Example - layering US and EU resources with web services

Rolling Deck to Repository: Opportunities for US-EU Collaboration

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Woods Hole Oceanographic Institution

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Scripps Institution of Oceanography

Karen Stocks
San Diego Supercomputer Center

Session ESSI2 - Informatics in Oceanography
7 April 2011
Traditional Practice
Find funding
  Go to sea
 Publish papers

New paradigm
Exchange data (before, during and after expedition)
 Publish data in repositories
  Publish journal articles with links to data

Data management now critical
Three Topics for Today

1. What is R2R?

2. What is available?

3. How can we benefit from collaboration?

Avoid re-inventing the wheel
Catalyst for innovation
Enable broader discovery

Rolling Deck to Repository
http://rvdata.us
1. What is R2R?

US research fleet data gateway

Lead Investigator
Suzanne Carbotte
Lamont-Doherty Earth Observatory

Program Officer
Jim Holik
NSF
Oceanographic Centers and Facilities

Collaborative effort
5-year National Science Foundation support
Rolling Deck to Repository (R2R)
Collaborative effort

R2R Team Members
Lamont-Doherty Earth Observatory
Scripps Institution of Oceanography
San Diego Supercomputer Center
Woods Hole Oceanographic Institution
Florida State University

Coordination with
NOAA NGDC, NODC
UNOLS
Vessel Operators
Shipboard technicians
Chief Scientists
R2R Activities

1. Receive data from 26 vessels
   Initially transfer each cruise to deep archive, as-is

2. National cruise catalog
   Standard cruise metadata
   Standard navigation products

3. ELOG event logger tool
   (Poster XL169 at EGU, Thursday April 7)

4. Auto harvest underway data
   Transfer to national repositories

5. Assess data quality
   Timely feedback to operators

Previously data at risk, no systematic effort

Fortunately submissions now mostly over Internet
2. What is available on R2R? - Browse http://rvdata.us

Overview

With their global capability and diverse array of sensors, the U.S. academic research fleet is an essential mobile observing platform for ocean science. Data collected on every expedition are of high value, especially given the high costs and increasingly limited resources for ocean exploration. The Rolling Deck to Repository (R2R) program aims to develop comprehensive fleet-wide management of underway data to ensure preservation of and access to our national oceanographic research data resources.

Home >> About R2R

Community Engagement
Stakeholders Benefits
"Underway" Data
Standard Products
Quality Assessment
Event Log
Realtime Data
Data Pipeline
Data Policies
R2R Team Members

Metadata, vocabularies, web services
R2R links end users to National Repositories

“Inventory” displays complete list of all shipboard data (Transport to repository may be pending, some data may be on hold)

“Info” links to chief scientist’s project site

“Download” links to NGDC holdings
R2R Creates Standard Cruise Navigation Products

Original shipboard GPS issues:
- Logged in at least 15 different formats
- Multiple sensors, multiple files
- Sometimes only embedded in data logger records

R2R produces 3 quality controlled files for each cruise:

<table>
<thead>
<tr>
<th>Date/Time (ISO8601)</th>
<th>longitude</th>
<th>latitude</th>
<th>NMEA-0183</th>
<th>number of satellites</th>
<th>horizontal dilution</th>
<th>height above sea level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-01-11T23:56:01Z</td>
<td>176.182813</td>
<td>-37.648890</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>38</td>
</tr>
<tr>
<td>2010-01-11T23:56:02Z</td>
<td>176.182815</td>
<td>-37.648890</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>38</td>
</tr>
</tbody>
</table>

1. Best resolution
   Original sampling, usually 1 second, tab-delimited

2. One-minute sampling
   Often used for merging underway data

3. Control points
   Convenient for graphical display

Aaron Sweeney, SIO
Vessel Profiles

Track instruments across the fleet

Operators provide
Manufacturer, model, shipboard location

R2R versioning will track changes

Available R2R metadata, vocabularies, web services
Vocabularies

- Country (ISO)
- Cruise Type (UNOLS)
- Cruise
- Device Type
- Facility
- Fileset Type
- Gazetteer - Exclusive Economic Zone (VLIZ)
- Gazetteer - Sea Area (IHO)
- Gazetteer - Undersea Feature Name (IHO)
- Language (ISO)
- Media Type
- Organization (IANA)
- Person
- Port (UNOLS)
- Processing Level (CODMAC)
- Program
- Role Type
- Sample Type (USGS)
- State (FIPS)
- Vessel (ICES)

