



# **Useful Arctic Knowledge: partnership for research and education (UAK)**

## **UAK Data Management Plan**

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**Version 1.0  
26 January 2023**

HISTORY OF CHANGES		
Version	Publication date	Changes
1.0	26.01.2023	First version

**Executive summary:** This document is the Data Management Plan for the UAK project. UAK is funded by the INTPART programme 2018-2021 (International partnerships for excellent education, research and innovation) under the Research Council of Norway and the Norwegian Agency for International Cooperation and Quality Enhancement in Higher Education (Diku). The project, which includes partners from Norway, USA and Canada, brings together leading researchers, educators and young scientists working on selected Arctic science topics. The project was also supported by the H2020 project INTAROS – Integrated Arctic Observation System, (<http://intaros.eu>, <http://intaros.nersc.no>). UAK has organised two research schools onboard Norwegian Coastguard vessel KV Svalbard where students and young scientists have received training in collecting oceanographic, acoustic and sea ice data. Furthermore, the research schools addressed the different steps in the data delivery chain from development of data management plan, collection of data and securing meta data, processing and formatting data, and ingestion into a data system providing a persistent unique identifier (DOI). Prior to the research schools, the students were given training in data management and after the cruises the students were trained in preparing the collected data for publication in a data system that will secure long-term storage and access, along with a DOI for citation. Oceanographic and acoustic data collected during the two research schools have been published in the Norwegian Marine Data Centre (NMDC), in standard formats and with metadata to support discovery, access and reuse. Seismology data collected during the UAK 2020 Research School are stored in the Norwegian National Seismic Network (NNSN).

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## 1. Data Summary

The data collected during the UAK 2020 Researcher School (Sagen et al., 2020) and UAK 2021 Research School (Sagen et al., 2021) are described in detail in their respective cruise reports.

The following oceanographic and acoustic datasets have been published in the Norwegian Marine Data Centre as a result of the UAK 2020 Researcher School:

1. **CTD data collected in Storfjorden, Svalbard, during the UAK 2020 Cruise**

Authors: Hanne Sagen (Nansen Environmental and Remote Sensing Center) Astrid Stallemo (University of Bergen) Emilia Botnen Van den Bergh (Western Norway University of Applied Sciences) Frida Klockmann (Western Norway University of Applied Sciences) Håvard Råheim Økland (University of Bergen) Julie Knutsen (University of Bergen) Kristoffer Tesdal Galtung (University of Bergen) Malin Lunde (University of Bergen) Matias Helleve (University of Bergen) Nil Eryilmaz (University of Bergen) Torunn Sandven Sagen (University of Bergen)

Published: 2020

DOI: <https://doi.org/doi:10.21335/nmdc-nersc-758932911>

2. **UAK - Active and Passive Acoustic data - 23 Jun 2020**

Authors: Espen Storheim (Nansen Environmental and Remote Sensing Center) Kjell Eivind Frøysa (Western Norway University of Applied Sciences) Emilia Botnen Van den Bergh (Western Norway University of Applied Sciences) Kristoffer Tesdal Galtung (University of Bergen) Matias Helleve (University of Bergen) Malin Lunde (University of Bergen) Astrid Stallemo (University of Bergen)

Published: 2020

DOI: <https://doi.org/doi:10.21335/NMDC-NERSC-1373893755>

3. **UAK - Active and Passive Acoustic data - 24 Jun 2020**

Authors: Espen Storheim (Nansen Environmental and Remote Sensing Center) Kjell Eivind Frøysa (Western Norway University of Applied Science) Emilia Botnen Van den Bergh (Western Norway University of Applied Science) Kristoffer Tesdal Galtung (University of Bergen) Matias Helleve (University of Bergen) Malin Lunde (University of Bergen) Astrid Stallemo (University of Bergen).

Published: 2020

DOI: <https://doi.org/doi:10.21335/NMDC-NERSC-71625140>

4. **UAK - Active and Passive Acoustic data - 25 Jun 2020**

Authors: Espen Storheim (Nansen Environmental and Remote Sensing Center) Kjell Eivind Frøysa (HVL-Western Norway University of applied sciences) Frida Tryggestad Klockmann (HVL-Western Norway University of applied sciences) Julie Knutsen (University of Bergen) Nil Eryilmaz (University of Bergen) Håvard Råheim Økland (University of Bergen) Torunn Sagen (University of Bergen).

Published: 2020

DOI: <https://doi.org/doi:10.21335/NMDC-NERSC-911275918>

5. **UAK - Active and Passive Acoustic data - 26 Jun 2020**

Authors: Espen Storheim (Nansen Environmental and Remote Sensing Center) Kjell Eivind Frøysa (Western Norway University of Applied Sciences) Frida Klockmann (HVL-Western Norway University of Applied Sciences) Julie Knutsen (Department of Earth Sciences-University of Bergen) Nil Eryilmaz (Department of Earth Sciences-University of Bergen) Håvard Råheim Økland (Department of Earth Sciences-University of Bergen)

Published: 2020

DOI: <https://doi.org/doi:10.21335/NMDC-NERSC-1027351247>

6. **Optical property measurements collected in Storfjorden, Svalbard, during the UAK 2020 Cruise**

