OurOcean
A web portal to serve near real-time coastal ocean data products

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Outline

- Motivation
- *OurOcean* Architecture
- *OurOcean* Data Server
- *OurOcean* User Interface
- *OurOcean* Visualization Tools
- Current *OurOcean* Data Products
- Status & Future Direction
Coastal Oceans are scientifically interesting and practically important.
Satellite data alone does not provide enough and accurate information at the coastal regions.

- Ocean data have gaps between satellite tracks.
- Satellite data are contaminated near coastlines (by land).
- A high resolution (1-10 km) regional atmosphere model is required to fill the satellite data gaps.
OurOcean Architecture

- An end-to-end web-based system for data retrieval, data archive, data processing and data distribution with a focus on the East Pacific Coastal Ocean wind.
  - Daily QuikSCAT wind data (PODACC at JPL)
  - Daily COAMPS simulated wind data (FNMOC)
  - Blended wind data (JPL)
  - 3D ocean temperature, salinity and current datasets (ROMS 3D model by JPL)
Blended Wind Data Product (from QuikSCAT & COAMPS)
- Two-dimensional variation data assimilation algorithm
- Fill the missing data in QuikSCAT data set using the simulated wind.
- Can be used as input to the real-time 3D regional ocean model

ROMS (Regional Ocean Modeling System)
- A parallel high-resolution 3D ocean modeling and forecasting system by UCLA/JPL
- Using terrain-following curvilinear grids and good for modeling coastal oceans.
Use LAS (Live Access Server) developed by NOAA Pacific Marine Environmental Laboratory (PMEL) as the web server.

Data are stored in COARDS (Cooperative Ocean/Atmosphere Research Data Service) compliant NetCDF files, one file per year per data source.

Use XML to define the metadata for the datasets, the user interface, and the visualization tool options.

Use Ferret data visualization and analysis system as the backend visualization tool.
COARDS NetCDF Data Format

NetCDF (Network Common Data Form) -- Unidata

- A machine-independent format for representing scientific data
- An interface for array-oriented data access and a library to implement the interface

COARDS NetCDF (Cooperative Ocean/Atmosphere Research Data Service) -- NOAA

- For sharing and distribution of global atmospheric and oceanographic data sets.
- Support rectilinear coordinate systems
- Support 1D, 2D, 3D, and 4D datasets

```plaintext
netcdf QuikSCATL3_2002

dimensions:
    lat = 126 ;
    lon = 186 ;
    time = UNLIMITED ; // (295 currently)

variables:
    float lat(lat);
        lat:long_name = "Latitude" ;
        lat:units = "degrees north" ;
    float lon(lon);
        lon:long_name = "Longitude" ;
        lon:units = "degrees east" ;
        lon:modulo = "" ;
    float time(time);
        time:long_name = "time" ;
        time:units = "days since 2002-01-01" ;
        time:time_origin = "1-JAN-2002" ;
    float u_asc(time, lat, lon);
        u_asc:long_name = "u, ASCENDING PASS" ;
        u_asc:units = "m/s" ;
        u_asc:scale_factor = 1. ;
        u_asc:add_offset = 0. ;
        u_asc:missing_value = 0. ;

data:
    lat = 28.875,29.125,29.375,....
```
<lasdata>
<datasets>
  <QuikSCATL3_2002_nc url="file:/myocean/data/QuikSCAT/QuikSCATL3_2002.nc"
    name = "QuikSCAT L3 Data 2002" namedoc="">
    <variables>
      <u_asc units="m/s" name="u, ASCENDING PASS">
        <link match="/lasdata/grids/QuikSCATL3_2000_nc_lon_lat_time_grid"/>
      </u_asc>
    </variables>
  </QuikSCATL3_2002_nc>
</dataset>
<grids>
  <QuikSCATL3_2002_nc_lon_lat_time_grid>
    <link match="/lasdata/axes/QuikSCATL3_2002_nc_lon"/>
    <link match="/lasdata/axes/QuikSCATL3_2002_nc_lat"/>
    <link match="/lasdata/axes/QuikSCATL3_2002_nc_time"/>
  </QuikSCATL3_2002_nc_lon_lat_time_grid>
</grids>
<axes>
  <QuikSCATL3_2002_nc_lon units="degrees_east" type="x">
    <arange start="199.875" step="0.25" size="186"/>
  </QuikSCATL3_2002_nc_lon>
  <QuikSCATL3_2002_nc_time units="day" type="t">
    <arange start="2002-01-01 00:00:00" step="1" size="295"/>
  </QuikSCATL3_2002_nc_time>
</axes>
</lasdata>
OurOcean User Interface

