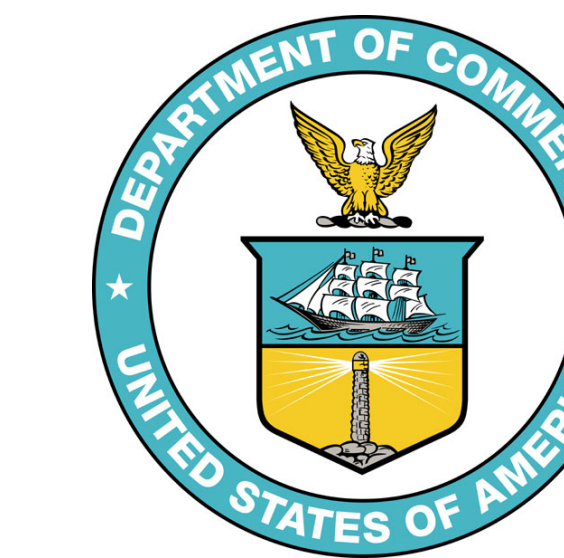
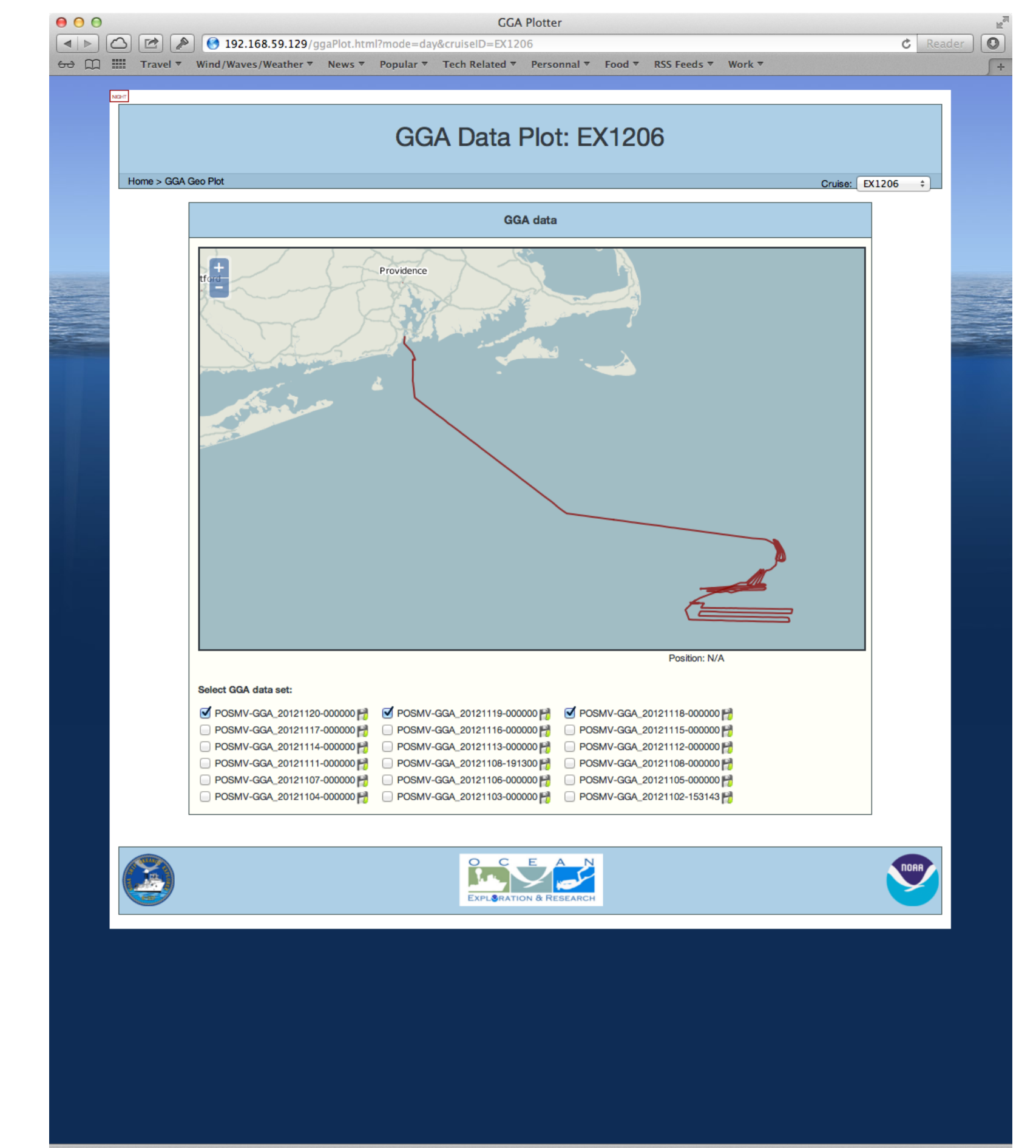
