Observing System Monitoring Center

Integrating data and information across observing system networks
OSMC background

Database of data and metadata ("realtime")

- GTS -- primary source
- Data begins in June, 2004
- ~2 billion observations
OSMC tools

Monitoring
- Oct 1, 2012 – All reports by platform
- Oct 1, 2012 – Salinity reports by country
- Sept 2012 – SST drifters in the Pacific
- Sept 2012 – Japanese Argo Floats

Planning

Reporting
April 15, 2014: All Observations by Platform

April 15, 2014: Salinity

Mar 2014: drifters measuring SST in Pacific

Mar 2014: Japanese Argo Floats reporting

Data tables

Individual drifter tracks, colored by date

Drifter tracks, colored by SST

Drifting buoy reports with Reynolds Bias errors and underlay

Plot SST along drifter trackline

Indian Ocean Moored buoy SST anomaly relative to World Ocean Atlas Climatology

Glider profile, Feb-Mar 2014
% of Weeks with All SST > 25 in 5x5 degree boxes
Summary counts available to other applications
What about the actual data?

- QC’d data can take months to become available
  - Forecast models could utilize NRT data to improve their forecasts
- Can be difficult to obtain (GTS)

- Challenge: provide interoperable access to valuable NRT data
  - With limited funding
  - With limited burden placed upon providers
What isn’t “integrated data management?”

<table>
<thead>
<tr>
<th>A Web page</th>
<th>Email requests</th>
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<tr>
<td>A site requiring registration</td>
<td>An ftp site</td>
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Barriers to integration include:

<table>
<thead>
<tr>
<th>Stovepipes</th>
<th>Download required</th>
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<tr>
<td>Differing formats</td>
<td>Limited or No machine-machine access</td>
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• Users prefer to use tools they are familiar with

• Users want to interact with collections of features

• Users would prefer to not have to fuss over formats

• Users need to find the data
• Projects: (too many to name)

Data formats:
- netCDF
- GRIB
- ASCII
- ...

Applications:
- Matlab
- ArcGIS
- Ferret
- GrADS
- Google Earth
- IDV
- LAS
- ERDDAP
- ...

Users: (too many to name)
ERDDAP

• Out of NOAA Pacific Fisheries Environmental Lab
• Data server that provides services
• Acts as middleman to reduce complexity when accessing data in many common formats
• Has a Web page for humans, but utilizes RESTful Web services
  – Crucial for machine to machine access
• Multitude of clients can connect and access data through ERDDAP
Integration strategy provides multiple access and discovery services for near real time data.

REST services via OSMC/ERDDAP

Original metadata can be enhanced at this point, if necessary.

Data flows directly into users’ applications.

GTS

ESRI Geoportal

Live Access Server

Google Earth

iPython notebook

Matlab™
Accessing the data

Work flow for real-time ESPreSSO ROMS 4DVar

John Wilkin
Rutgers Ocean Modeling Group
MARACOOS

- 72-hour forecast NAM-WRF 0Z cycle at 2 am EST  
  [NCEP NOMADS]
- RU regional CODAR product – hourly: 4-hour latency delay  
  [RU TDS]
- RU glider T,S when available (seldom) (~ 1 hour delay)  
  [RU TDS]
- USGS daily average flow available 11:00 EST  
  [USGS waterdata]
- AVHRR IR passes 6-8 per day (~ 2 hour delay)  
  [MARACOOS TDS]
- REMSS MW-IR blended SST daily average  
  [PO-DAAC]
- HYCOM NCODA 7-day forecast updated daily  
  [NRL]
- Jason-2 along-track SLA (4 to 16 hour delay for OGDR)  
  [RADS]
- SOOP XBT/ CTD, Argo floats, NDBC buoys on GTS  
  [OSMC ERDDAP]
Integration of delayed-mode data
REST services via OSMC/ERDDAP

Integration strategy provides multiple access and discovery services for near real time data.

Metadata available through international standards.

Data flows directly into users’ applications.
Integration strategies that provide multiple access and discovery services for near real-time data can be leveraged for delayed mode data as well.

Original metadata can be enhanced at this point, if necessary.

Data flows directly into users’ applications.
Integration of delayed-mode data

• Also serve through ERDDAP
  • Provides standard queries to access all data

• Allow easy comparison between NRT and delayed mode data
Data found in delayed mode source, but not available through the GTS SST data gridded to 5° by 1 month grid. 

Delayed mode SST gridded to 5° by 1 month grid.

Difference of the 5° by 1 month gridded SST data.

Drifter track comparison.

Trajectories in AOML (blue) and in DSMC (red).
Integration of delayed-mode data

• Serve through ERDDAP
  • Provides standard queries to access all data

• Allow comparison between NRT and delayed mode data

• Allow integration of data

• Users can work with parameters, not platforms
GOAL: Investigate “Surface” Temp from the In Situ Ocean observations from 2012. Platforms include:

- Argo
- Drifter
- SOCAT underway
- Gosud underway
- Tropical Moored buoys
Getting the data – current steps

**Argo**
- Can select region at Coriolis
- Download notification via email
- ftp files
- Argo netCDF format

**Drifter**
- ftp available from AOML
- Can select region, or just download full regions
- ASCII format, with metadata in separate file

**GOSUD**
- Available via ftp
- Download all data, no subsetting
- netCDF format

**SOCAT data collection**
- Available as zip file for whole collection or individual cruise files
- Can download Tropical Pacific
- ASCII data – excel file

**Tropical Moored Array data**
- Available through PMEL
- Can use UI to select platforms
- Download netCDF data
Getting the data - integrated

use http://dunkel.pmel.noaa.gov/erddap/tabledap/integrated_SST?time,longitude,latitude,temp
go polymark poly/lev=(-INF)(15,35,1)(INF) 'LONGITUDE' 'LATITUDE' 'TEMP'
Getting the data - integrated

Regrid to 1x1 degree box
Getting the data - integrated

Can now easily compare with climatological surface temp
use http://dunkel.pmel.noaa.gov/erddap/tabledap/integrated_SST.kml?time,longitude,latitude,temp

Getting the data - integrated
Getting the data - integrated

use http://dunkel.pmel.noaa.gov/erddap/tabledap/integrated_SST.csv?time,longitude,latitude,temp

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REST services via ERDDAP

… Or, better yet, here

Metadata available through international standards

Original metadata can be enhanced at this point, if necessary

Data flows directly into users’ applications
Thank you!

- OSMC: [www.osmc.noaa.gov](http://www.osmc.noaa.gov)
- OSMC ERDDAP: osmc.noaa.gov/erddap/
- ERDDAP: coastwatch.pfeg.noaa.gov/erddap

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