Authors: Håkon Sandven (University of Bergen) Tristan Petit (University of Bergen) Astrid Stallemo (University of Bergen) Emilia Botnen Van den Bergh (Western Norway University of Applied Sciences) Frida Klockmann (Western Norway University of Applied Sciences) Håvard Råheim Økland (University

of Bergen) Julie Knutsen (University of Bergen) Kristoffer Tesdal Galtung (University of Bergen) Malin Lunde (University of Bergen) Matias Helleve (University of Bergen) Nil Eryilmaz (University of Bergen) Torunn Sandven Sagen (University of Bergen)

Published: 2020

DOI: <https://doi.org/doi:10.21335/NMDC-NERSC-1741962272>

The following oceanographic and acoustic datasets have been published in the Norwegian Marine Data Centre as a result of the UAK 2021 Researcher School:

1. **CTD data collected north of Svalbard, during the UAK 2021 Research School with KV Svalbard**

Authors: Hanne Sagen (Nansen Environmental and Remote Sensing Center) Astrid Stallemo (University of Bergen) Jozef Rusin (Meteorological institute of Norway) Astrid Stallemo (Nansen Environmental and Remote Sensing Center) Laust Færch (University of Tromsø) Anna Mathea Skar (University of Bergen) William Jenkins (Scripps Institution of Oceanography) Hayden Johnson (Scripps Institution of Oceanography) Meghan Helmberger (University of Colorado) Sofia Iris Vakhutinsky (University of Colorado) Anna Telegina (University of Tromsø) Ella Tessin (University of Bergen) Mads Skjerven Moldrheim (University of Bergen) Guney Dincturk (University of Bergen) Agnieszka Beszczynska-Möller (Institute of Oceanology of the Polish Academy of Sciences) Espen Storheim (Nansen Environmental and Remote Sensing Center)

Published: 2021

DOI: <https://doi.org/doi:10.21335/nmdc-nersc-758932911>

2. **XBT data collected north of Svalbard, during the UAK 2021 Research School with KV Svalbard**

Authors: Hanne Sagen (Nansen Environmental and Remote Sensing Center) Astrid Stallemo (University of Bergen) Jozef Rusin (Meteorological institute of Norway) Astrid Stallemo (Nansen Environmental and Remote Sensing Center) Laust Færch (University of Tromsø) Anna Mathea Skar (University of Bergen) William Jenkins (Scripps Institution of Oceanography) Hayden Johnson (Scripps Institution of Oceanography) Meghan Helmberger (University of Colorado) Sofia Iris Vakhutinsky (University of Colorado) Anna Telegina (University of Tromsø) Ella Tessin (University of Bergen) Mads Skjerven Moldrheim (University of Bergen) Guney Dincturk (University of Bergen) Agnieszka Beszczynska-Möller (Institute of Oceanology of the Polish Academy of Sciences) Espen Storheim (Nansen Environmental and Remote Sensing Center)

Published: 2022

DOI: <https://doi.org/doi:10.21335/NMDC-NERSC-2062295180>

The Ocean Bottom Seismometer (OBS) data collected during the UAK 2020 Research School is stored in Norwegian National Seismic Network (NNSN): <https://nnsn.geo.uib.no/>.

## 2. Metadata and data standards used

The most widely accepted practice for data management is the FAIR Data Principles (Wilkinson et al., 2016), which states that data must be:

- Findable (searchable through an open online data system)
- Accessible (downloadable through links in the metadata)
- Interoperable (possible to read/write with standard libraries or tools)
- Reusable (having sufficient documentation for other scientists to use)

Before each cruise, general principles for data management and how to generate a Data Management Plan were presented, together with a set of metadata sheets for each category of data planned to be collected during the researcher school. These metadata sheets were used in the lab exercises onboard KV Svalbard, after the data collection to record the needed description (metadata) of the individual dataset.

In addition, an online tool called Rosetta for converting ASCII files to NetCDF/CF was presented before the cruise. Students use Rosetta after the cruise to generate NetCDF/CF files for their CTD, XBT and marine optics

data. For the acoustics data, files generated during the cruise were used for visualisation and publication of data (e.g. WAV format for active and passive acoustic data). Metadata based on the Climate and Forecast (CF) convention and the Attribute Convention for Data Discovery (ACDD) were used (Hamre et al., 2021).

For all categories of data, a metadata record was prepared for each dataset to register the dataset in NMDC. The metadata and datasets in standards formats were published through the NMDC data portal (2023), with support from the instructors.

OBS data are stored in miniSEED format with FDSN StationXML metadata.

### 3. Long-term data storage

Data collected during the two Researcher Schools organised by UAK are stored in the national data infrastructure Norwegian Marine Data Centre (NMDC), which is led by the Institute of Marine Research. NMDC is a distributed data infrastructure, where among others NERSC hosts a data node. Metadata is harvested from the NERSC Data Node into the central data portal at <https://nmdc.no>. The datasets themselves remains in the NERSC Data Node (further described below).

NMDC assigned a Digital Object Identifier (DOI) to each dataset, enabling unique identification and citation. Datasets collected during the cruise were registered in the INTAROS Data Catalogue (<https://catalog-intaros.nersc.no/>), making them also available to the international scientific community. The catalogue entries above provide descriptions of the individual datasets and link to the data files (through the DOI). All data files are stored in the NERSC THREDDS Data Server (<https://thredds.nersc.no/>).

The Norwegian National Seismic Network is operated by Department of Earth Science, University of Bergen. It is part of the European Plate Observing System (EPOS) research infrastructure <https://www.epos-eu.org/>.

### 4. References

Hamre, Torill, Sagen, Hanne, