

Work Plan

Project Title: The Ship Of Opportunity Program (SOOP)

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1. Project Summary

As part of the Ship Of Opportunity Program (SOOP), this project continues providing the contribution to the XBT network in the form of XBT deployments from mostly cargo vessels, their data acquisition and transmission through the Shipboard Environmental Data Acquisition System (SEAS), and providing quality control, and support to other observational networks such as ThermoSalinoGraphs (TSGs), global drifter array, and Argo profiling floats. XBTs deployments supported by this project are deployed along transects recommended by the international community in two different modes: frequently repeated and high density. The SEAS component of this project is also used for the acquisition and transmission of marine meteorological observations made from the Voluntary Observing Ships (VOS).

The project includes these main components:

- A system called SEAS (Shipboard Environmental Acquisition System) for the merchant fleet to acquire ocean and meteorological information and transmit it in real-time to users worldwide;
- Upper ocean temperature observations using expendable bathythermographs (XBTs) deployed broadly across large ocean regions along repeated transect: the frequently repeated XBT program;
- Upper ocean temperature observations using XBTs deployed closely spaced in order to measure the mesoscale field: the high-density XBT program;
- Support of AOML TSG operations; and
- Support of drifter and Argo float deployment opportunities.

This project is necessary and essential to the Department of Commerce's mission as evidenced by two of the three strategic goals that comprise the Department's mission statement:

- Foster science and technological leadership by protecting intellectual property, enhancing technical standards, and advancing measurement science,
- Observe, protect, and manage the Earth's resources to promote environmental stewardship.

2. Project Description.

2.1 SEAS software.

The Shipboard Environmental data Acquisition System (SEAS) is a Windows-based real time application that combines acquisition and transmission of environmental data collected over several platforms. The system acquires atmospheric and oceanographic data, such as meteorological, sea surface salinity and temperature. It operates on vessels of the SOOP, VOS, on NOAA vessels, University-National Oceanographic Laboratory System (UNOLS) ships, and Coast Guard vessels, to produce high quality marine weather, and oceanographic observations. NOAA and Scripps Institution of Oceanography are the principal users of the software. Additionally, SEAS creates a series of reports, which describe point of departure, route and arrival of a ship. These reports are transmitted using Standard-C and include ships in a real-time search and rescue database.

SEAS is a user-friendly software, its intuitive design is proper for users at all levels of computer experience. It improves data accuracy with extensive error checking, and allows quality control at the point of the origination of the observation. SEAS software also includes many tools and utilities to simplify operations. SEAS is installed on more than 400 ships of the VOS program to transmit over three million meteorological messages, constituting the largest source of marine meteorological observations, which are used in weather forecast prediction models and analysis, such as the National Hurricane Center. SEAS is also installed in more than 50 ships of the SOOP, which participate with NOAA/AOML in acquiring and transmitting data from approximately 13,000 XBTs per year.

The data acquired by the SEAS system are transmitted in real-time to the Global Telecommunication System (GTS) and to global data distribution centers to be used by scientists and operational centers. These data are used, for example, for ENSO monitoring and prediction, the initialization of climate models at centers for environmental prediction, and in delayed mode for research related to seasonal to decadal climate studies of the upper ocean thermal layer. There are no restrictions on sharing this information as it is distributed in real-time on the GTS.

2.2. XBT Operations.

There are three main modes of deployment of XBT probes: Low Density (LD), Frequently Repeated (FR) and High Density (HD) (Table I). AOML is currently focusing in FR and HD modes, and mainly in HD XBT deployments in the Atlantic Ocean (Figure 1). Most of the probes used in this work are Sippican Deep Blue, which reach depths between 750 and 800 m. The international community has made recommendations of XBT transects, some of which are carried by NOAA/AOML under this project.

MODE	Spacing	Frequency
Low Density (LD)	~ 250 km	12 times per year
Frequently Repeated (FR)	~ 150 km	18 times per year
High Density (HD)	~25 km	4 times per year

Table I. Spacing and frequency sampling of the three different modes of XBT deployment.

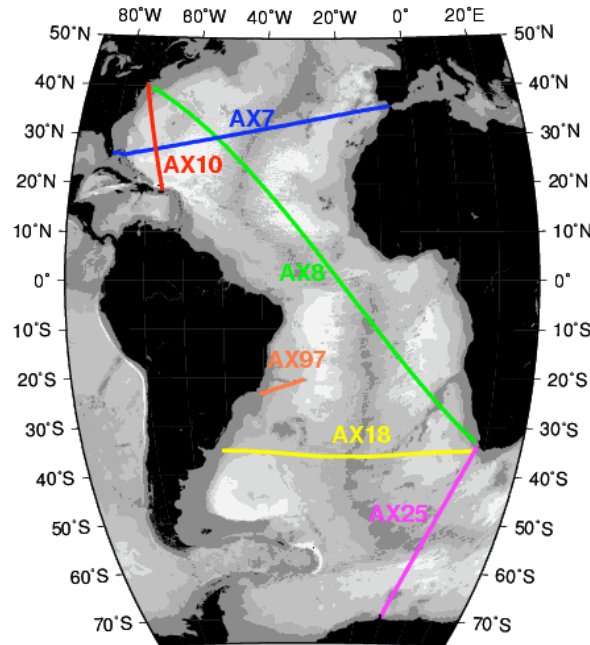


Figure 1. Location of High Density XBT transects that will be maintained by NOAA/AOML. Please note that the recently initiated AX01 transect is not included in this map.

