2B.5 AN INTRODUCTION TO THE OBSERVING SYSTEM MONITORING CENTER

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1. INTRODUCTION

Understanding climate variability requires the development, maintenance and evaluation of a sustained global climate observing system. The purpose of the Observing System Monitoring Center (OSMC), which is being funded by the National Oceanic and Atmospheric Administration's (NOAA) Office of Climate Observation (OCO), is to provide a tool that will assist managers and scientists with monitoring the performance of the global *in-situ* ocean observing system, identifying problems in real-time, and evaluating the adequacy of the observations in support of ocean/climate state estimation, forecasting and research.

2. BACKGROUND

The Observing System Monitoring Center (OSMC) system was initially developed as an information gathering, decision support, and display system for the National Oceanic and Atmospheric Administration's (NOAA) Office of Climate Observations (OCO) located in Silver Spring, MD. It is an essential component of a sustained Ocean Observing System for Climate, that permits many discrete components to be visualized and managed as a system. The OSMC system displays current and historical status of globally distributed meteorological and oceanographic data collection systems. The OSMC system provides data visualization tools to identify the coverage of any given collection of platforms and parameters. These visualization tools are available via the internet and can be used to present information from OSMC to other NOAA centers, national partners, and international partners.

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3. OSMC COMPONENTS

The OSMC is primarily built of two components -- a data base of metadata and tools to assist with the interpretation of that metadata.

3.1. A DATABASE OF METADATA

At its core, the OSMC is database of metadata, which is focused on both real time and historical observations. The primary source of the real time metadata is the Global Telecommunications System (GTS). On a daily basis, metadata (and some data) is pulled from the GTS and ingested into an Oracle database. This database is then used to drive the different OSMC tools to assist in monitoring the global ocean observing system.

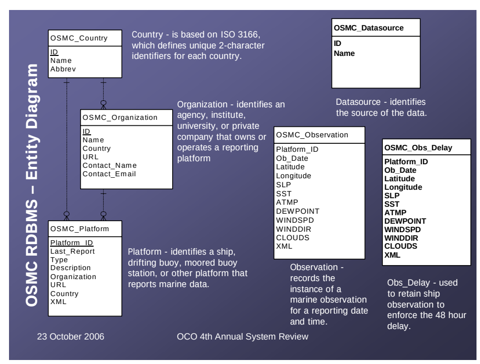


Figure 1. Current OSMC database schema

As previously mentioned, the OSMC is primarily about metadata (what observations were taken), but "data" must be included to some degree, too, for a couple of reasons:

1. quality assessment metadata is generally missing. The data values can provide a surrogate in some cases
2. The observations reveal the variability of the system, which is fundamental to observing system design

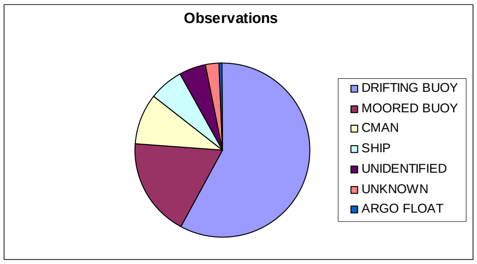


Figure 2. Breakdown of current platform types

3.2 OSMC TOOLS

The tools for interpretation of the metadata include those that give the user a visual overview of the global ocean observing system, and those that drill down and discover metadata associated with specific observations. These tools provide both observing system managers and scientists insight as to where the global ocean observing system is meeting expectations as well identifying regions which may be excellent candidates for observing system expansion.

There are several tools which serve to give the user a visual overview of the global ocean observing system.

3.2.1 LAS ACCESS TO THE OSMC

The first tool is one which is built on the Live Access Server (LAS) technology (more information at www.ferret.noaa.gov/LAS). From the main console (Figure 3a and 3b) of this tool the user can chose from among several different platforms and variables, as well as constrain observations by domain, country of origin, and date, among others. Observations, as well, can be colored by either platform type, country of origin, or date.

