

Rolling Deck to Repository (R2R)

Robert Arko

Lamont-Doherty Earth Observatory

Vision

“the academic fleet as an integrated global observing system”

R2R proposes an evolution of data management for research vessels, providing a “direct pipeline” for routine underway cruise data and documentation from the operating institution to a central shoreside repository.

Program Team



5-year program funded by
NSF Oceanographic Technical Services
(September 1, 2009 – '14)

Bob Arko *

Mark Bourassa

Suzanne Carbotte (*Lead PI*)

Cyndy Chandler *

Dru Clark *

Alex Dorsk *

Vicki Ferrini

Andy Maffei *

Scott McCue

Stephen Miller

Suzanne O'Hara

Shawn Smith *

Karen Stocks

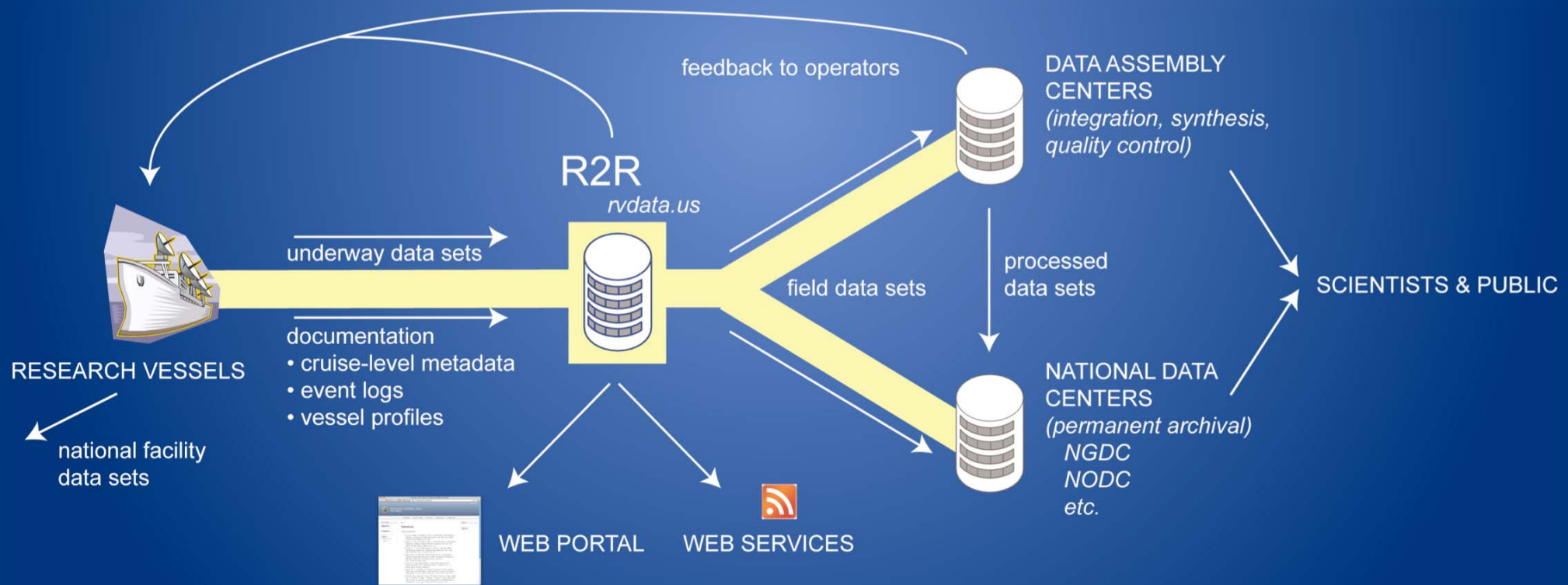
Aaron Sweeney *

**(at this meeting)*

(all part-time)

Overview

- Migrate all routine “underway” data to long-term repositories
- Create national catalog of cruises and standard products
- Assess data quality and provide timely feedback to operators



Benefits

- Facilitate data preservation and dissemination
- Standardize data acquisition and processing procedures
- Improve data quality and documentation
- Enhance data integration and synthesis (compilations)
- Facilitate cruise planning, permits, clearances

Global Synthesis: Seafloor Bathymetry



(Monterey Canyon)

Applications:

- Tsunami modelling
- Ocean mixing/Bottom currents
- Maritime navigation/Cables
- Benthic habitats

Timeline



- 2007
 - Mar. – UNOLS Data Committee charter
 - Nov. – RVTEC report/discuss
- 2008
 - Sep. – R2R pilot program funded
 - Sep. – LOE / R2R Workshop
 - Oct. – UNOLS Data Committee report to Council
 - Oct. – RVTEC report/discuss
- 2009
 - Sep. – R2R full program funded
 - Nov. – RVTEC report/discuss

