Lessons Learned From 104 Years of Mobile Observatories

Stephen P. Miller[1], Caryn Neiswender[1], Dru Clark[1], Lisa Raymond[2], Margaret A. Rioux[2], Cathy Norton[2], Robert Detrick[2], John Helly[3], Don Sutton[3], John Weatherford[3]

104 Years of Observations: Hand-Written Logbooks, Paper Records, Microfilm, Microfiche, 9-track Tapes, Video (Beta, VHS, 8 mm, 16 mm, 35 mm), Computer Disk (5 1/4", 3 1/2", Zip, CD, DVD, USB), Real-Time Stream, Machine-Machine Transfer, Next Generation…

The Data Challenge

"With data streams from diverse sensor systems accessible to anyone, researchers not traditionally involved in ocean research can be engaged.

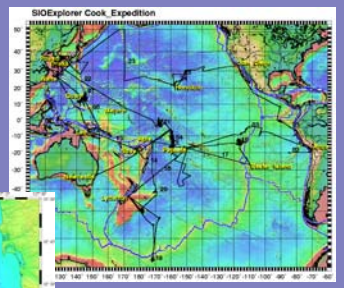
…More people with a broader palette of skills and talent can be brought to bear on ocean research problems in real time.

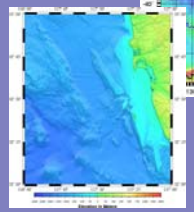
This involvement extends to everyone - researchers in other fields, teachers, students, policy makers and the interested lay public.

From Bohlen, S. "Embracing the Data Challenge", Sea Technology v 46, no 5 May, 2005, p 77

Experience with "mobile observatories" suggests that meeting the data challenge of a new era of broader use will require that greater attention be paid to metadata and archiving practices, starting at acquisition time.

Maps Define the Context of Observatories and Expeditions

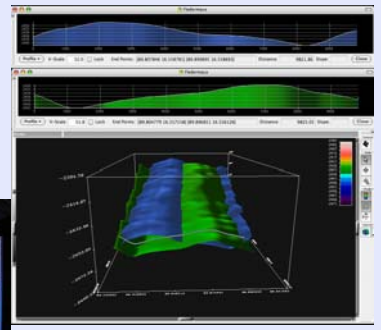




Certified multibeam bathymetry data from more than 300 cruises are available for scientists and repositories from a digital library http://SIOExplorer.ucsd.edu

Visualization Needed for QC and Interpretation

Individual research and group projects benefit from visualization techniques, especially when merging large and diverse data sets.



Fledermaus enables rapid detection of sound velocity and roll-bias problems in multibeam data.

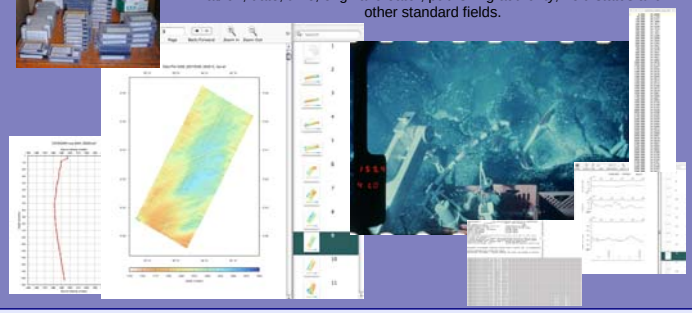
Teamwork needed, not just Technology

Whether the questions concerned data ownership, collection techniques, data diversity or institutional practices, the solutions involve joint discussion with scientists, data managers, shipboard technicians and archivists.

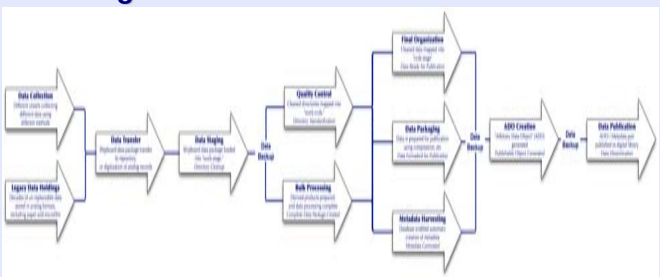
A digital library approach to archiving preserves the entire context of a cruise, with data, images and documents from a wide range of disciplines and sensor systems.

Data Diversity is a Challenge

Diversity across decades and institutions was found to be much more of a challenge than data volume, as data are gathered from a wide range of authorities, laboratories, servers and media, with conflicting versions and little documentation. Metadata for each object need to record cruise ID, lat/lon, date, time, original creator, publishing authority, hold status and other standard fields.

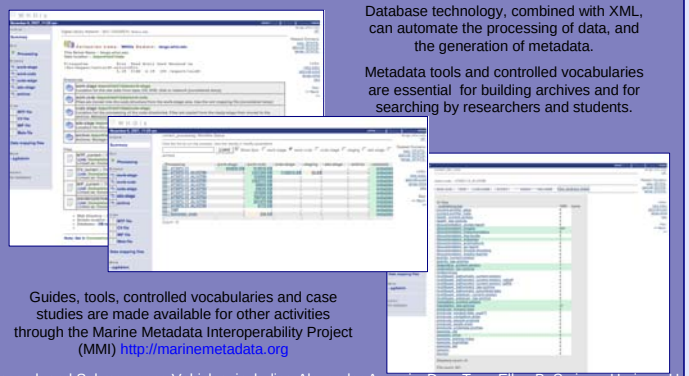


Archiving has to be Automated



A second-generation automated archiving system has recently processed more than 1000 cruises at SIO, and a prototype established at WHOI for cruises and submergence operations. Scalability is achieved by sorting similar data from diverse sources into appropriate locations in a "Canonical Cruise Data Structure (CCDS)."
Metadata are auto-generated by rules and vocabulary templates based on the CCDS.

Metadata Technology Enables Everything



Database technology, combined with XML, can automate the processing of data, and the generation of metadata.

Metadata tools and controlled vocabularies are essential for building archives and for searching by researchers and students.

Guides, tools, controlled vocabularies and case studies are made available for other activities through the Marine Metadata Interoperability Project (MMI) http://marinemetadata.org

Continuing Issues and Future Planning…

The new era of observatories and broader re-use of field data brings challenges to the Marine Sciences as they emerge from a traditional single-PI research model.

Investments in automated metadata and archiving procedures and tools will be required, as individual manual approaches are too costly and error-prone.

Observatories and the academic fleet have many of the same data and metadata problems, and shared experiences and resources will benefit both communities.

104 Years of Research and Submergence Vehicles, including Alexander Agassiz, DeepTow, Ellen B. Scripps, Horizon, Hugh M. Smith, Melville, New Horizon, Oconostota, Robert Gordon Sproul, Roger Revelle, Spencer F. Baird, Stranger, Thomas Washington, ABE, Alvin, AMUVS, ANGUS, Argo, Argo-Jason, Argo2, Atlantis, Atlantis II, Atlantis (AGOR-25), DSL120, DSL120a, Jason, Jason Jr (1), Jason2, Jason-Medea, Knorr, Oceanus, TowCam

Funding provided by the Library of Congress and NSF (IIS 0455998)

1. Scripps Institution of Oceanography (SIO), UCSD; 2. Woods Hole Oceanographic Institution (WHOI); 3. San Diego Supercomputer Center (SDSC), UCSD