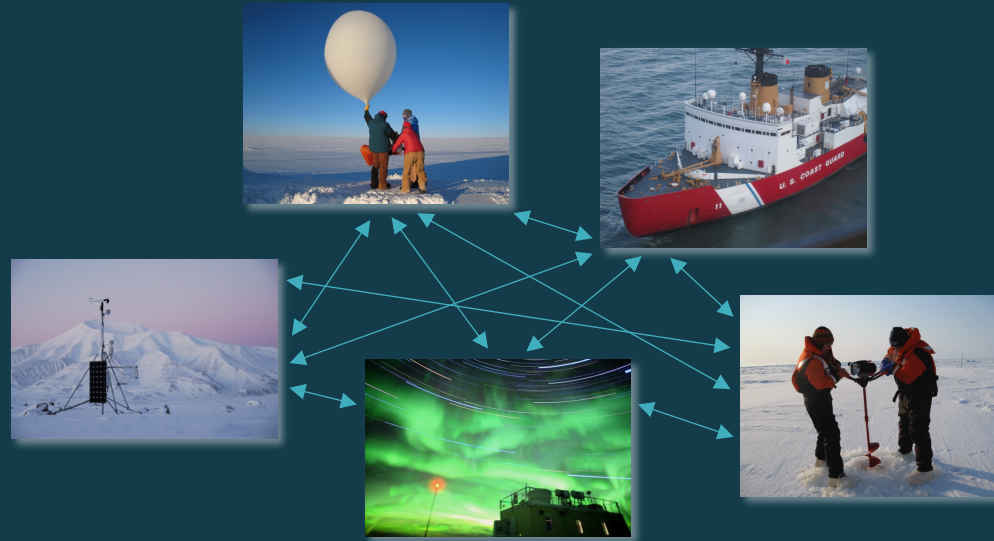


Metadata Interoperability for Stations, Projects, Vessels, and Other Types of Observing Assets



FARO at ASSW 2023
17 February 2023

William Manley, Roberta Pirazzini, Allison Gaylord, Adrienne Canino, Chantelle Verhey, Christoph Wohner, Taco De Bruin, Jan Rene Larsen, Jay Pearlman, Shannon Christopherson, Michael Allchin, Josephine-Mary Sam, Elmer Topp-Jørgensen, Maureen Biermann, Jonathan Blythe, Hajo Eicken, Heidi Sevestre, and other POAwg Participants

Polar Observing Assets Working Group

POAwg [Home](#) [Purpose](#) [Sign Up](#)

Polar Observing Assets Working Group

Coordinating Observing Metadata for the Polar Science Community

The Polar Observing Assets working group (POAwg) facilitates the discovery and interoperability of information about research & monitoring assets in polar regions: sites, transects, observatories, projects, and networks or systems.

Goals

- make asset information more discoverable, accessible, interoperable, and reusable
- promote best practices for interoperability beyond the dataset level
- help span a spectrum across science planning, data management, & disciplinary or interdisciplinary science

- **Want to showcase your network?**
- **Interested in best practices for sharing information about observing sites, projects, stations, and more?**
- **Want an easier way to create, populate, expand, or deploy a catalog of observing assets?**

Recognized Need

Observing:

- identify strengths and gaps
- create “knowledge maps” to clarify directions
- find ways to build capacity to better meet observing goals

Logistics:

- optimize resources
- co-locate instruments
- streamline operational support

Observing Assets

Components of *in situ* observing:

Infrastructure:

- **Sites:** Fixed stations, facilities, plots, moorings, observatories, stationary platforms, community-based observations, or locations wherever repeat measurements have been made.
- **Mobile Platforms:** Buoys, vessels, aircraft, floats, gliders, UAVs, AUVs, animal-borne sensors, and other mobile platforms.