Routine “Underway Data” Types

Instrument System	Data - Description	# Systems (by RV Class)			
		Global/Ocean (10)	Inter/Regional (8)	Coastal/Local (7)	TOTAL
“Navigation”	<i>(date/time, position, motion – GPS-INS, compass, speed log, etc.)</i>	51	41	23	= 115
Gravimeter		9	1	0	= 10
Magnetometer		8	1	0	= 9
Echosounder	<i>(high/fixed freq. single/split beam)</i>	7	5	6	= 18
Multibeam	<i>(hull-mounted swath + sea surface sound velocimeter)</i>	11	0	2	= 13
Subbottom	<i>(low/swept freq. – profile images)</i>	12	10	5	= 27
ADCP	<i>(acoustic doppler current profiler)</i>	16	13	9	= 38
Met. Station	<i>(temperature, pressure, humidity, wind speed/direction, precipitation, radiation, etc.)</i>	10	8	7	= 25
CTD	<i>(towed/lowered – temperature, salinity, depth, dissolved oxygen, pH, PAR, transmissivity, etc.)</i>	11	9	8	= 28
TSG	<i>(surface – temperature, salinity)</i>	8	3	5	= 16
Fluorometer	<i>(fluorescence, turbidity, absorbance)</i>	6	4	2	= 12
pCO2	<i>(partial pressure of CO2)</i>	4	0	0	= 4
Exp. Probe	<i>(temperature, salinity, depth, sound speed – XBT, XCTD, XSV, etc.)</i>	10	4	2	= 16
Winch/Wire	<i>(tension, speed, payout, etc.)</i>	10	8	7	= 25

(as of
Oct.
2009)

<http://www.rvdata.us/about/profiles>

Design Principles

- Work directly with operators – create a “fleet portal”
- Accomodate full range of vessels and classes
- Maximize efficiency for ~500 cruises/ year
- Synchronize with scheduling and inspection databases
- Routinize submission to the national data centers

Status

- 12 vessels actively submitting data
- 1,000+ cruises inventoried
- 3.8 million data files archived

*Atlantis
Barnes
Healy
KOK
Kilo Moana
Knorr
Langseth
Melville
Oceanus
Revelle
Sharp
Thompson*

Cruise Catalog | Rolling Deck to Repository (R2R)

http://www.rvdata.us/catalog

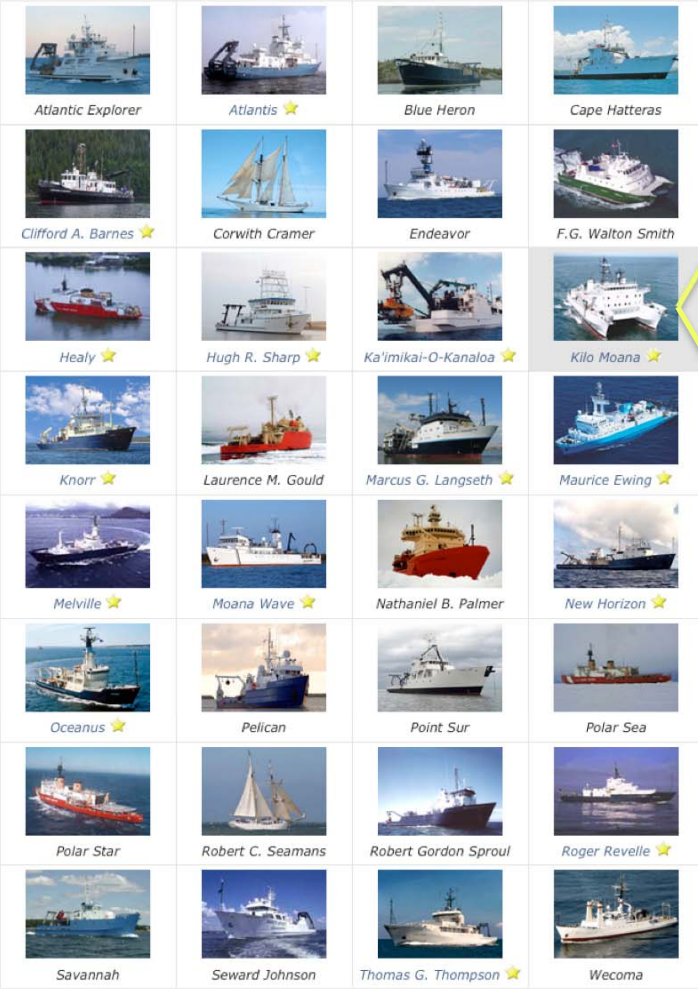
Home About R2R Cruise Catalog Calendar Contact Us Internal

