

AMVER SEAS 2K

Automated Mutual-Assistance Vessel Rescue System; Ship and Environmental (Data) Acquisition System



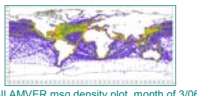
AMVER SEAS 2K is a real-time ship and environmental data acquisition and transmission system. The AMVER software creates a series of reports which describe point of departure, route and arrival. These reports, which are transmitted using Standard-C, include ships in a real-time search and rescue database. The SEAS 2K software acquires atmospheric, oceanographic data and transmits the data real-time for addition to scientific and operational databases. SEAS 2K is employed on volunteer observing ships (VOS) and on NOAA, UNOLS, Coast Guard Vessels.

AMVER was developed for the United States Coast Guard and is used by authorities worldwide. This is a voluntary ship reporting system, where the participating ships are identified in the area of distress and the best-suited ship(s) are diverted to respond.

The Coast Guard extracts identification data from the SEAS 2K Meteorological messages. SEAS 2K is installed on 350+ VOS ships and over 200,000 AMVER SEAS MET messages are transmitted per year.



AMVER SEAS2K Sailing Plan: Oakland to Honolulu.



All AMVER msg density plot, month of 3/06



Crew of M/V Cape Nelson and survivors from the Fishing Vessel Abound, that sank 625 miles off the coast of San Francisco



SEAS 2K Met msgs from 4/05 to 4/06

SEAS 2K is operating in all the worlds oceans. Developed and tested by NOAA's Atlantic Oceanographic and Meteorological Laboratories and SCRIPPS Institute, the U.S. Weather Service and Woods Hole Oceanographic Institute.

• AMVER reports and meteorological (MET) reports. Currently installed on 350+ vessels. Implemented 2000



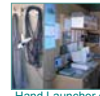
Cloud Dialog from Met Report

Ice Berg Report

• Hand Launching of Expendable Bathythermographs (XBT's). Implemented 2003.



VOS Container Ship



Hand Launcher on VOS bridge

• Integration: AOML and SIO auto-launchers and the Mark 21; WHOI and NOAA AutoMET; and therosalinograph. Real-Time Iridium transmissions.

SEAS 2K auto-launcher on all high density cruises in the Atlantic (AOML) and Pacific (SIO and AOML). Implemented 2005



SEAS 2K Computer controlling XBT Auto Launcher



AOML XBT Auto Launcher



SCRIPPS XBT Auto Launcher

TSG installed on the VOS ships Cap Victor in 2006 and Olander in 2007



SEA Bird TSG and SST sensors

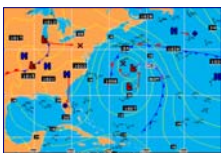
MV Explorer TSG installation with Real-Time transmission via Iridium phone, June 2007



SEAS data is used in a variety of applications by diverse public and private organizations.

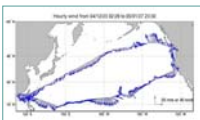
MET data is used for model development of forecasts by national centers and among other things, provides data that can help correct existing climatologies.

Atlantic Surface Analysis: Valid 12 UTC 02 5/06 Sources OPC, TPC, HPC; FCSTR: Rowland.



Surface analysis, courtesy of NOAA, National Center for Environmental Prediction.

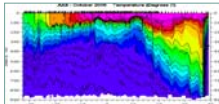
WHOI AutoMET, hourly wind Observations.



Hourly wind, courtesy Wood Hole Oceanographic Institute.

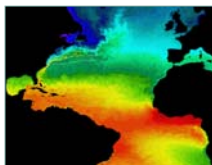
XBT data is used at national centers, including the "National Center for Environmental Prediction" (NCEP) at Camp Springs, MD. and by scientist at laboratories, universities, national forecast centers world wide.

AOML contour plot created from SEAS 2K high density Atlantic run in 8/05



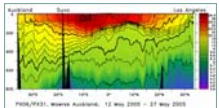
Newark to Puerto Rico contour plot, courtesy AOML.

Measuring the upper ocean heat content and transport, is important for understanding how the ocean and climate respond to changes in surface temperature.



Upper ocean thermal plot, courtesy AOML.

SCRIPPS Inst. contour plot created from SEAS 2K high density Pacific run in 5/05



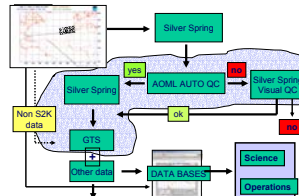
New Zealand to LA contour plot, courtesy SCRIPPS Inst.

XBT data used to develop the seasonal to inter-annual El Nino Southern Oscillation analysis.



Typical weather Anomalies preceding heavy west coast precipitation, courtesy National Center for Environmental Prediction.

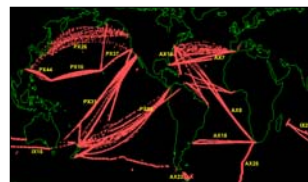
SEAS XBT data is transmitted real-time via Standard-C to Silver Spring. It goes through extensive quality control before being distributed to the GTS for scientific and operational uses.



The table shows the number of XBT drops successfully, routed on to GTS, world wide. The SEAS 2K XBT Program accounts for more than half of all XBT drops world wide.

| Year | SEAS XBT Obs. in GTS | All XBT Obs. in GTS |
|------|----------------------|---------------------|
| 2000 | 2,800 | 10,400 |
| 2001 | 10,400 | 20,300 |
| 2002 | 9,200 | 18,285 |
| 2003 | 12,000 | 22,100 |
| 2004 | 16,500 | 25,700 |
| 2005 | 14,100 | 23,400 |
| 2006 | 12,449 | 26,917 |

There are 15 VOS ships dropping XBT's using SEAS 2K software. AOML and SCRIPPS Inst. are the principal users of the software. National Marine Fisheries Service is running an AX22 Antarctic line.



Record of SEAS XBT drops from April 2005- April 2006

SEAS 2K continues to evolve new functionality. Future programs include: interfacing with the Scientific Computing System on the NOAA fleet and UNOLS vessels; acquiring data from ocean chemistry sensors; and alternate forms of satellite transmission for all real-time data.



VOS Vessel Cap Victor



NOAA Ship Ron Brown