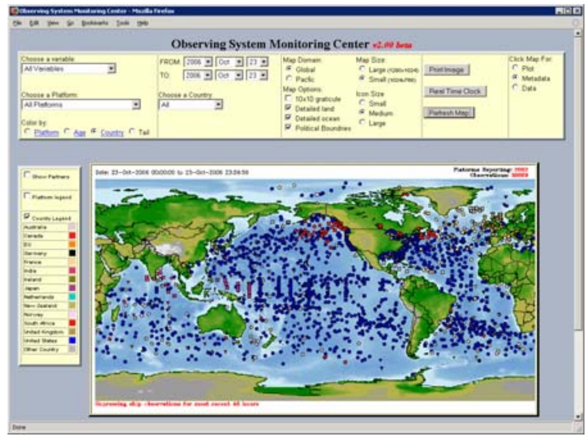


Figure 3a. OSMC LAS main console page with one day's observations colored by country

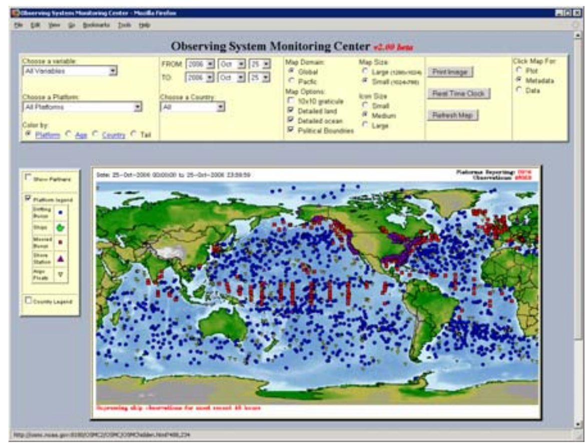


Figure 3b. Same daily observations as above, but colored instead by platform

Once an area of concern or interest has been identified, a user may then drill down to the metadata of a particular platform using the observations map, as in Figure 4.

Figure 4. OSMC LAS drill down to metadata

Other tools exist to view observations colored by age of last report, as well as employing "tails" to show direction of movement. Figure 5 shows an example of three weeks of drifter observations in the Pacific Ocean.

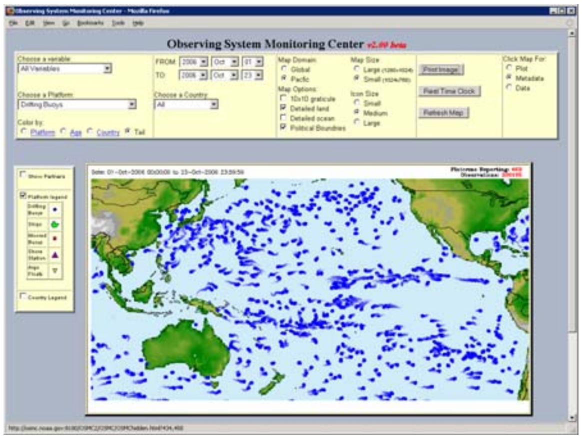


Figure 5. OSMC three week drifter observations with "tails"

3.2.2 GIS ACCESS TO THE OSMC

Another tool that the OSMC utilizes is a GIS-based system using ArcView. This tool gives the user a GIS look at the most recent 5 days of data that are available in the OSMC database. Users can view layers containing different types of data, adding reference information such as continents, rivers, and political boundaries if desired.