Ships: 15
Cruises: 1053
Files: 3795530
November 16, 2009

Search

Home

Cruise Catalog



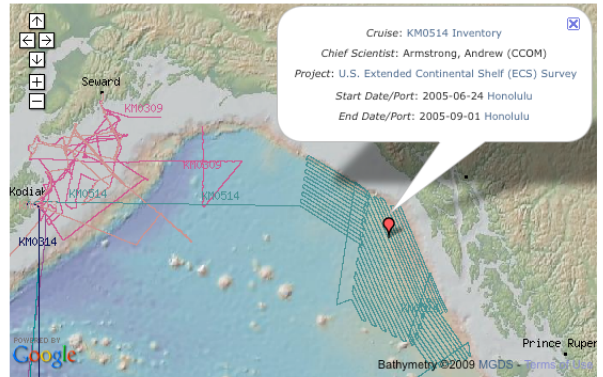
Atlantic Explorer Atlantis★ Blue Heron Cape Hatteras
Clifford A. Barnes★ Corwith Cramer Endeavor F.G. Walton Smith
Healy★ Hugh R. Sharp★ Ka'imikai-O-Kanaloa★ Kilo Moana★
Knorr★ Laurence M. Gould Marcus G. Langseth★ Maurice Ewing★
Melville★ Moana Wave★ Nathaniel B. Palmer New Horizon★
Oceanus★ Pelican Point Sur Polar Sea
Polar Star Robert C. Seamans Robert Gordon Sproul Roger Revelle★
Savannah Seward Johnson Thomas G. Thompson★ Wecoma

Click here for vessel details. ★- (data online)

http://www.rvdata.us/catalog/Kilo_Moana

Home

Cruise Catalog: Kilo Moana



Cruise: KM0514 Inventory
Chief Scientist: Armstrong, Andrew (CCOM)
Project: U.S. Extended Continental Shelf (ECS) Survey
Start Date/Port: 2005-06-24 Honolulu
End Date/Port: 2005-09-01 Honolulu

Operator: University of Hawaii

Cruise ID	Start Date	Start Port	End Date	End Port
Details				
Inventory	Project: Hawaii Ocean Timeseries (HOT-173) Chief: Santiago-Mandujano, Fernando (Hawaii)			
KM0514	2005-06-24	Honolulu	2005-09-01	Honolulu
Inventory	Project: U.S. Extended Continental Shelf (ECS) Survey Chief: Armstrong, Andrew (CCOM)			
KM0513	2005-06-13	Honolulu	2005-06-17	Honolulu
Inventory	Project: Hawaii Ocean Timeseries (HOT-170) Chief: Santiago-Mandujano, Fernando (Hawaii)			
KM0512	2005-06-02	Honolulu	2005-06-10	Honolulu
Inventory	Project: Improvement of Bottomfish Stocks: Phase III Chief: Kelley, Christopher (Hawaii)			
KM0511	2005-05-28	Honolulu	2005-05-30	Honolulu

(178 cruises)

Cruise Catalog

http://www.rvdata.us/catalog/Hugh_R._Sharp

Home

Cruise Catalog: Hugh R. Sharp

Operator: University of Delaware

Cruise ID	Start Date	Start Port	End Date	End Port
HRS081013AW	2008-10-13	Lewes	2008-10-17	Lewes
<i>Inventory</i>	Project: New Jersey Wind Farm Chief: Whitt, Amy (Geo-Marine)			
HRS081001EH	2008-10-01	Solomons	2008-10-10	Solomons
<i>Inventory</i>	Project: Estuarine Turbidity Maxima Chief: Houde, Edward (UMCES)			
HRS080920RS	2008-09-20	Woods Hole	2008-10-02	Solomons
<i>Inventory</i>	Project: Nonlinear Internal Waves Chief: Shearman, Kipp (Oregon State)			
HRS080818DK	2008-08-18	Lewes	2008-08-18	Lewes
<i>Inventory</i>	Project: Photoheterotrophic Microbes of the Mid-Atlantic Bight Chief: Kirchman, David (Delaware)			

(100 cruises)

Cruise Catalog | Rolling Deck to Repository (R2R)

<http://www.rvdata.us/catalog>

Home About R2R Cruise Catalog Calendar Contact Us Internal

Ships: 116
Cruises: 1058
Files: 3795530
November 16, 2009

Search

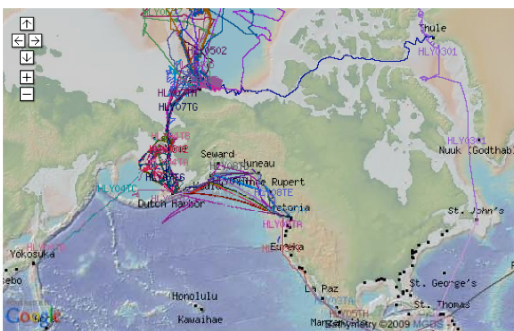
Cruise Catalog

Atlantic Explorer	Atlantis	Blue Heron	Cape Hatteras
Clifford A. Barnes	Corwith Cramer	Endeavor	F.G. Walton Smith
Healy	Hugh R. Sharp	Ka'imikai-O-Kanaloa	Kilo Moana
Knorr	Laurence M. Gould	Marcus G. Langseth	Maurice Ewing
Melville	Moana Wave	Nathaniel B. Palmer	New Horizon
Oceanus	Pelican	Point Sur	Polar Sea
Polar Star	Robert C. Seamans	Robert Gordon Sproul	Roger Revelle
Savannah	Seward Johnson	Thomas G. Thompson	Wecoma

Click here for vessel details. ★ - (data online)

Cruise Catalog

Cruise Catalog: Healy



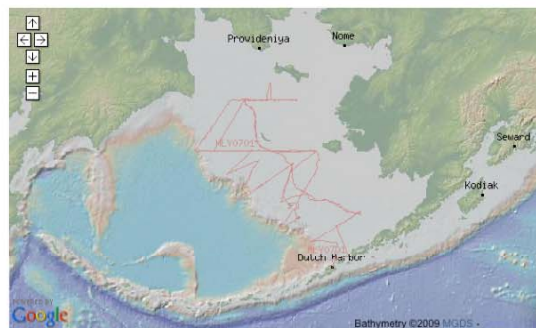
Operator: U.S. Coast Guard

Cruise ID	Start Date	Start Port	End Date	End Port
Details				
HLY07TD	2007-06-20	Dutch Harbor	2007-06-26	Seattle
Inventory				
Project: Transit				
HLY0702	2007-05-16	Dutch Harbor	2007-06-18	Dutch Harbor
Inventory				
Project: St. Lawrence Island Polynya (SLIPP07)				
Chief: Grebmeier, Jacqueline (UTK)				
HLY0701	2007-04-10	Dutch Harbor	2007-05-12	Dutch Harbor
Inventory				
Project: Bering Sea Ecosystem Study (BEST): Nitrogen Supply for New Production				
Chief: Sambrotto, Raymond (LDEO)				
HLY07TC	2007-04-03	Seattle	2007-04-09	Dutch Harbor
Inventory				
Project: Transit				
HLY07TB	2007-03-08	Seattle	2007-03-16	Seattle

(103 cruises)

Home

Cruise Catalog: HLY0701

Operator: U.S. Coast Guard
Vessel: Healy

Cruise ID	Start Date	Start Port	End Date	End Port
Details				
HLY0701	2007-04-10	Dutch Harbor	2007-05-12	Dutch Harbor
Inventory				
Project: Bering Sea Ecosystem Study (BEST): Nitrogen Supply for New Production				
Chief: Sambrotto, Raymond (LDEO)				
SCIENCE PARTY				
DATA SETS				
System	Vendor-Model	Repository		
Multibeam	L-3/SeaBeam 2112	NGDC		

Download

National Data Centers

- documentation
- archival
- dissemination

Multibeam data:
R2R > NGDC

Cruise File List

http://www.ngdc.noaa.gov/mndc/struts/results?op_0=I&v_0=NEW907&t=101378&s=8&d=70&d=

Cruise Catalog: HLY0701 | Roll... Cruise File List

NOAA > NESDIS > NGDC > MGG > Multibeam Bathymetry

National Geophysical Data Center (NGDC)

NOAA Satellite and Information Service

Multibeam Bathymetric Data

HLY0701 Data File List

These data are not to be used for navigation.

Downloads may take a long time, depending on file size and data transfer rates.

Download All Files | <---Click here to package and download all files listed below

File Name (click to view/download)	File Size	Description
Multibeam Files ---- MBSystem Cruise Summary		
Version 1 Full Resolution----		
sb20071002100.mb41	20.1 MB	SeaBeam 2100 series vender format
sb20071002200.mb41	20.2 MB	SeaBeam 2100 series vender format
sb20071002300.mb41	11.3 MB	SeaBeam 2100 series vender format
sb20071010000.mb41	11.2 MB	SeaBeam 2100 series vender format
sb20071010100.mb41	11.4 MB	SeaBeam 2100 series vender format
sb20071010200.mb41	11.5 MB	SeaBeam 2100 series vender format
sb20071010300.mb41	11.6 MB	SeaBeam 2100 series vender format
sb20071010400.mb41	11.3 MB	SeaBeam 2100 series vender format
sb20071010500.mb41	12.5 MB	SeaBeam 2100 series vender format
sb20071010600.mb41	12.6 MB	SeaBeam 2100 series vender format
sb20071010700.mb41	18.3 MB	SeaBeam 2100 series vender format
sb20071010800.mb41	23.4 MB	SeaBeam 2100 series vender format
sb20071010900.mb41	23.2 MB	SeaBeam 2100 series vender format
sb20071011000.mb41	23.7 MB	SeaBeam 2100 series vender format
sb20071011100.mb41	23.3 MB	SeaBeam 2100 series vender format
sb20071011200.mb41	23.2 MB	SeaBeam 2100 series vender format

Done

<http://www.rvdata.us/catalog/Healy>

Standard Deliverables

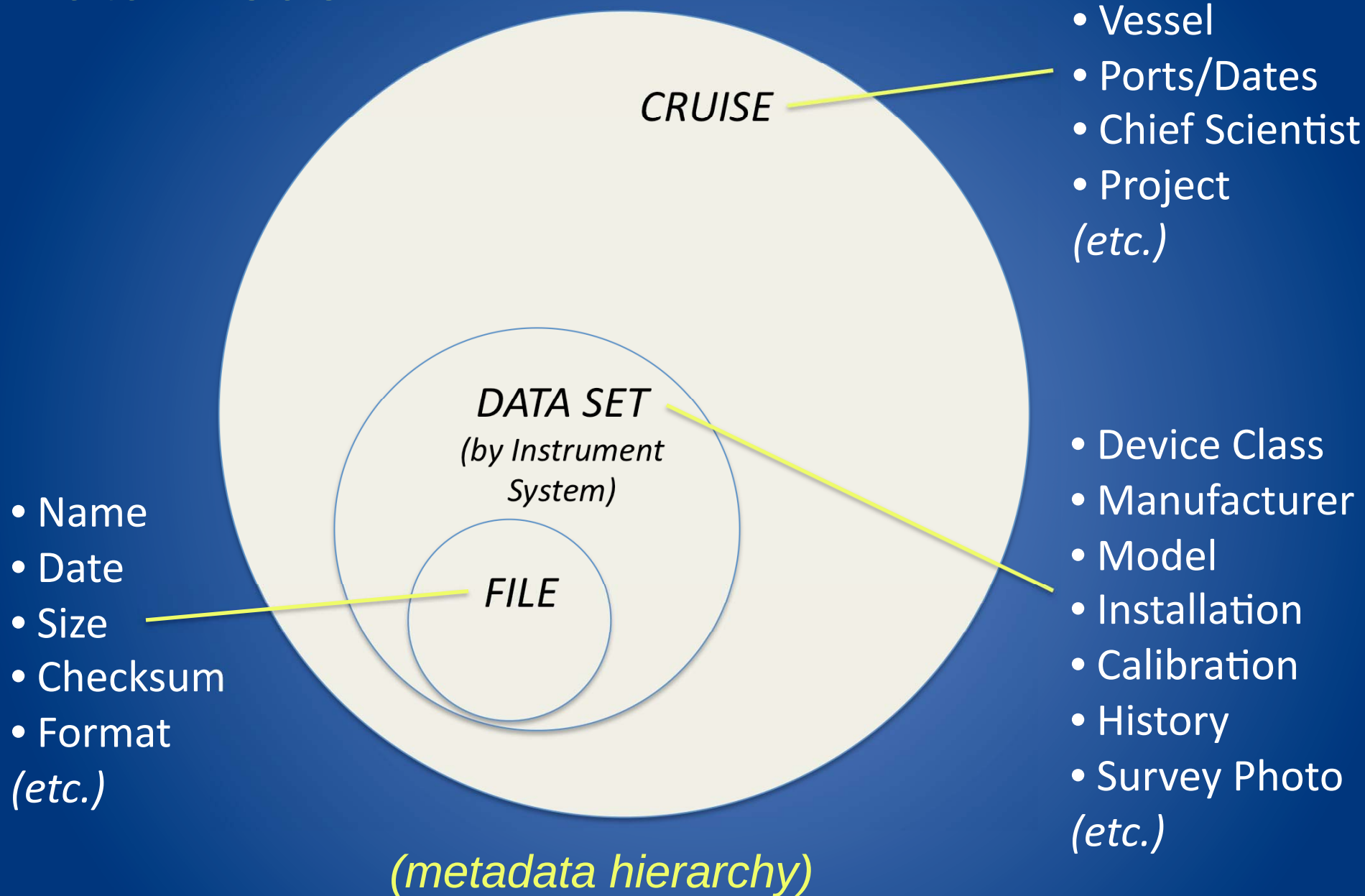
Products

- Catalog Record (cruise-, dataset-, and file-level metadata)
- Ship Track (cleaned navigation and control point geometry)
- Event Log (scientific sampling and/or engineering events)
- Operation Report (formatted document with standard products + appendices)