R2R vocabularies allow aliases to enable interoperability with other authorities

Vocabulary - Device Type

(authority=R2R)

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Directory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>adcp</td>
<td>adcp</td>
<td>(acoustic doppler current profiler) sonar measures water current velocities</td>
</tr>
<tr>
<td>anemometer</td>
<td>wind</td>
<td>measures wind speed and direction</td>
</tr>
<tr>
<td>ctd</td>
<td>ctd</td>
<td>integrated hydrographic system measures conductivity, temperature, pressure, etc.</td>
</tr>
<tr>
<td>echosounder</td>
<td>echo</td>
<td>sonar measures depth to seafloor or midwater reflectors - fathometer, fishfinder, etc.</td>
</tr>
<tr>
<td>expendableprobe</td>
<td>xbt</td>
<td>hand/deck-launched single-use probes - XBT, XCTD, XSV, XCP, etc.</td>
</tr>
<tr>
<td>flowmeter</td>
<td>flow</td>
<td>measures rate of water flow - can be mechanical, optical, electromagnetic, etc.</td>
</tr>
<tr>
<td>fluorometer</td>
<td>fluoro</td>
<td>measures fluorescence (usually for phytoplankton)</td>
</tr>
<tr>
<td>gnss</td>
<td>gnss</td>
<td>(global navigation satellite system) - GPS/WAAS, GLONASS, Galileo, etc.</td>
</tr>
<tr>
<td>gravimeter</td>
<td>grav</td>
<td>measures the Earth's local gravitational field</td>
</tr>
<tr>
<td>gyrocompass</td>
<td>gyro</td>
<td>compass with a motorized gyroscope that tracks true north (heading)</td>
</tr>
<tr>
<td>hdss</td>
<td>hdss</td>
<td>(hydrographic doppler sonar system) sonar measures water current velocities</td>
</tr>
<tr>
<td>magnetometer</td>
<td>mag</td>
<td>measure strength and/or direction of the Earth's magnetic field</td>
</tr>
<tr>
<td>metstation</td>
<td>met</td>
<td>integrated meteorological system measures temperature, humidity, etc.</td>
</tr>
<tr>
<td>mru</td>
<td>mru</td>
<td>(motion reference unit) measures pitch, roll, heave, and heading</td>
</tr>
<tr>
<td>multibeam</td>
<td>multibeam</td>
<td>multiple formed beam mapping sonar system</td>
</tr>
<tr>
<td>multiplex</td>
<td>[name]</td>
<td>serial de/multiplexing+timetagging acquisition system or post-processing package</td>
</tr>
<tr>
<td>pco2</td>
<td>pco2</td>
<td>measures partial pressure of dissolved carbon dioxide</td>
</tr>
<tr>
<td>radiometer</td>
<td>rad</td>
<td>measures radiation - pyranometer, pyrhiometer, pyrgeometer, albedometer, etc.</td>
</tr>
<tr>
<td>rain gauge</td>
<td>rain</td>
<td>(udometer) measures amount of liquid precipitation</td>
</tr>
<tr>
<td>speedlog</td>
<td>speedlog</td>
<td>measures Doppler near surface vessel speed through water</td>
</tr>
<tr>
<td>ssv</td>
<td>ssv</td>
<td>sea surface sound velocimeter - typically input to multibeam</td>
</tr>
<tr>
<td>subbottom</td>
<td>subbottom</td>
<td>sonar profiling system for shallow sediment penetration</td>
</tr>
<tr>
<td>thermometer</td>
<td>thermo</td>
<td>measures air or water temperature</td>
</tr>
<tr>
<td>transmissometer</td>
<td>trans</td>
<td>measures fraction of light absorbed or scattered by particles in water</td>
</tr>
<tr>
<td>tsg</td>
<td>tsg</td>
<td>(thermosalinograph) measures flow-through conductivity, temperature, etc.</td>
</tr>
<tr>
<td>winch</td>
<td>winch</td>
<td>measures wire tension, speed, payout, etc.</td>
</tr>
</tbody>
</table>
Cruise Level Metadata xml

Get with web service

http://get.rvdata.us/services/cruise/?id=KM0508

Project name
Cruiseid
Project url

Vessel name and id
Operator name and id

Lat-lon bounds

Ports

Names and institutions for at least chief scientist

ISO-compliant specification, Anna Milan, NOAA:
http://ngdc.noaa.gov/mgg/ecs/metadata/

URI embedded for every vocabulary source
Cruise Tracklines

Get with web service

http://get.rvdata.us/services/tracks/?id=KM0508

Available for all R2R cruises

Control points for graphical display

GeoJSON format
  - Java Script Object Notation – Geometry and Feature Description
http://geojson.org/
3. How can we benefit from US-EU collaboration?