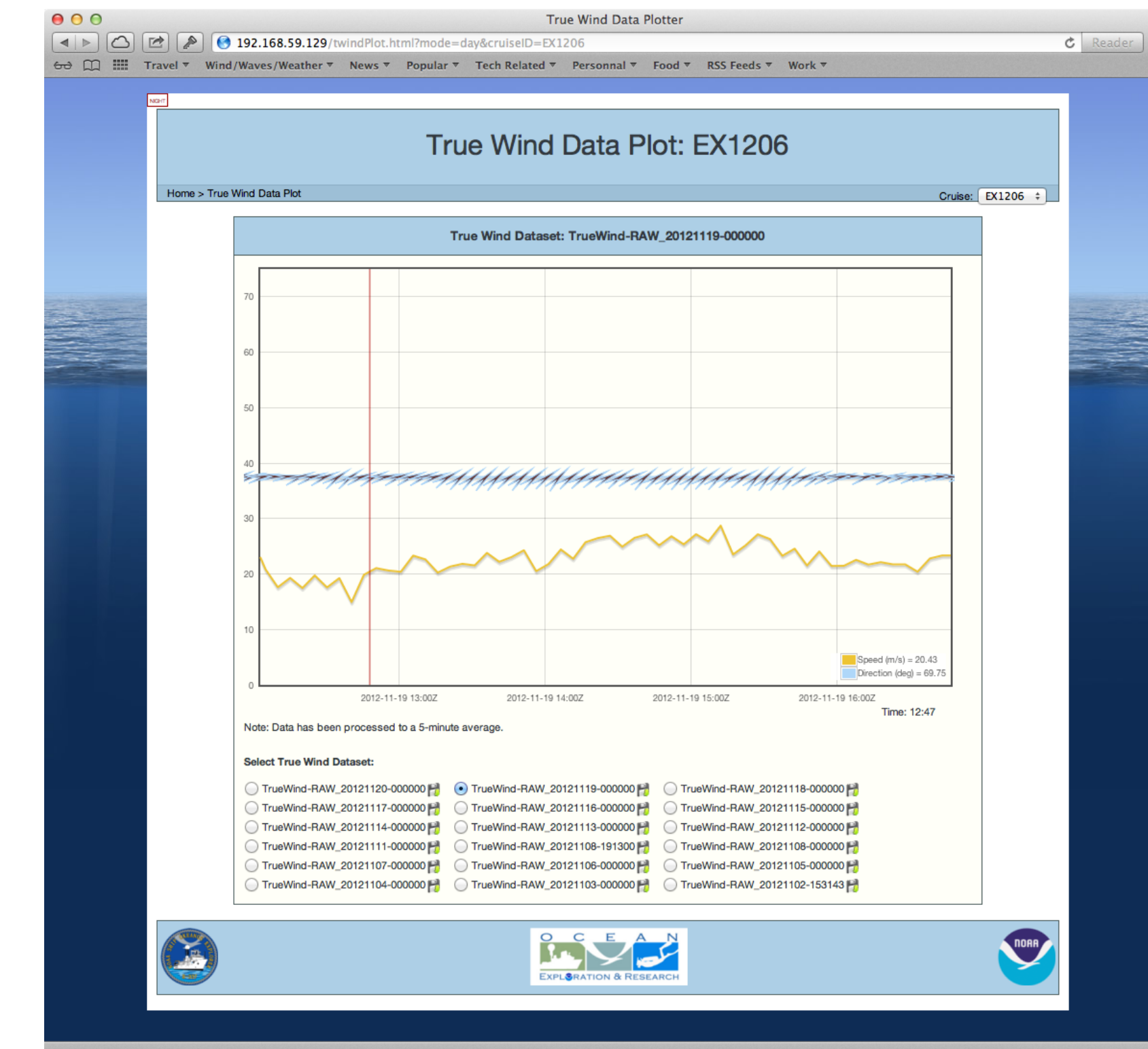
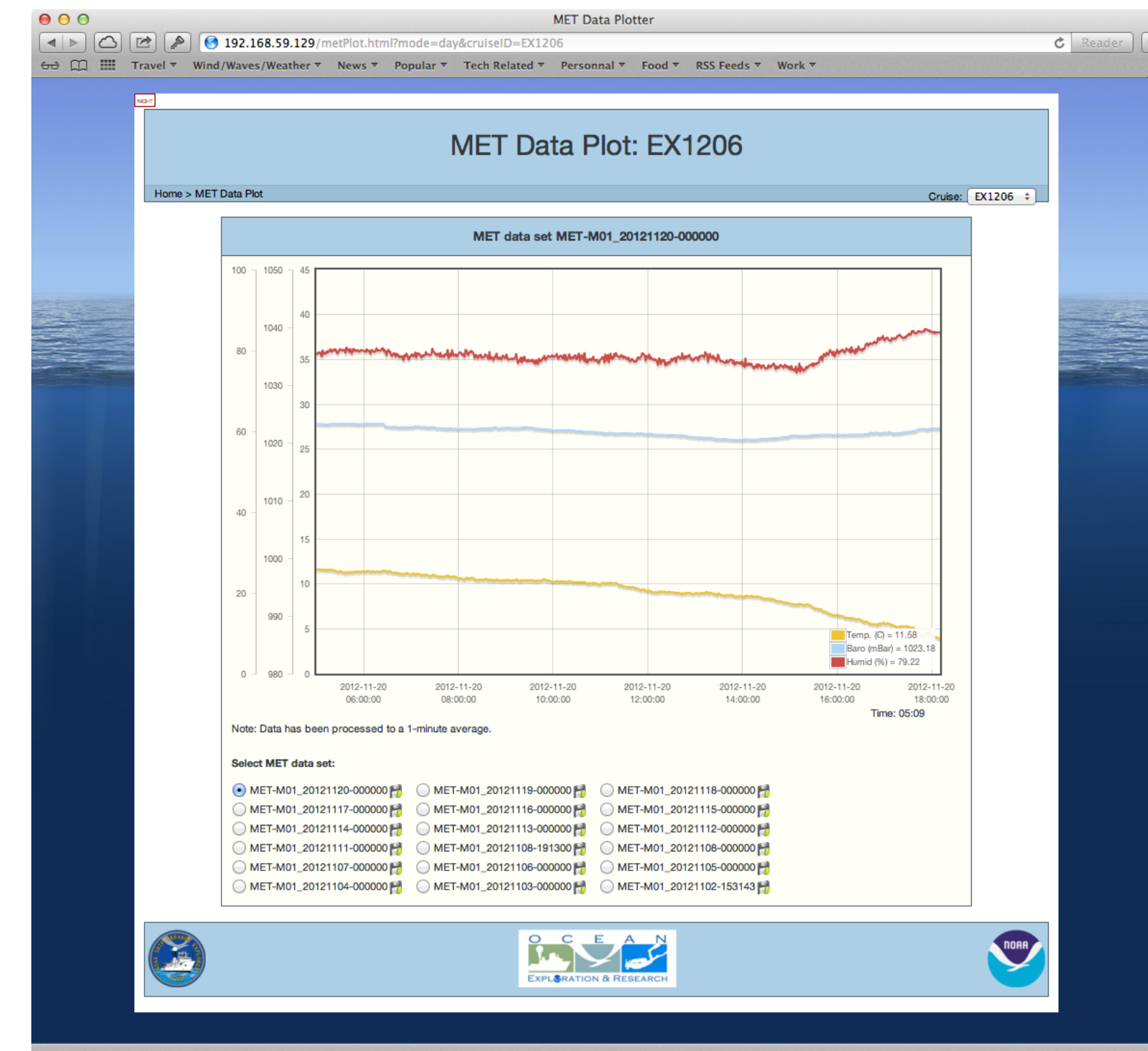