Services

- Catalog Service – publish catalog records and associated controlled vocabularies
- “Recovery” Service – provide replacement copies of original field data distribution
- Clearance Service – support State Dept. in preparing data deliveries to foreign nations
- “Update” Service – lightweight Web feed to update operator on archiving progress
- Training Guides – publish community best practices for data acquisition/reduction
- Mapping Service – publish navigation products and track maps as Web services

Data Model



Controlled Vocabularies

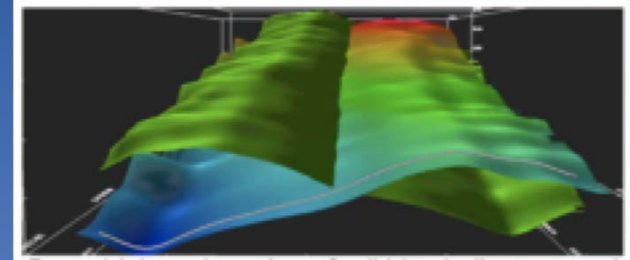


<http://ocean-partners.org/>

- Cruise
- Country (*ISO*)
- State (*FIPS*)
- Device Type
- Data Type
- Organization (*IANA*)
- Vessel (*ICES*)
- Port (*UNOLS*)
- Person
- Role
- Language (*ISO*)
- Media

Data Quality

- Develop automated procedures to assess data
- Publish results as object-level metadata
- Partner with existing programs/specialists (e.g. SAMOS)



Example: Multibeam data

Assessment procedures –

1. document sound velocities, archive profiles
2. build global catalog of patch test sites and results
3. flag bad navigation (time and speed outliers)
4. generate daily plots of raw swath track

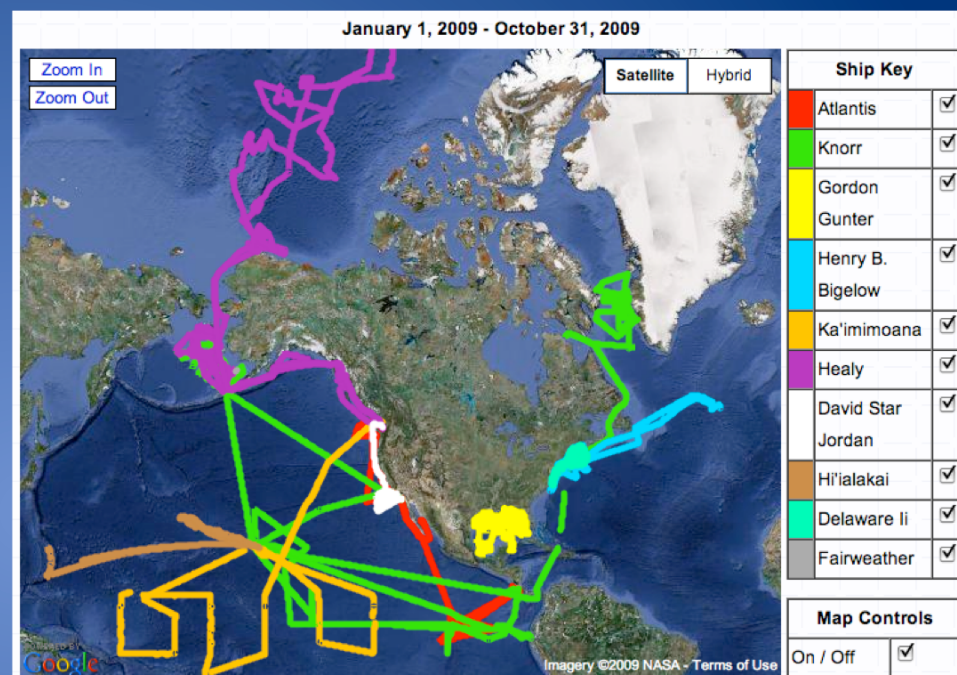
Real-time MET/TSG



- Partnership between SAMOS data center and R2R to expand SAMOS stewardship to UNOLS

SAMOS:

- Providing quality evaluation and feedback to RVs since 2005
- Currently, 23 vessels
 - Operators are WHOI (3), NOAA (15), USCG (2), RPSC (2), Australian BoM (1)
 - ~30-40K one-minute observations per month from each vessel
- Quality monitoring includes
 - Daily visual inspection (no editing)
 - Automated quality flagging
 - Delayed-mode visual editing
- Archival agreement in place with NODC



Operator Benefits

- At-sea notification of sensor problems
- Sensor placement recommendations
- Data with QC rapidly available to users



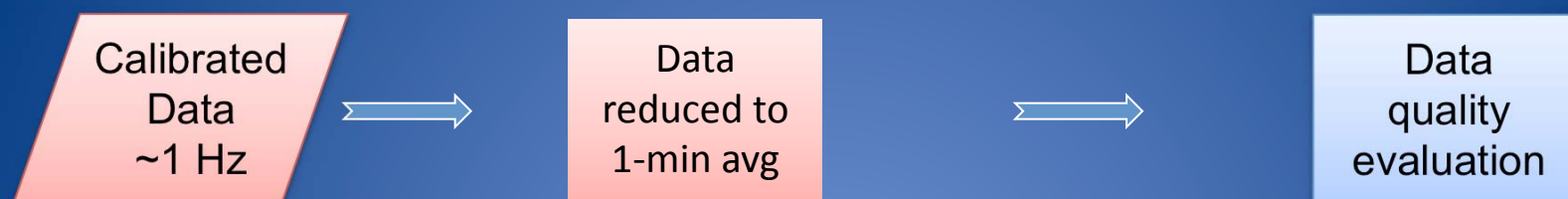
smith@coaps.fsu.edu

17 of 23

Real-time MET/TSG



Present SAMOS data transfer protocol



Proposed R2R/SAMOS data transfer protocol



- ? – Operator input is needed to develop data transfer protocol (formats, parameters, scheduling, etc.)
- Status of this activity to be discussed in afternoon breakout

<http://www.rvdata.us/about/realtime>

Event Logger

- software application and best practices manual for the science party
- a way to record all sampling events during a cruise
- each record includes a unique event ID and basic metadata (position, time, sampling device)

Example event log records:

event	date	time	time_L	sta	lon	lat	ev_type	person	activity
0212208	20020121	2208	1108	TEST	-175.220	-53.572	CTD	nd	CTD001
0230442	20020123	0442	1742	0	-171.480	-55.398	CTD	Wang	CTD002
0231556	20020123	1556	0456	0	-171.583	-55.407	ZooTow	Landry	ZooplankTow
0240153	20020124	0153	1453	1	-171.490	-55.329	TM	Wang	TM001
0240745	20020124	0745	2045	1	-171.408	-55.335	Pump_Cast	Andrews	PumpCast01
0241435	20020124	1435	0335	1	-171.385	-56.333	HPT	Tanner	PlanktonTow
0241520	20020124	1520	0420	1	-171.383	-55.337	TM	Landry	TM002

Event Logger - Prototype

- Community input from technicians, scientists, data managers
- Tested on several cruises
- Next Steps:

The screenshot displays a web-based interface for an event logger. It features a table with columns for Event ID, Datetime (GMT), Latitude (dd), Longitude (dd), Station, and Cast. The table contains three entries, with the first one locked. Below the table, there are buttons for 'Make a new entry' and 'Make new template...'. A search bar on the right side allows users to search the log, with a placeholder text 'search results will appear here'. The interface is designed for data entry and search, with a clean and functional layout.

Event ID	Datetime (GMT)	Latitude (dd)	Longitude (dd)	Station	Cast
OC525_0007	2008-11-12 06:18:03	20.13638	043.45721		
Investigator: DDD Notes: Look. More dolphins. Locked. Someone else is editing this entry.					
OC525_0008	2008-11-13 18:57:13	19.18234	042.42345	5	1
Event Type	Bottom Depth (m)	Core Length (m)	Finger?		
Gravity Core	2350	2.8	No		
Investigator: Muddy Waters Initials: WTS Notes:					
OC525_0009	2008-11-14 12:03:48	18.12341	042.00023		

Make a new entry:

CTD General Gravity Core Hobo Cast MOCNESS Make new template...