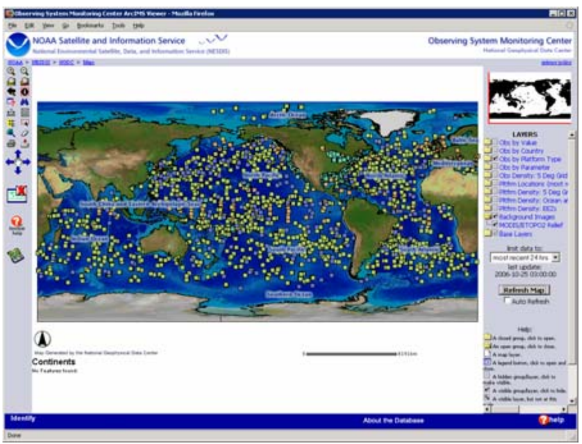
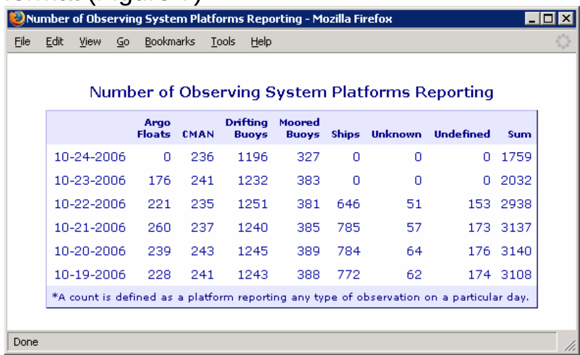


Figure 6. GIS Access to most recent 5 days of data in the OSMC

The GIS system also allows drill down for data discovery once a region or platform of interest is identified.

3.2.3 DIRECT ACCESS TO OSMC VALUES

Often times it may be more efficient to look at the metadata in the OSMC as numerical summaries rather than graphic overviews. The OSMC has the capability to list the last 5 days of data for platforms reporting in a clear table format (Figure 7).



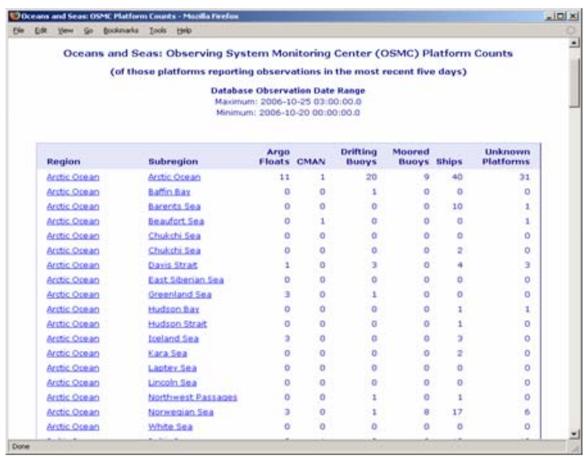
Number of Observing System Platforms Reporting

	Argo Floats	CMAN	Drifting Buoys	Moored Buoys	Ships	Unknown	Undefined	Sum
10-24-2006	0	236	1196	327	0	0	0	1759
10-23-2006	176	241	1232	383	0	0	0	2032
10-22-2006	221	235	1251	381	646	51	153	2938
10-21-2006	260	237	1240	385	785	57	173	3137
10-20-2006	239	243	1245	389	784	64	176	3140
10-19-2006	228	241	1243	388	772	62	174	3108

*A count is defined as a platform reporting any type of observation on a particular day.

Figure 7. Table listing of last 5 days of data

It is also possible to retrieve platforms and observation counts which occur in predefined, delineated ocean basins, as in Figure 8.



Oceans and Seas: Observing System Monitoring Center (OSMC) Platform Counts

(of those platforms reporting observations in the most recent five days)

Database Observation Date Range
Maximum: 2006-10-25 03:00:00.0
Minimum: 2006-10-20 00:00:00.0

Region	Subregion	Argo Floats	CMAN	Drifting Buoys	Moored Buoys	Ships	Unknown Platforms
Arctic Ocean	Arctic Ocean	11	1	20	9	40	31
Arctic Ocean	Baffin Bay	0	0	1	0	0	0
Arctic Ocean	Barents Sea	0	0	0	0	10	1
Arctic Ocean	Beaufort Sea	0	1	0	0	0	1
Arctic Ocean	Chukchi Sea	0	0	0	0	0	0
Arctic Ocean	Chukchi Sea	0	0	0	0	2	0
Arctic Ocean	Davis Strait	1	0	3	0	4	3
Arctic Ocean	East Siberian Sea	0	0	0	0	0	0
Arctic Ocean	Greenland Sea	3	0	1	0	0	0
Arctic Ocean	Hudson Bay	0	0	0	0	1	1
Arctic Ocean	Hudson Strait	0	0	0	0	1	0
Arctic Ocean	Iceland Sea	3	0	0	0	3	0
Arctic Ocean	Kara Sea	0	0	0	0	2	0
Arctic Ocean	Laptev Sea	0	0	0	0	0	0
Arctic Ocean	Lincoln Sea	0	0	0	0	0	0
Arctic Ocean	Northwest Passages	0	0	1	0	1	0
Arctic Ocean	Norwegian Sea	3	0	1	8	17	6
Arctic Ocean	White Sea	0	0	0	0	0	0