Activities:

- **Projects:** Research projects, studies, and other activities typically funded or coordinated by an agency or program within a defined timeframe.
- **Campaigns:** Scientific cruises, expeditions, aircraft operations, fieldwork, and other planned routes or completed activities.
- **Initiatives:** Coordinated ongoing efforts including organizations, networks, observing systems, and programs.

The Challenge ...

... is obtaining a comprehensive perspective.

- Across agencies, programs, and networks
- At the international scale

Polar Portals for:

Sites

AOOS	INTERACT
AOV	Isaaffik
ArcticCBM	JERICO RI
ArcticConnect	Leo Network
ArcticLCC	NEON
BAID	NOAA NDBC
CALM	OceanOPS
CALON	Polardex
COMNAP	SIOS
DEIMS-SDR	SOOS
GTN-P	TFS GIS
ICOS	USDA NRCS
INTAROS	WMO WIGOS

Mobile Platforms

COMNAP
IABP
IARPC FO
JERICO RI
OceanOPS
Polardex

Projects

Arctic CBM	NASA ABoVE
Arctic LCC	NIPR
ARMAP	NPDC
ASDI	NPRB
BOEM ESPIS	NPS ARCN
CAFF	NSSI
DEIMS-SDR	RiS
DueSouth	UNOLS MFP
Isaaffik	USGS ScienceBase
Met Norway	

Campaigns

AOV
ARICE
DueSouth
IARPC FO
Isaaffik
OceanOPS
Polardex
UNOLS MFP

Initiatives

DEIMS-SDR
INTAROS ARCMAP
Isaaffik
WMO WIGOS

The Real Challenge ...

... is a lack of interoperability.

- Custom metadata structures
- Custom vocabularies
- Lack of machine-readable access
- Duplicated time and effort

Lessons Learned ...

... from the broader polar data community:

- Established metadata standards
- Controlled vocabularies
- Public-facing endpoints with interoperable service protocols
- Translators and crosswalks
- Aggregation & Federated Search

... making data more Findable, Accessible, Interoperable, and Reusable (FAIR).

Tasks

1. Create a **registry** of polar observing networks, documenting asset-related metadata standards, semantic technologies, and transfer protocols in use
2. Build **crosswalks** and facilitate existing tools for translation across standards
3. Create **recommendations** for adoption and implementation of established solutions



Registry of Polar Observing Networks

Filter

- Region ▶
- Subregion ▶
- Disciplines ▶
- Asset Type ▶
- Machine Access ▶

Search ...



Sort by ▼

Showing 1-20 of 132

← Previous Next →

 **SIOS Svalbard Integrated Arctic Earth Observing System**

Region **Arctic** Subregion **Svalbard**


Domain **Land** **Ocean**

Disciplines **Biology** **Cryosphere** **Geological Sciences** **Oceanography**

Meteorology and Climate

Asset Types ⓘ **sites**

Website sios-svalbard.org

 **POLARDEX Polardex**

Region **Arctic, Antarctic** Subregion **various**

Domain **Land** **Ocean** **Atmosphere**

Disciplines **Biology** **Cryosphere** **Geological Sciences** **Oceanography**

Meteorology and Climate **Space Physics**

Asset Types ⓘ **sites** **mobile platforms** **campaigns**

Website polardex.org

 **ABOVE NASA Arctic-Boreal Vulnerability Experiment**

Region **Arctic** Subregion **Alaska, Arctic Canada**

Domain **Land**

Disciplines **Biology** **Cryosphere**

Asset Types ⓘ **projects**

Outcomes

- ❑ a foundation for planning and integration across multiple systems
- ❑ improved interoperability for observing-related information
- ❑ guidance for implementation, saving time and effort

Thank You!