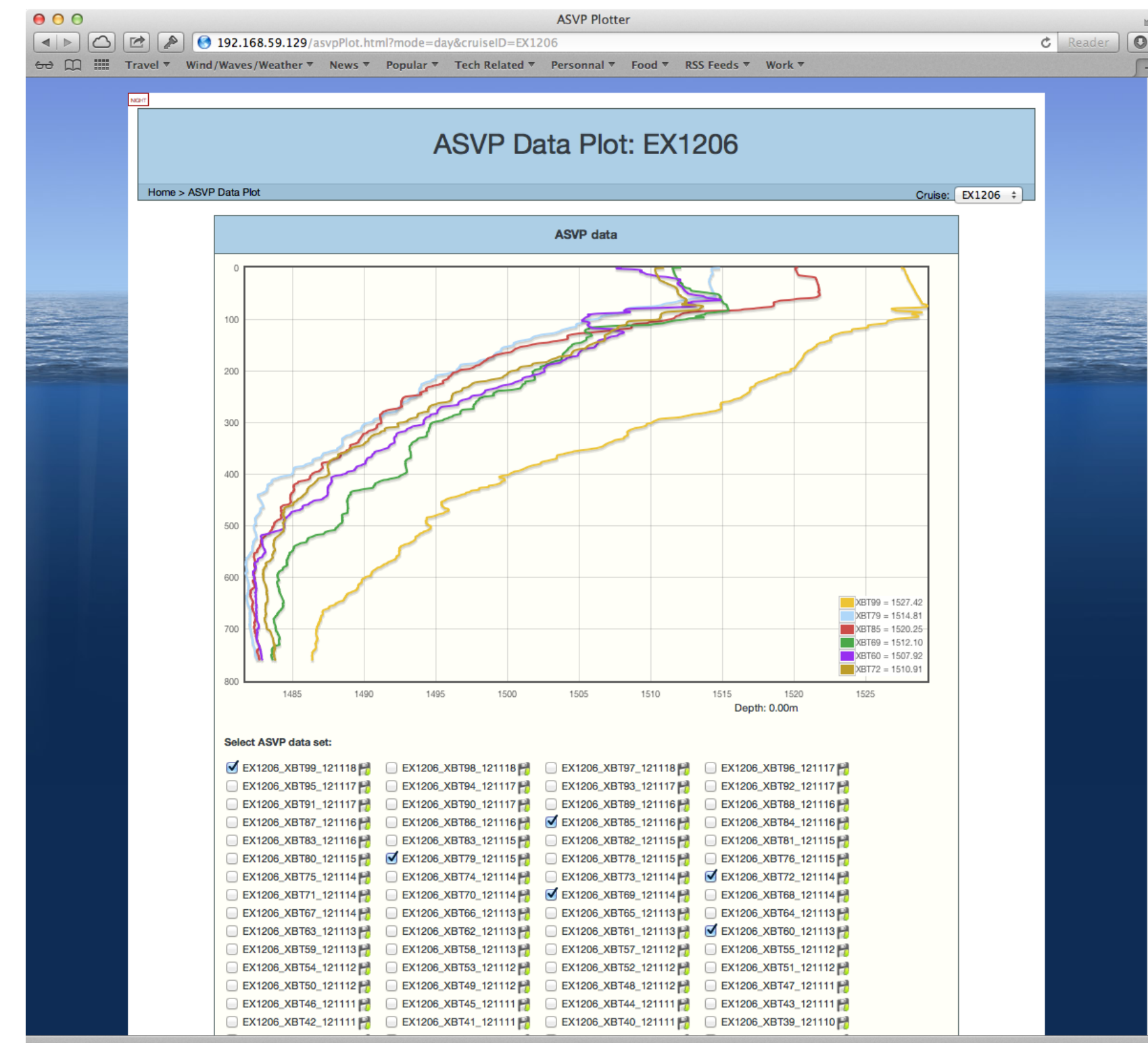