- Java applet enabled Web browser
- Multi-level selection of datasets
- Clickable and zoomable map to select a sub-area of the dataset
- Pull-down menu to select a subset in depth or time dimension
- Various output formats—images at different resolutions, raw data, NetCDF file, text data
- 2D plots of cross sections of any two dimensions from a 2D, 3D, or 4D data set.
- Configurable user interface using XML metadata
<menu type="ops" name="Ops_Std2D">
    <item values="shade,shade">Shaded plot (GIF)</item>
    <item values="shade,ps">Shaded plot (PostScript)</item>
    <item values="data,txt">Quick inspection (text)</item>
    <item values="data,cdf">NetCDF</item>
    <item values="data,tsv">Tab separated (text)</item>
    <item values="data,csv">Comma separated (csv)</item>
    <item values="data,asc">FORTRAN formatted (text)</item>
    <item values="data,arc">ArcView gridded</item>
    <item values="ferret_script,jnl">Ferret script</item>
</menu>

<menu type="regions" name="Regions_Pacific">
    <item values="190,252,29,60">Full Region</item>
</menu>

<menu type="views" name="Views_StdVec">
    <ifitem view="xy" values="xy">xy (lat/lon) slice</ifitem>
    <ifitem view="xz" values="xz">xz (lon/depth) slice</ifitem>
    <ifitem view="xt" values="xt">xt (Hovmoller) slice</ifitem>
    <ifitem view="yz" values="yz">yz (lat/depth) slice</ifitem>
    <ifitem view="yt" values="yt">yt (lat/time) slice</ifitem>
    <ifitem view="zt" values="zt">zt (depth/time) slice</ifitem>
</menu>

<image name="Image_Pacific" url="gifs/region.jpg" bounds="190,252,29,60"/>

<map type="livemap" name="Regions_Pacific">
    <image href="#Image_Pacific"/>
    <menu href="#Regions_Pacific"/>
</map>
Our Ocean Visualization Tools

- Ferret as default visualization tool
  2D plots of large 4D gridded data sets.
  - Shaded plots
  - Contour maps
  - Vector plots
  - Land shade

Wind vector plot from COAMPS

- Customized visualization tools such as MatLab, IDL or other 3D vis. tools can be added.
- Capable of plotting compound variables (vectors) or difference of any two variables
- XML definition for plotting options

The temperature profile from 9/99 - 9/00 at 37.5° latitude,
Data generated from a ROMS 3D model
OurOcean Data Products

The QuikSCAT wind, u component, descending pass, 9/21/2002

The COAMPS wind, u analysis data at 00h, 9/21/2002
The blended wind data, u component, descending pass, 9/21/2002

The comparison of the blended wind and the QuikSCAT data, u component, 9/21/2002
- *OurOcean* is serving 3 real time datasets (QuikSCAT, COAMPS, Blended Wind) and 3 ROMS datasets covering different regions (Atlantic, Central California Coastal and Pacific)

- *OurOcean* is currently open to selected collaborators outside JPL, will go public in December.

- Future plans:
  - Run East Pacific Coastal ROMS model on SGI Origin 2000 daily with the blended wind data as input, serve real time ROMS data on *OurOcean*
  - Add customized 3D visualization tool to *OurOcean*
An End-to-End Ocean Forecasting System
Integrating Observations, Model and Users

Observations (satellite, in situ)

3-D Ocean Models (forward and inverse)

User Community
Local Managers
Education
Public Outreach

Data Input

Observation Network Design

Synthesis Products

OurOcean