Search the log

Search results
search results will appear here

Actions

Alex Dorsk (WHOI)

- determine best deployment strategies
- science party enters events during the cruise
- final log reported with shipboard data
- ingest log to R2R database and disseminate

<http://www.rvdata.us/about/eventlog>

Cruise Metadata

1. Cruise Summary
 - Operator
 - Vessel
 - Ports/Dates
 - Chief Scientist
 - Title
 - Award(s)
 - Cruise ID

www.rvdata.us Web form*
seeded from
UNOLS STRS System

2. Science Party
 - Name
 - Institution
 - Role

www.rvdata.us Web form*
seeded from
UNOLS Ship Utilization Form

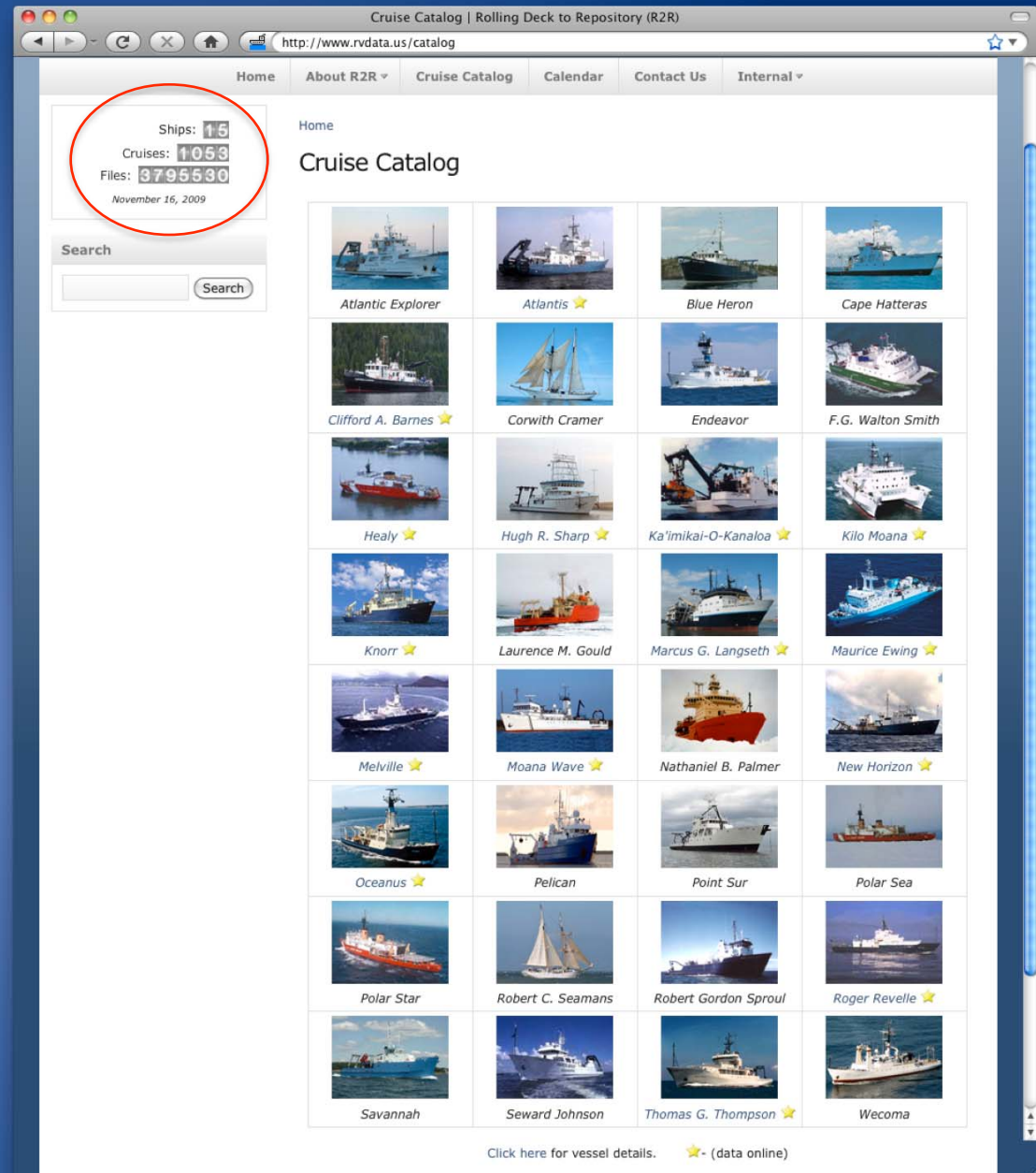
3. Instrument Profile
 - Type
 - Make/Model
 - Serial Number
 - Firmware
 - Installation
 - Calibration
 - Directory

www.rvdata.us Web form*

**(or spreadsheet)*

Next Steps

1. Identify R2R contact(s) for all operators; establish routine submission of cruise data distributions
2. Real-time MET/TSG
3. Event log development + deployment



Feedback



- This meeting – R2R breakouts
- AGU Fall Meeting '09 and Ocean Sciences Meeting '10
- Web contact form and email

<http://www.rvdata.us/contact>

info@rvdata.us



Thank you.