For more info, see the POAwg
[Short Statement](#) for AOS 2022

POAwg Short Statement for Arctic Observing Summit 2022

Optimizing Polar Observing with Asset-Level Metadata Interoperability Across Networks
William Manley¹, Roberta Prazzini², and other Members of the SAON Polar Observing Assets Working Group³

¹University of Colorado, ²Finnish Meteorological Institute, ³<https://polarobservingassets.org>

There is broadly recognized need for an integrated Arctic observing system, including a means of identifying overlaps and gaps, a “knowledge map” to clarify directions, and ways to build capacity to better meet observing goals (e.g. AOS, 2020; ASM, 2021; IADPC, 2021; EU-PolarNet, 2022). However, a fundamental challenge exists: Observing assets such as sites, tracks, research stations, projects, and programs are deployed in a diverse and distributed fashion across hundreds of networks and initiatives. At this time, it is difficult to strategically assess, plan, or synthesize because the granular information needed – specific details on activities and infrastructures – is fragmented and incomplete. Most asset-related inventories, catalogs, and portals are limited in thematic or geographic scope. Furthermore, only a fraction of networks share structured information in a way that can be accessed, harmonized, and aggregated for a comprehensive perspective.

To help address this challenge, a new Polar Observing Assets Working Group (POAwg) has been formed under the SAON Committee on Observations and Networks (CON). This group builds upon steps taken by the polar data community for the interoperability of “dataset-level” metadata, but in this case for discovery-level details in “asset-level” metadata (see Table 1). POAwg will identify and promote community-based approaches for the use of relevant standards, controlled vocabularies, crosswalks, federated search, and linkages to operational or scientific datasets. In so doing, its broader goals are to make observing-related metadata – beyond the dataset level – more Findable, Accessible, Interoperable, and Reusable (FAIR; Wilkins et al., 2016), as well as to help showcase and integrate the surmised contributions of multiple systems. For more information, see <https://www.polarobservingassets.org>. POAwg has identified three tasks that are focused and achievable in the short term.

The first task is to create a registry of polar observing networks – focusing on interoperability parameters and documenting: Asset-related metadata standards (e.g., ISO 19115/19139 ontologies), transfer protocols (e.g., OAI-PMH, CSW, WFS, or custom APIs), and machine-readable endpoints that are currently in practice. Use cases for the registry have been identified and will guide the development process moving forward. The registry will have a frontend allowing users to browse, search, and filter for networks, potentially with a graphical interface illustrating patterns of implementation. As a start, the group has developed a crosswalk for elements across prior inventories by SAON CON and EU-PolarNet, and in a few existing network-level metadata models (e.g. DEMS-SDR, INTERACT). Current efforts are to prioritize metadata elements and to envision the user experience. The registry of polar observing networks will help to: Clarify best practices for observing-related metadata sharing; establish a

and the website:

polarobservingassets.org

extra slides

A Mismatch of Content

Project Title



Project Title

Study Site Name



Site Name

Platform Type



GCMD Platform Keyword

Program Name



Funding Agency

Network Title



Initiative

Project Status



Discipline



Recommendations

- Encourage sharing of observing-related metadata
for stations, vessels, and more
- Don't reinvent the wheel for observing-related metadata
use established standards and vocabularies when possible
- Take advantage of existing portals for observing-related information
e.g. INTERACT, IARPC-FO, UNOLS MFP, Polardex, AOV, Isaaffik, etc.

Discovery-Level Details

Network-Level	Project-Level	Site-Level
<i>e.g., GTN-P</i>	<i>e.g., TSP</i>	<i>e.g., borehole</i>
Network Name	Funding Agency	Network Name
Network Description	Funding Program	Site Name
Domain	Funding Country	Site ID
Disciplines	Project Title	Site Description
Organization	Project ID	Facility Type
Organizational Country	Discipline	Observed Properties
Time Range	Region	Country
Region	Subregion	Location
Subregion	Location	Latitude & Longitude
Spatial Extent	Latitude & Longitude	Elevation
Contact Info	Institution	Site Start Date
Asset Type	Contact Info	Site End Date
Metadata Standards	Project Start Date	Institution
Transfer Protocols	Project End Date	Contact Info
Links to network, organization, and data	Links to project summaries, sites, data, and more	Links to network, institution, data, and more


SIOS

Svalbard Integrated Arctic Earth Observing System

An international observing system for long-term measurements in and around the Norwegian archipelago of Svalbard addressing Earth System Science questions.



