NDBC Metadata Services for the Climate Data Assembly Center

William Burnett
NOAA National Data Buoy Center, Stennis Space Center, MS

Table of Contents

1. Introduction 1
2. Tasks Completed 3
3. 2009 Accomplishments: 3

1. Introduction

The National Data Buoy Center's (NDBC) weather/ocean network consists of 115 moored platforms located in the Atlantic, North Pacific, Gulf of Mexico, Great Lakes and Caribbean / Bering Seas – and collect timely weather and oceanographic information in real-time. They also operate 50 coastal marine stations located around the coastal United States, Caribbean and the Atlantic.

Figure 1 shows a global map with the location of NDBC's weather/ocean platforms. The thirteen (13) stations highlighted with a red circle denote stations that NDBC has operated for over thirty (30) years – providing a rich and varied climate record for those stations.

NDBC assumed responsibility for the crown jewel of the global climate observing system, the equatorial Pacific Tropical Atmosphere Ocean (TAO) array of 55 moorings in 2005 and is partnering with NOAA/Pacific Marine Environmental Laboratory (PMEL) on the Pilot Research Moored Array in the Atlantic (PIRATA). In February 2008, NDBC also completed the 39-buoy tsunameter array which provides water-level data form the world's ocean basins to support tsunami warnings.

The NOAA TAO array provides real-time and delayed-mode data from moored ocean buoys to improve detection, understanding and prediction of El Nino and La Nina events. TAO's real-time processing subsystem starts with the processing of automated distribution service messages from Service Argos, a global data telemetry service. An automated real-time quality control is performed for gross error checking, and then the TAO database is updated with corrected data. The TAO real-time data monitoring subsystem supports daily, weekly and monthly quality assurance/quality activities by providing on-demand data checking functionality to the DAC. In addition to the automated gross error checking, the real-time data monitoring subsystem provides on-demand reports for once-daily, thorough examinations of all current buoy data and detailed reviews of the real-time data. The reports cover daily quality control, platform transmissions, deployment, present positions, Argos positions, latitude/longitude time series and data plots.

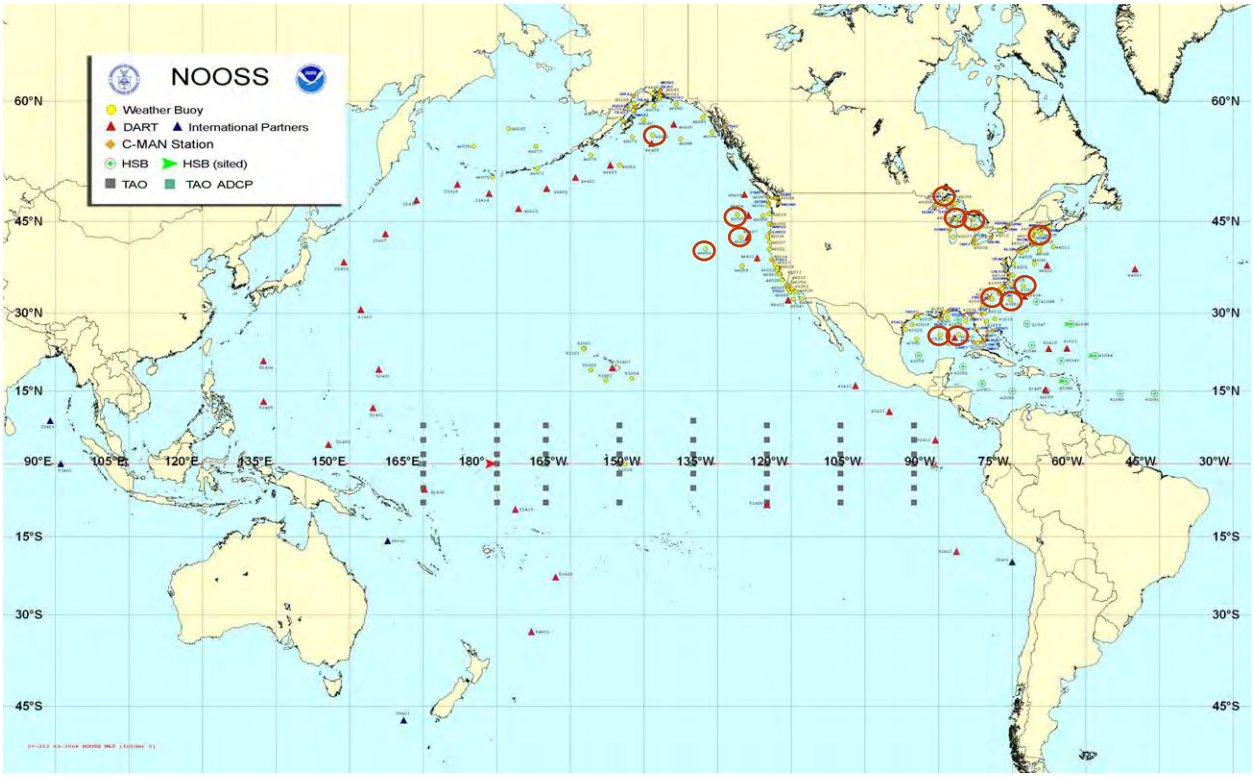

Figure 1. The National Data Buoy Center's Ocean Observing System of Systems (NOOSS) network. Stations with red circles show that the station has been collecting data at that location for over 30 years.

The DAC monitors the various real-time transmissions of tsunameter messages depending on the operating mode of the bottom-pressure recorder. Transmission of real-time water level heights occurs when the tsunami detection algorithm is triggered by a seismic event or when interrogated by the NOAA Tsunami Warning Centers. The bottom unit transmits the messages to a surface buoy via underwater acoustic systems. The surface buoy is equipped with duplicate and independent communication systems to transmit data to the Iridium satellite constellation and then to the Iridium Gateweay in Arizona. NDBC's real-time processing systems attach NOAA header information and message identifies and sends the data to the NWS Telecommunications Gateway in Silver Spring for distribution to the warning centers.

The NDBC Climate Data Assembly Center is being established to provide an international standardization framework for collecting the enormous amount of weather, ocean, geophysical and biogeochemical observations – and the associated metadata – to meet NOAA's climate objectives. High-quality, long-term observations of the global environment are essential for understanding the Earth's environment and its variability. The United States contributes to the development and operation of many ocean observation systems – some of which have been in operation for many years. To ensure high quality of the large amount of ocean observations that will be available in the near future, systems must require more robust quality control and quality assurance procedures.

The U.S. data management community developed seven monumental standards for an ocean community struggling to understand the challenges related to the distribution and description of data from the Integrated Ocean Observing System (IOOS). First, every real-time observation distributed to the ocean community **must** be accompanied by a quality descriptor (Was the data quality controlled? Was the data quality questionable?). Second, all observations should be subject to some level of automated real-time quality testing. Third, quality flags and quality test descriptions **must** be sufficiently described in the accompanying metadata. Fourth, observers should independently verify or calibrate a sensor before deployment. Fifth, observers should describe their method of verification/calibration in the real-time metadata. Sixth, observers should quantify the level of calibration accuracy and the associated expected error bounds. Finally, manual checks on the automated procedures, the real-time data collected, and the status of the observing system **must** be provided by the observer on a time-scale appropriate to ensure the integrity of the observing system. Though the primary focus of these principles is on real-time QA/QC, it was understood that some methods and requirements for the real-time data are easily extendable to "delayed mode" QA/QC and that the real-time and retrospective processing are both linked and ultimately required.

2. Tasks Completed

The metadata services being developed at NDBC originally began under the JCOMM/META-T Pilot Project – initiated in 2006. The intent of the project was to develop a standardized process for collecting and distributing enhanced sensor metadata for NDBC's observing platforms to sustain an ocean observing system for climate. In FY2009, NDBC focused on developing some parts of the infrastructure outlined in the JCOMM META-T work plan. Once the pilot project is over, the metadata services will remain as a core contribution to the management of metadata necessary for complete and thorough documentation of the data collected by the observing system to ensure it's climate applicability in the future.

3. 2009 Accomplishments:

- NDBC evaluated the potential to expand the META-T server capabilities to include ocean variables besides ocean temperature.

- Coordinated software development efforts with IOOS Data Integrated Framework and Observing System Monitoring Center (OSMC) efforts to decode BUFR reports and extract metadata from the reports.

- Began to populate a metadata server with metadata from real-time data flow and from platform operators (e.g. SEAS), JCOMMOPS (buoys, XBTs), OceanSITES, Argo GDACs, GLOSS and SOOPPIP.

- Began transforming Pub47 xml to SensorML XSLT.