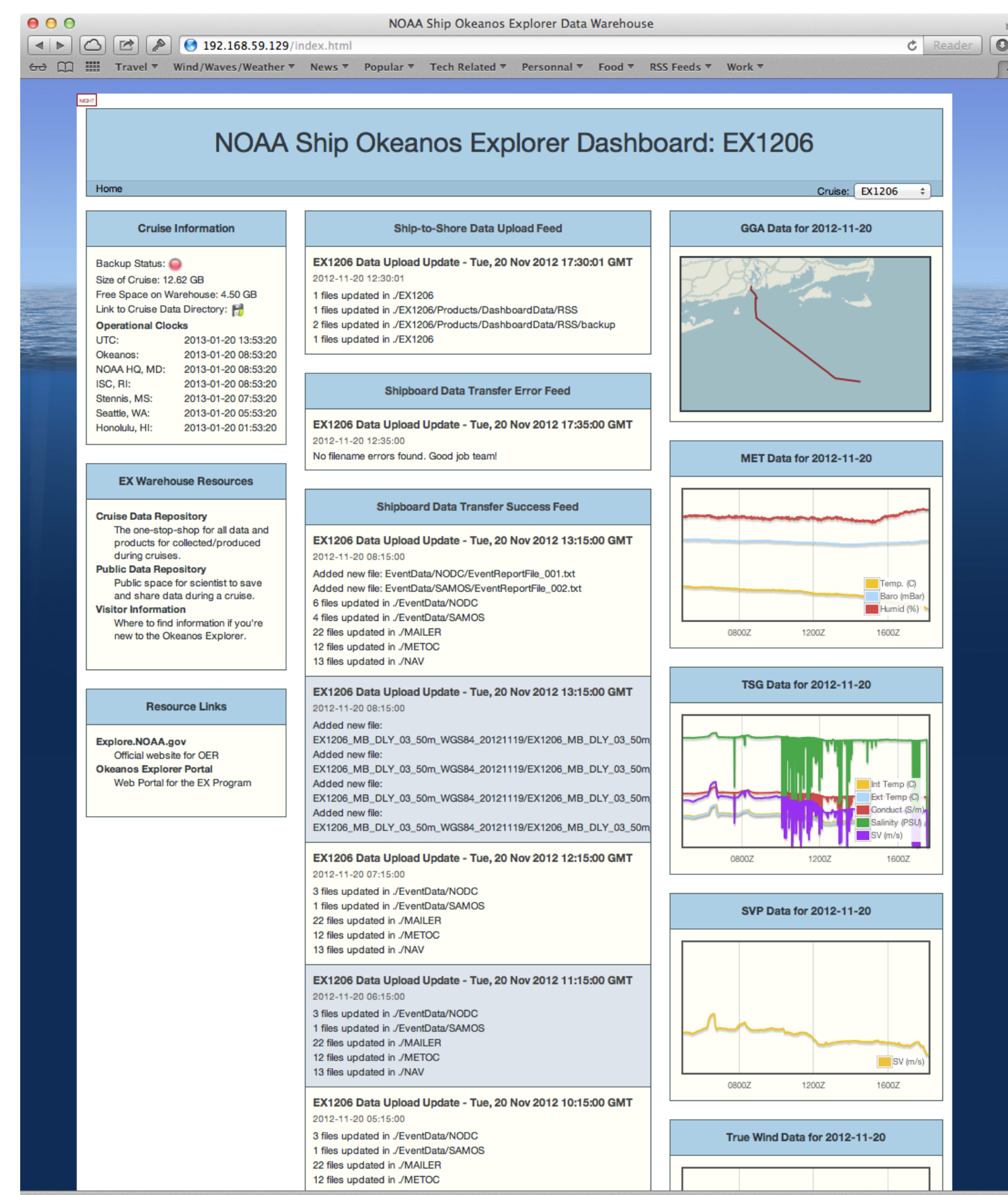




