Developing a common global framework for marine data management
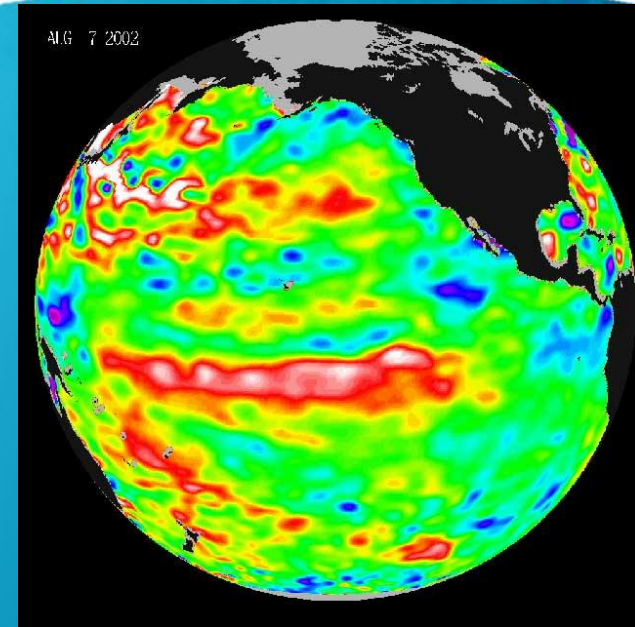
Helen Glaves
British Geological Survey

Drivers for modern ocean research

- Resource exploitation

- Marine planning

- Global environmental challenges

  - Climate change

  - Sea-level

  - Ocean chemistry (acidification)

Drivers for sharing of marine data: policy

European

- Marine Strategy Fra...
  - European Marine Ob...
- Marine Knowledge 2...
- Blue Growth Strateg...
- Galway Statement o...
  - Transatlantic Ocean Resea... ...nce

Australia

- Marine Nation 2025
- National Marine Science Plan 2015-2025

"Australia's ongoing marine research success depends on improved management of national and global marine research data and information"

Drivers for sharing of marine data: scientific and economic

- Improved understanding of marine ecosystems

- Assessment of health of marine environments

- Modelling and forecasting of potential future changes

- Sustainable exploitation of the oceans

  - Maximisation of ecosystem services

  - Minimisation of human impact

THE EUROPEAN BLUE ECONOMY GENERATES €500 billion/year AND 5.4 million JOBS

THE GREAT BARRIER REEF GENERATES US$5.7 billion/year AND 69,000 JOBS

fppt.com

Modern ocean observing

- Conducted by many organisations

- Wide range of equipment/sensors

- Various platforms

- Challenging environments

- Producing vast amounts of heterogeneous data

Use and re-use of marine data: the challenges

- Inconsistent data formats

- Spatial referencing

  – Coordinate systems

  – Horizontal datums

- Different standards/best practice

- Data access policies (organisational, national and regional level)

Data access policies

- Vary between organisations, countries and regions

- Publicly-funded data

  - Open-access

  - INSPIRE

  - Lack of globally-consistent policies

- Commercial data

  - Collected for specific purposes

  - No open access mandate

- Maritime security

Image courtesy of Jonathan Gray

Marine e-infrastructures

- Regional e-infrastructures

    - Address specific 'local' requirements for data discovery and access

    - Developed in response to needs of the user community and funding agency policy and guidelines

    - Created in isolation to those in other regions

- Global e-infrastructures

    - Domain specific e.g. IODE – ODP

    - Multidisciplinary e.g. GEOSS

Global framework for marine data management

- Supports sharing of marine data across regional and global systems

- Single point for user access

- Delivering interoperable data

- Implementation requires:

  - Significant resources

  - Cultural change

  - Based on existing marine data systems

Ocean Data Interoperability Platform (ODIP/ODIP II)

EU-USA-Australia collaborative project

ODIP: October 2012 – September 2015

Funded in parallel by:

- European Commission

- National Science Foundation (NSF)

- Australian Government

ODIP II: April 2015 – March 2018

ODIP/ODIP II: Objectives

- Develop a common global approach to marine data management

- Establish a European - USA – Australia -Canada co-ordination platform to promote dialogue between regional marine data infrastructures

- Demonstrate this coordinated approach by:

  - developing common approaches for specific aspects of marine data management e.g. vocabularies, data formats

  - establishing interoperability between existing regional marine data infrastructures and with global systems

ODIP/ODIP II: Objectives

- Develop a common global framework for marine data management

- Establish a European - USA – Australia -Canada co-ordination platform to promote dialogue between regional marine data infrastructures

- Demonstrate this coordinated approach by:

  - developing common approaches for specific aspects of marine data management e.g. vocabularies, data formats

  - creating an inventory of standards, best practices etc.

