed from a very “hands on” program to a highly automated program. Along the path, many instruments were removed because they could not be automated or maintained. Equipment that remained is all IP enabled. This includes the power strips so that a “hard reset” can be executed over the VPN from almost anywhere there is Internet access. Instruments and the sea water system are programmed to turn on and off under autonomous control. There are safety and error checks that will cause the

system to be shut down, place the sea water system in manual mode and report automatically. The system will be engineered to push small subsets of the data hourly to a RSMAS based server for distribution to the immediate scientific community. The GTS data streams for real-time meteorological and SST data transmissions will be re-initiated. To date over 355 cruises have been completed and data from these cruises have been reported in more than 130 papers and presentations.

6. (PP): Status of TSG operations in M/V Explorer
   a) equipment
   b) operations manual

7. (PR): The use of SEAS/AutoIMET in the VOS operation

My talk will be a brief overview of the SEAS/AutoIMET system. NOAA's National Weather Service and OMAO NOAA Corps have endorsed and approved this system to be implemented on all existing NOAA research vessels as well as future vessels for the collection of marine weather observations. I will elaborate on the inherent benefits of this data collection platform which will ultimately reach out across all federal agencies as well as academia, industry, non-governmental organizations and the general public.

8. (DD): The VOS Program

The mission of the VOS is two-fold:

- to collect and disseminate critical real-time maritime weather observations through the recruitment and support of ships to fulfill National needs and International agreements supporting commerce, forecasts and warning programs, and the Safety Of Life At Sea (SOLAS) worldwide, and
- to define the global climate and help measure extreme weather events, climate variability, and long-term climate changes.

Port Meteorological Officers (PMO) recruit, support and provide training for crewmembers of ships that participate in VOS program as part of the U.S. commitment to SOLAS

- Check and calibrate barometers
- Provide equipment to selected vessels on a case by case basis
- Perform Quality Control of observations

9. (UR): TSG equipment and inventory
   a) test of equipment at AOML
   b) calibration

10. (IG): Status of SEAS 2000 TSG development, maintenance and upgrades at AOML/Miami
    a) Iridium transmission logs

11. (PC): Transmission of data in real-time from SOOP ships
    a) Iridium costs: Theory vs. Reality

12. (FB): TSG data flow
    a) QC in real-time
    b) QC in delayed-time
    c) insertion of TSG data into the GTS
    d) visual QC

TSG data received in real-time from ships of the SOOP and the NOAA fleet is downloaded and 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.

Currently a QC system is under development for the analysis of TSG data in delayed-time mode. This system include a visual quality control using the TSG-QC software by Yves Gouriou, Gael Alory, Jacques Grelet and Loic Petit de la Villeon from IRD, Brest. This software have several important features such as:

- plot TSG data as well as data location
- assign quality control flags to each data record
- compare TSG data with external data (buddies) and climatology values (monthly, seasonal and annual climatology)
- temperature, salinity longitude and latitude interpolation
- data correction and “calibration”

13. (FB): Status and plans of TSG operations in ships of the NOAA fleet
    a) RT data transmission
    b) QC operational reports

Since January, 2009 we have received data transmissions from 11 ships of the NOAA fleet, containing more than 1.5 million of ‘good’ (after QC) temperature and salinity records. These observations are located mostly around continental US with more than 35% located at high latitudes (above 45°). We are currently generating reports containing statistics of the TSG data received. We are planning to use these reports as a tool for the monitoring of the NOAA fleet TSG operation providing automatic detection of problems with transmissions and equipments.

14. (CP) National Oceanographic Data Center TSG activities

Acquisition Activities: NODC is currently acquiring and/or archiving underway TSG data from six institutions. First, we are continuing to archive (252 accessions total) underway data, including TSG data from the Office of Marine and Aviation Operations (OMAO) as part of the NOAA Shipboard Sensor Data Acquisition (NSSDAC) project, which comes mainly from NOAA Fisheries vessels. Secondly, we archive underway (13 accessions total) data, to include TSG data from NOAA Ocean Exploration and Research (OER) funded cruises. Thirdly, underway TSG data as part of the Global Observing Surface Underway Data (GOSUD) project are archived at NODC. Fourth, NODC is archiving underway TSG data from Korean ferries collected by South Korea's National Fisheries Research and Development Institute (NFRDI) as part of the Ship-of-Opportunity Program (SOT-SOOP) project. Fifth, quality controlled surface underway data are being archived (238 accessions) as part of the Shipboard Automated Meteorological and Oceanographic System (SAMOS) product. Sixth, NODC is acquiring quality controlled TSG data from AOML. NODC is currently negotiating with SeaKeepers and PMEL to acquire and archive TSG from their projects.

AOML-TSG Activities: NODC is currently acquiring the quality controlled TSG data supplied on the AOML FTP site. The Submission Information Form is mainly complete and only requires minor updates. NODC is developing a Network Common Data File (netCDF) template for the AOML-TSG data. This format will contain all of the metadata and data within the original files of the Submission Information Package and will make the data more interoperable among the user community.

Future Activities: The AOML-TSG data will be available from our OPeNDAP (Open-source Project for a Network Data Access Protocol) and Thredds (Thematic Realtime Environmental Distributed Data Services) servers to increase the accessibility of the data to the users. We are also working on adding the data to the Shipboard Sensor Database.

15. (JT): Status on the migration into BUFR format

16. (FB): Web pages

Web pages created at AOML display several products from TSG data with the objective of:

- Dissemination and visualization of TSG data:
  - Time series of Temperature and Salinity
  - Space-Time diagrams of Temperature and Salinity
- Monitoring of the TSG operation:
  - Maps of ship tracks
  - Maps of TSG observations distribution
- Additional tools for TSG operations monitoring (under development):
  - Tables with data statistics
  - TSG reports for ships of the SOOP and the NOAA fleet

The TSG web pages can be reached from *http://www.aoml.noaa.gov/phod/tsg/* and include figures, tables and other products from ships of the SOOP (Oleander, Explorer of the Seas, MV Explorer), and the NOAA fleet.

17. (UR): Evaluation of new instruments and equipments: Underway CTD's and Gliders

18. (GG): Future of TSG operation

List of Participants

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