3. Fiscal Year 2011 Work Plan.

The following activities will be included in the SOOP operations:

- AOML will continue with the XBT operations as carried out in previous years for HD transects in the Atlantic Ocean, with special emphasis in enhancing the current HD network, and to make these operations more efficient;
- Collaboration with international and domestic partners to implement HD transects;
- Maintenance of several FR transects in the Atlantic and Pacific oceans. (Note: Some FR transects will need to be discontinued as a consequence of level funding);
- SEAS software will continue being updated;

- Continue close collaboration with the NWS in the installation of SEAS for marine meteorological observations;
- Support of pCO₂ observations by installing TSGs in vessels of the SOOP;
- The ratio of deployed versus transmitted data is expected to remain close to 100%.
- Work will continue in developing the standards for BUFR and metadata;
- Continue studies to investigate XBT biases and fall rate equation coefficients;
- Work will be continued to finalize the construction of an autolauncher designed to deploy Deep XBT probes.

3.2. Scientific contribution.

Although this proposal is funded to conduct fieldwork and data collection only, Drs. Gustavo Goni, Molly Baringer and Silvia Garzoli will continue carrying out the data analysis of observations from HD XBT transects maintained by NOAA/AOML, which will help the scientific community to:

- Monitor for abrupt climate change,
- Understand natural climate variability, and
- Determine heat, fresh, and volume transports of two major components of the thermohaline circulation.

4. Budget Synopsis.

AOML Cost Sharing

NOAA/AOML maintains a high level of AOML contributed salary (\$737,000) for the SEAS, FR, and HD components of this program through legacy support provided when this project was part of NOS.

This project is directed by the PIs: Drs. Gustavo Goni, Molly Baringer, and Silvia Garzoli, with AOML contributing with 8 mm of their salaries. The AOML contribution also includes 31 mm for SEAS software maintenance and upgrades (Paul Chinn and Pedro Pena), to support data transmission and data base (Paul Chinn), computer support (Jessie Harris), ship support and logistics (James Farrington), hardware development (Ulises Rivero and Pedro Pena), hardware support (Andrew Stefanick), HD data processing and analysis (Yeun-Ho Daneshzadeh), logistics support (Robert Roddy).

Requested Funds

AOML requests funds to cover salaries of personnel dedicated to SEAS software maintenance and training (Gonzalez and Roseli), data tracking (Bringas and Soneira), automatic quality control of data (Sabina and TBD), visual quality control of data (Aranda), data tracking, web page development (Bringas and Aranda), data monitoring

(Trinanes, Bringas and Aranda), technical support (Seaton, Stefanick), data processing and analysis (Yao), cruise personnel (Bringas, DiNezio, Farrington, Rawson), data analysis (DiNezio and Bringas), data formatting/BUFR (Bringas and Trinanes), Metadata (Trinanes, Bringas, and TBD).

This project supports, partially or totally, a large number of Federal Full Time Employees (FTEs) and CIMAS employees:

Number of Federal FTEs supported by this funding: 12

Number of non-Federal FTEs supported by this funding: 14

A contractor (SCMI) is used on the west coast (California) to help with the different aspects of FR transects in the Pacific Ocean, including but not limited to XBT storage, equipment installation in ships, crew training, and data downloading.

The amount of probes needed for this project is:

- 3311 (\$136,082) for reduced FR operations;
- 4500 (\$184,950) for HD operations; and
- 1944 (\$79,898) for international collaboration.

The shipping costs are related to those corresponding to ship XBTs to Norfolk (James Farrington) and to the contractor in the west coast. The cost to ship XBTs to the international collaborators are now paid by them.

Travel funds are requested to support the HD operations and FR in the NE coast, to cover the greeting and loading of ships in the AX08 and AX10 transects, and travel for AOML contractors carrying AX08, AX18 transects; and AOML and CIMAS employees carrying out AX10 and AX07 transects.

Four trips for Silver Spring personnel and contractors to attend the annual AOML SEAS meeting are included. Eight trips for Miami personnel (Goni, Bringas, Baringer, Gonzalez, Rivero) to travel to Silver Spring are requested. Trips to attend science and operational meetings are requested, including the Annual OCO meeting (Goni, Baringer), the biannual SOT meeting to be held in Hobart (Goni, Bringas, Trinanes, and TBD), the SAMOC meeting to be held in Cape Town (Goni and Garzoli), the first XBT Science Workshop to be held in Melbourne (Goni, Baringer, and TBD), and the GTSP meeting to be held in Silver Spring (Goni and Trinanes).

Overtime is requested for HD cruises in the amount of \$48,720. Riders in AX18, AX25 and some AX08 transects are done by international collaborators from Argentina and South Africa. The contract for all riders amount \$40,000.

Agent fees include handling of XBT shipments, meeting the ship rider, helping with customs and port entry in host countries and is based on FY 2008 expenses (\$5000). Communication costs for \$6,000 include the test transmissions done with Iridium.

Gradual replacement of the existing systems is required as equipment fails. This cost is included for SEAS2K MK21, computer, wires, connections, antennas, modems, etc.

5. Impact of Level Funding.

In order to submit a budget at FY2010 level, the amount of \$78,577 had to be subtracted from the required funding needed to carry the proposed work. The level funding will be reached by substantially reducing the number of XBT probes used in FR XBT operations, donated in international collaboration, and on participation of the PIs and science support personnel in science and operational meetings.