Figure 8. Ocean and Seas platform data

3.2.4 GOOGLE EARTH ACCESS TO THE OSMC

Google Earth has become a widely known and often used software tool for displaying geospatial data. We have included the ability to view global ocean observations through Google Earth in the OSMC, see Figure 9

Figure 9. Google Earth access to OSMC data

3.2.5. ACCESS TO HISTORICAL DATA THROUGH THE OSMC

Time series plots of the history of observing system performance, based on analysis done in global 5 by 5 degree boxes are also available.

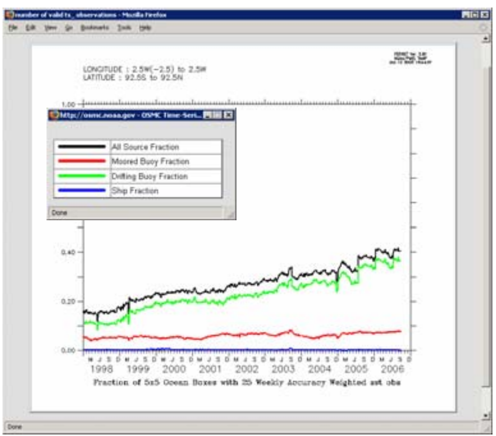


Figure 10. Fraction of 5x5 weekly boxes with 25 or more SST observations since 1998

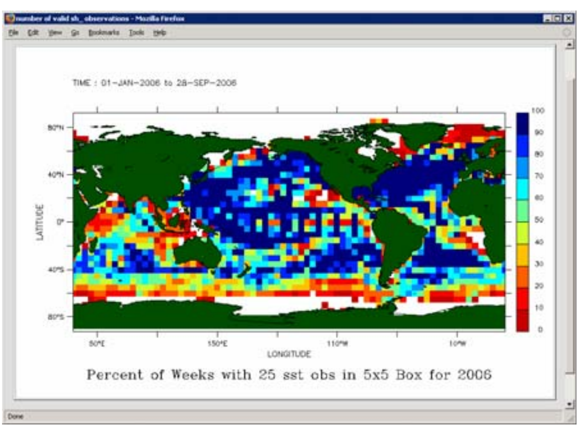


Figure 11. Percentage of weeks with 25 or more SST observations in a 5x5 degree box for 2006

4. Future plans

As the OSMC continues to move forward, so do the plans for additional capabilities. Among the plans for FY07 include adding support for accessing profile data from Argo floats and moored buoys. We continue to expand the list of platforms available to the OSMC, and are currently working on adding tide gauges as well as Ocean Reference stations and tsunameters. We also continue to nurture a partnership with Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology Observing Platform Support Center (JCOMMOPS). This partnership is crucial for fleshing out and enriching the metadata information available in the OSMC. We are also planning on adding support for the Open Geospatial Consortium web services WMS and WFS. Working with the Office of Climate Observation, as well as other climate scientists, we plan to integrate metrics into the OSMC which will assist in the evaluation of both ocean observing systems, as well as the climate models which attempt to describe those systems.

5. CONCLUSION

The global *in-situ* ocean observing system is a very complex system of systems. The task of managing such complexity can be eased by tools which are developed to help monitor those systems. The OSMC is designed for such a purpose – to provide insight into the performance of the *in-situ* global ocean observing system as well as to assist in identifying areas where performance is either meeting or not meeting expectations. The OSMC provides visualization and assessment tools for the international observing system as a whole as well as representing an important step towards the fulfillment of commitments to the Ten Climate Monitoring Principles.

6. AKNOWLEDGEMENTS

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