  - establishing interoperability between existing regional marine data infrastructures and with global systems

International data infrastructures

IODE GEOSS pogo

Data

Prototype 1
Discovery and access of
marine data

GEODAB
The GEOSS Discovery and Access Broker

Prototype 2
Cruise summary reporting
(CSR)

Prototype 3
Sensor web enablement
(SWE)

Ocean Data Interoperability Platform

EUROPE AUSTRALIA USA

SeaDataNet AODN NCEI
NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION

rvdata.us

IOOS

Regional data infrastructures

Establishing interoperability between regional marine data discovery and access services :

- SeaDataNet, (Europe)

- AODN (Australia)

- US NODC/NCEI (USA)

- Using EuroGEOSS GEO-DAB brokering services

- Facilitate sharing of metadata

  - across regional data infrastructures

  - with global GEOSS portal and IODE ODP

fppt.com

- SeaDataNet provides REST /CS-W web services at collection level

- >480 collections

ODIP 1: Further development

- Move to fully operational system

- Dynamic propagation of updates throughout the component data infrastructures

- Improve semantic interoperability

- Enhanced horizontal interoperability between regional data systems

- Establishing interoperability:

  - regional cruise summary reporting (CSR) systems

  - global cruise catalogue (POGO)

- Unified system for cruise discovery

  - Common formats, standards and vocabularies

  - Routine harvesting of cruise data from regional systems using GeoNetworks

- SeaDataNet CSR (Cruise Summary Report) 3.0 schema (ISO 19139 compliant) adopted by:

  – R2R consortium partners (USA)

  – Marine National Facility (Australia)

- GeoNetwork catalog deployed providing GUI interface and API (CSW service).

- ISO Cruise Summary Reports harvested from regional nodes and exposed in the POGO portal

- Large number of new CSRs added to POGO CSR Catalogue service including >1700 CSRs for the USA

Details of Kilo Moana Cruise C-MORE 2014, Leg 5 (BSH Ref-No.: 20156133)

GENERAL INFORMATION

Platform/Ship
Cruise begin
Cruise end
Port of Departure
Port of Return
Chief Scientist(s)
Responsible Laboratory

LOCATION

General Ocean Areas
Marsden Squares(S, N, E, W
Bounding Box(es)

Specific Geographic Areas
Link to Charts

PROJECT

Project Title / Coordinating Body

OBJECTIVES

Description

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pogo

Cruise Summary Report Inventory (CSR)

Details of Falkor Cruise Expanding Mariana Trench Perspectives (BSH Ref-No.: 20156144)

GENERAL INFORMATION	
Platform/Ship	Falkor
Cruise begin	15.12.2014
Cruise end	21.12.2014
Port of Departure	Apra Harbor, Guam
Port of Return	Apra Harbor, Guam
Chief Scientist(s)	Bartlett, Douglas - Scripps Institution of Oceanography
Responsible Laboratory	Rolling Deck to Repository

LOCATION	
General Ocean Areas	
Marsden Squares(S, N, E, W)	

Bounding Box(es)	WEST	EAST	SOUTH	NORTH
	142.2487	144.6767	11.313	13.4588

Specific Geographic Areas	
Link to Charts	›› GML track

PROJECT	
Project Title / Coordinating Body	

OBJECTIVES	
Description	Expanding Mariana Trench Perspectives

ADDITIONAL INFORMATION	
Parameters measured	
Instruments used	current profilers fluorometers

ODIP 2: Further development

- Further ingestion of CSRs and population of POGO portal

- Upgrading of CSR schema to accommodate requirements for Linked Data

    - Publishing CSRs in RDF

    - Provide SPARQL endpoints for CSR services

- (Near) real-time access to ocean sensor data

- OGC suite of standards and best practice

  – Domain independent

  – High degree of flexibility

  – Potential for divergence

- Common marine SWE profile

- Delivers ocean observing system data directly to data centres

- Supports integration with data discovery systems

ODIP 3: progress

- Multiple initiatives in the marine domain addressing some aspect of SWE:

    - Europe research projects for observing systems (EuroFleets, JERICO FixO3, AtlantOS, GROOM), data management (SeaDataNet); instruments and sensors (Sense OCEAN, NEXOS, and SCHeMA),

- USA major implementations of SWE in US-IOOS programme

- Initiatives including SWE in Australia

- Community of practice

    - Testbed

    - Collaboration tool e.g. GitHUB

fppt.com

ODIP 3: Further development

- Evaluate OGC SWE standards

- Provide recommendations for practical implementation of the standards

- Develop marine profiles of relevant OGC SWE standards

- Support greater interoperability across existing SWE systems

ODIP II: Cross-cutting themes

- Data citation and publication

- Persistent identifiers: DOIs, ORCiDs etc.

- Vocabularies: RDF, SPARQL endpoints, mappings etc.

- Big data and model workflows

Final remarks

- Ecosystem level marine research has made an integrated global network of data services a necessity

- Leveraging existing marine data infrastructures to establish a common global framework for marine data management potentially overcomes many of the recognised barriers to the sharing of marine data.

Final remarks

- An approach based on existing marine data systems is one that is potentially highly scalable and robust, as well as being transferable to other domains

- Establishing interoperability across regional data infrastructures and with the larger global data systems makes marine data more widely available for a diverse range of multidisciplinary applications

More information

http://www.odip.org

Paolo Diviacco, Adam Leadbettter, Helen Glaves (2016)

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