Sharing of:
- Experiences
  What works (and what doesn’t)
- Services
  Maintain catalog of services by all partners
- Tools
  Data QA, QC
  Data processing
  Metadata creation and mapping
- Standards
- Vocabularies
- Actual data (Holy Grail)
  Search for cruises in a region
  Search for data types

Support end user audiences

If Parsifal would have had an interoperable search portal...
Combined Data Portal

Example using open source GIS tool “uDig”
http://udig.refractions.net/

MGDS Global Multi-Resolution Topography (WMS)

R2R ship tracks (WMS)
This is by vessel, for Melville MV:
http://www.rvdata.us/cgi-bin/mapserv?map=/local/home/mgds/web/get.rvdata.us/htdocs/gis/wms_MV.map

R2R world ports (WMS)
http://www.rvdata.us/cgi-bin/mapserv?map=/local/home/mgds/web/get.rvdata.us/htdocs/gis/wms_ports.map

EMODNET geology (WMS)
http://geomaps2.gtk.fi/ArcGIS/services/EMODNET-Geology/MapServer/WMSServer

World Maritime Boundaries (VLIZ Shape file)
World Country Boundaries (VLIZ Shape file)
In the case VLIZ layers previously downloaded

Load data from local system and remote systems
WFS (web feature service)
WMS (web map service)
Proposed US-EU Interoperability Exchange Tables

Crossover between social and computer networking
Quickly introduce participants to resources of other projects

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Project Name</th>
<th>URL</th>
<th>Content Description</th>
<th>Technical Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project information</td>
<td>R2R</td>
<td><a href="http://www.rvdata.us/">http://www.rvdata.us/</a></td>
<td>Rolling Deck to Repository (R2R) archives US underway data, worldwide, for &gt; 26 vessels, 2000 cruises, 26 device types</td>
<td>Robert Arko, LDEO</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>R2R</td>
<td><a href="http://www.rvdata.us/voc">http://www.rvdata.us/voc</a></td>
<td>Links to sources for all vocabularies used by R2R</td>
<td>Robert Arko, LDEO</td>
</tr>
<tr>
<td>Web service</td>
<td>R2R</td>
<td><a href="http://www.rvdata.us/about/services">http://www.rvdata.us/about/services</a></td>
<td>Description of all R2R web services, including examples</td>
<td>Robert Arko, LDEO</td>
</tr>
<tr>
<td>Data types</td>
<td>R2R</td>
<td><a href="http://www.rvdata.us/voc/devicetype">http://www.rvdata.us/voc/devicetype</a></td>
<td>List of R2R standard device type names</td>
<td>Robert Arko, LDEO</td>
</tr>
</tbody>
</table>

Tables also exist for Geo-Seas, EMODNET-Geology, soon EuroFleets
Use Existing Community Resources

Roy Lowry, BODC
SeaDataNet Vocabularies
http://vocab.ndg.nerc.ac.uk/client/vocabServer.jsp

Worldwide project descriptions:
http://marinemetadata.org/intitiatives
http://marinemetadata.org/references

Example of community page
http://marinemetadata.org/community/teams/ont

The following Pan-European metadata services give overviews of marine organisations in Europe and their engagement in marine research projects, managing large datasets, and data acquisition by research vessels and monitoring programmes for the European seas and global oceans:

- European Directory of Marine Organisations (EDMO)
- European Directory of Marine Environmental Data sets (EDMED)
- European Directory of Marine Environmental Research Projects (EDMERP)
- Cruise Summary Reports (CSR)

http://vocab.ndg.nerc.ac.uk/

News

- MIKADO new release
- MIKADO 2.0.1 is available
- SeaDataNet fifth plenary meeting
  The SeaDataNet fifth plenary meeting will take place in Angera - Italy on 2011, March 29–30–31 (more info).
  This meeting is organized by JRC (Ispra).
- NEMO New release
  version 1.2.29
- Advisory group report
  by M. Gregg, H. Dahlin & B. Keeley

Karen Stocks
John Graybeal
MMI and SIO
Required Ingredients for Collaboration

Eagerness
Start by defining clear benefits for all partners

Technology
Enable ongoing exchange of data, metadata, ideas

Events
Augment face-to-face meetings with telecons
Include technical staff, not just PI’s

Funds
Find new support for collaboration events
Leverage with partner resources

It Takes a Team