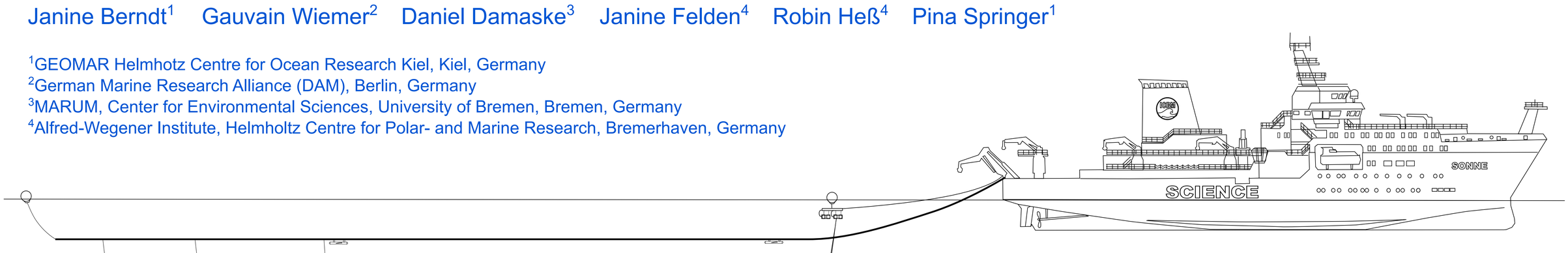
Towards FAIR data management of German marine seismic data

Janine Berndt[1] Gauvain Wiemer[2] Daniel Damaske[3] Janine Felden[4] Robin Heß[4] Pina Springer[1]

[1]GEOMAR Helmhotz Centre for Ocean Research Kiel, Kiel, Germany
[2]German Marine Research Alliance (DAM), Berlin, Germany
[3]MARUM, Center for Environmental Sciences, University of Bremen, Bremen, Germany
[4]Alfred-Wegener Institute, Helmholtz Centre for Polar- and Marine Research, Bremerhaven, Germany



Abstract

The German marine seismic community has agreed on a metadata standard for raw 2D marine multichannel seismic reflection data to fulfill FAIR principles. This standard is now being implemented on German research vessels. In addition, a direct data transfer of raw data from the vessel to the data repository PANGAEA has been established for underway data – a process that is transparent to the user and supports scientists in fulfilling their data management duties. The metadata are directly transferred to data access platforms like GEOMAR's Ocean Science Information System (OSIS). We will expand this concept to other seismic data types.

Data management initiatives

- Integration and funding through the Helmholtz DataHub
- Close collaboration with the German Marine Research Alliance (DAM)
- Pilot study funded through Nationale Forschungsdaten Infrastruktur (NFDI4Earth) Initiative
- Publication through the world data centre PANGAEA
- Industry integration through participation in the Open Subsurface Universe initiave of The Open Group

Metadata standard

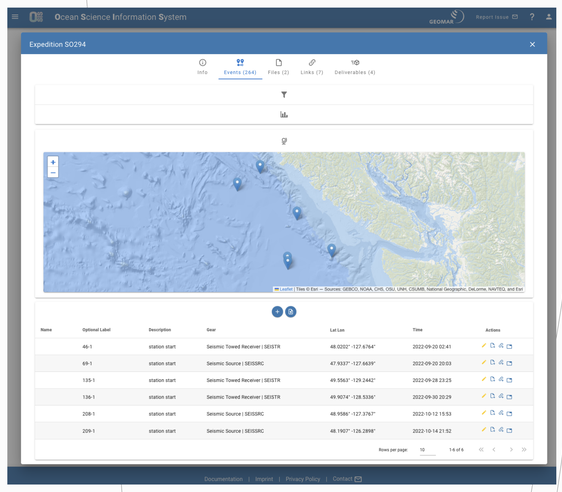
- Complete description of raw seismic data including geometry, source and receiver configuration
- PANGAEA vocabulary in alignment with NERC, SeaDataNet, and MGDS
- Possibility to engage with other repositories
- Expandable for future more complicated setups
- Developed in collaboration with all German marine geophysics groups

#	Name	Short Name	Unit
1	Binary Object	Binary	
2	Binary Object (File Size)	Binary (Size)	Bytes
3	Binary Object (MD5 Hash)	Binary (Hash)	
4	Binary Object	Binary	
5	Binary Object (Media Type)	Binary (Type)	
6	Binary Object (File Size)	Binary (Size)	Bytes
7	Binary Object (MD5 Hash)	Binary (Hash)	
8	Identification	ID	
9	Event label	Event	
10	Profile	Profile	
11	Device type	Device	
12	Data source	Data source	
13	File name	File name	
14	File format	File format	
15	Reel format	Reel format	
16	Seismic source	Seismic source	
17	Total seismic source volume	Tot seismic source vol	in^3
18	Seismic pressure	Seismic pressure	psi
19	Seismic time delay	Seismic time delay	ms
20	Water depth of gun	Water depth gun	m
21	Number of guns	N guns	
22	Distance to antenna dx	Dist antenna dx	m
23	Distance to antenna dy	Dist antenna dy	m
24	Receiver array	Receiver array	
25	Number of sections	N sections	
26	Number of total channels	N tot channels	
27	Number of auxillary channels	N auxillary channels	
28	Total active cable length	Tot active cable l	m
29	Cable depth	Cable depth	m
30	Compass birds	Compass birds	
31	Group spacing constant	Group spacing const	m
32	Group spacing nominell	Group spacing nominell	m
33	Distance near channel dx	Dist near channel dx	m
34	Distance near channel dy	Dist near channel dy	m
35	Samples per trace	Samples per trace	
36	Sampling interval	Sampling interval	
37	Recording delay	Recording delay	ms
38	NMEA string	NMEA string	
39	DATE/TIME	Date/Time	
40	LATITUDE	Latitude	
41	LONGITUDE	Longitude	
42	Comment	Comment	