Abbrev.	SIOS
Website	sios-svalbard.org
Region	Arctic
Subregion	Svalbard
Domain	Land Ocean
Disciplines	Biology Cryosphere Geological Sciences Oceanography Meteorology and Climate
Asset Types i	sites
Organization	SIOS Knowledge Centre
Org. Country	Norway
Year Started	1987
Contact Email	information@sios-svalbard.org

Asset-Level Metadata Interoperability i

Machine-Readable Access?	Yes
Metadata Standards	WIGOS
Transfer Protocols	REST API (JSON, XML)
Metadata Catalog	sios-svalbard.org/sios-ri-catalogue

 RoPON ID: <https://ropon.org/f0b67e0d-d3f0-483b-adf0-99ca7bcdcc26>

Last Modified: 2 February, 2022

Draft Network-Level Metadata Model

for the Registry of Polar Observing Networks

Network Information

Network Name
Network Abbreviation
Network Description
Network Website
Asset Types
Network RoPON ID
Network Logo
Operating Status
Organization
Organizational Country
Organization Link

Observational Scope

Domain (e.g. Atmosphere, Land, Ocean)
Discipline
Observed Parameters

Spatial and Temporal Coverage

Region
Subregion
Spatial Extent
Year Started

Contact Information

Contact Email
Contact Name
Contact Institution

Metadata Interoperability

Machine-Readable Access?
Metadata Standards
Controlled Vocabularies In Use
Transfer Protocols
Link for Metadata Catalog
Link for Metadata Catalog Endpoints

Data Access

Data Access (y or n)
Data Catalog Link

Asset Types as Reported by 44 Portals

research sites
field sites
sites
observing sites
study sites
observation facilities
field facilities
facilities
platforms
research stations
sensors
stations
plots
research assets
environmental events
infrastructures
communities

buoys
vessels
aircraft

expeditions
planned routes
ship tracks
cruises
research cruises
aircraft operations
logistics

research projects — 1 portal
projects — 16 portals
activities
studies

programs
networks
observing systems
organisations

POAwg Asset Types

sites

research sites
field sites
observing sites
study sites
sites
observation facilities
field facilities
facilities
platforms
research stations
sensors
stations
plots
research assets
environmental events
infrastructures
communities

projects

research projects
projects
activities
studies

mobile platforms

buoys
vessels
aircraft

campaigns

expeditions
planned routes
ship tracks
cruises
research cruises
aircraft operations
logistics

initiatives

programs
networks
observing systems
organisations

Metadata Standards for Asset Types

sites

OGC SensorML
OGC O&M
INSPIRE EF
WMO WIGOS
AOV ISO 19115
NEON EML
Wohner et al. (2020), INTERACT,
DEIMS-SDR, UNOLS MFP

projects

ADlwg ISO 19115
ARMAP ISO 19115
ODIS schema.org
INTERACT, NASA ABoVE

campaigns

IARPC FO, AOV,
UNOLS MFP, NASA ABoVE

initiatives

ROR (organization)
schema.org (organization)
DEIMS-SDR,
INTERACT, POAwg

mobile platforms

ODIS schema.org (vessels)
AOV

documented implementations

Technologies for Interoperability

Standards

ISO 19115 O&M
INSPIRE EF
WIGOS
ADlwg schema.org
ARMAP/AOV
custom

Semantic Technologies

controlled vocabularies,
ontologies, and more

domain discipline
keywords
observed parameters
essential variables

Transfer Protocols

OAI-PMH CSW
WMS WFS
custom API's

Related Efforts

ENVRI-FAIR

EU-PolarNet

GERI

eLTER RI

Science on Schema

ADIwg

RDA I-ADOPT

CAPARDUS

Arctic PASSION