A DASHBOARD INTERFACE FOR DATA COLLECTED ABOARD OCEANOGRAPHIC RESEARCH VESSELS



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INTRODUCTION

Oceanographic Research vessels are equipped with numerous sensor and data acquisitions systems. It is often difficult to ensure that all of the systems are working properly and to identify when problems occur. To address this challenge, members from NOAA's Office of Ocean Exploration and Research (OER) and the National Oceanographic Data Center (NODC) developed a modular dashboard interface that leverages many of the data management technologies developed for NOAA Ship Okeanos Explorer that provides ship's crew, ship's science party and shore-side participants with an interactive interface to the collected datasets.

The concept of a dashboard interface is to provide users with concise view to vital information related to the health of a system. Having the correct amount and detail of information promotes regular use and an accurate assessment as to the health of the systems.

DESIGN PARAMETERS

INTERACTIVE VISUALIZATIONS RENDERED CLIENT-SIDE BY WEB-BROWSER

The visualizations are designed to be interactive and allow users to see actual data values and times, without having to estimate based on an image. This is accomplished by using Javascript to rendering visualizations from data at the client. The result is a rich and interactive end-user experience without overburdening the host server.

AUTO-POPULATING BASED ON ACTUAL DATA FILES

The data used to populate the dashboard interface originated from the raw data files. Scheduled tasks run at set intervals to process the latest data files without the intervention of the marine technicians. Processing involves sub-sampling raw data and converting it into JavaScript Object Notation (JSON) objects. In the current design, new data from SCS is processed every 30 minutes; all other data files are processed every hour.

DATA RETRIEVAL OF JSON OBJECTS VIA AJAX AND RESTFUL WEB SERVICES

The dashboard requests data from the data server using Asynchronous Javascript and XML (AJAX) calls to a RESTful web-service. Data is served to the client as JSON objects.

MODULAR APPROACH TO SCRIPT DESIGN

The processing scripts are modular such that they can be called repeatedly and independently of other scripts and against new cruise datasets.

BENEFITS

NEAR-REAL-TIME STATUS MONITORING

- Simple and concise snapshots of the vessel's data management system health
- Visual aids showing sensor behavior and data trends

MODULAR = FLEXIBLE AND EXPANDABLE

- Data processed on a file-by-file and/or sensor-by-sensor basis.
- Process the latest datasets or apply to previously collected data retroactively.
- Integrate new sensors by writing self-contained processing modules that can be easily tested until ready for deployment.
- Add/Remove/Modify datasets without breaking the overall system.
- Visualizations modules used to provide both widget and full-size, interactive representations.
- Arrange dashboard widgets or create specialized dashboards as required by the vessel operator.

ENFORCES STANDARDS SET BY VESSEL OPERATORS

- Dashboard highlights problems with the data file names and cruise directory structure.
- Dashboard empowers technicians to quickly locate and resolve problems.

SIMPLIFIED ACCESS TO DATASETS FOR SCIENTISTS

- Provide scientists with simple, interactive visualizations of collected datasets.
- Provides scientists with safe, read-only access to raw data (via http).

PROJECTING A SHORE-SIDE PRESENCE

- The data needed to populate the dashboard is a fraction of the raw data. This opens the possibility for vessels with minimal bandwidth capabilities to project the dashboard interface to shore-side audiences in near-real-time.
- In practice the Okeanos Explorer is seeing a 300:1 difference in files sizes between what is needed to populate the dashboard compared to the associated raw data. (~1-2Mb/day)
- Using standard incremental file transfer techniques such as rsync, the dashboard data can be easily accommodated by the most modest of VSAT systems.
- Projecting the dashboard shoreside can convey the statuses of a vessel to a potentially global scientific and public audiences.

CURRENT USERS

NOAA SHIP OKEANOS EXPLORER

- Prototype vessel used to development Dashboard.
- Vessel was also used to developing the underlying technologies including the hybrid approach to oceanographic data management, web-based centralized management of automatic data consolidation and the use of RSS feeds to monitor adherence to standardized naming conventions.
- For the 2013 field season the dashboard interface will be replicated shore-side in near real time for all cruises.

R/V FALKOR OPERATED BY THE SCHMIDT OCEAN INSTITUTE

- First vessel to implement the Dashboard as well as the entire suite of underlying technologies developed aboard the Okeanos for oceanographic data management.
- The system was integrated aboard during a 12-day cruise. Work was completed using the ship's marine technicians, electronics technician and one additional contractor.
- The system was retroactively applied to all previous cruises aboard the R/V Falkor.
- The analysis immediately identified inconsistencies in the vessel's data collection and management procedures. The lessons learned were immediately applied to the vessel's standard operating procedures with the goal to continue improving the vessel's end-to-end data management procedures.

FUTURE WORK

- Simplified Deployment for new vessels
- Compatibility with More Datasets including mapping sensors, imagery and video
- Expanded Geo-referencing functionality to provide a map-based interface to datasets.
- Auditing tools to aid metadata generation and promote transfer to the National Environmental Data Archives

SYSTEM REQUIREMENTS

- 1 x86, Linux-based server
- Storage to accommodate all of the data collected during a single cruise, however it is recommended that there be enough storage to accommodate a field season.
- All software used is either open source or freely available.