Ocean Science Information System

OSIS is the central information hub for all research data for expeditions with German research vessels, expeditions with German participants, numerical simulation runs, and experiments

- Open access metadata
- Information and data exchange within projects
- Documentation and tracking of data deliverables
- Multiple links to e.g. published data sets, journal publications, and samples
- Roll-out for the German scientific community ongoing

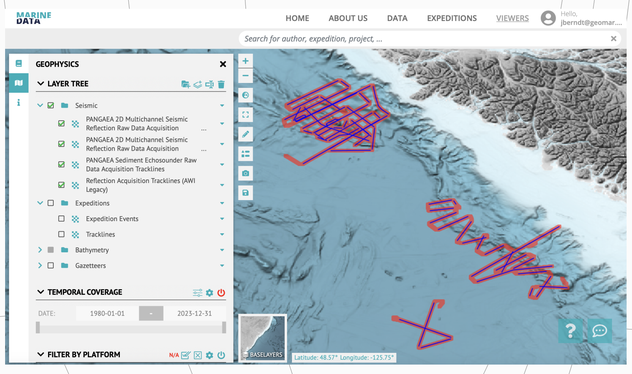


We have developed and implemented a new metadata standard for marine reflection seismic data

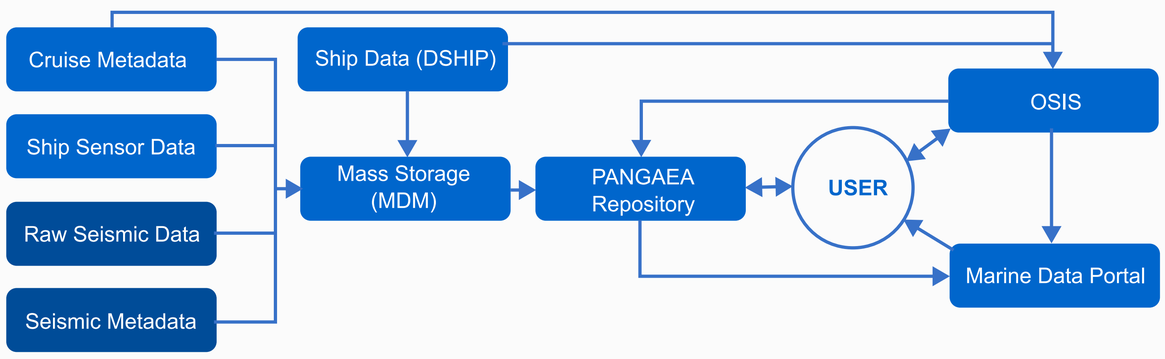
German Marine Data Portal

The German Marine Data Portal is the central access point to research data from the German marine research community

- Interactive map viewers enable the exploration of geodata products and their extensive metadata
- A dedicated viewer for seismic data is under development



Data flow



Outlook

- Metadata standards to be expanded to
  - raw 3D reflection seismic data (P-Cable)
  - raw active source ocean bottom seismic data (OBS, OBH)
  - raw ultra-high resolution sub-bottom profiler data (Parasound)
- Metadata standardization of processed seismic data in collaboration with Open Subsurface Data Universe (OSDU), The Open Group
- Integration with international academic marine seismic community and industry
- APIs for loading of different raw data formats (SEG-Y vs. SEG-D)

Findable

- Findable through OSIS, the German Marine Data Portal, and PANGAEA as searchable resources
- Unique and persistent identifiers are assinged to each seismic data set
- Data are described through rich metadata

Accessible

- Data and metadata are accessible in PANGAEA as the persistent long-term repository
- Standardized communication protocols are under development
- PANGAEA allows authentication and authorization

Interoperable

- The metadata use formal, accessible and broadly applicable language
- The metadata standard is based on the FAIR NERC data vocabulary where applicable
- The metadata include qualified references to the DSHIP and other expedition metadata and publications

Reusable

- Data and metadata are released under a clear and accessible data usage license
- Metadata are associated with their provenance, e.g. data originators such as chief scientists
- Data and metadata formats meet the domain-relevant community standards as far as they exist, e.g. SEG-Y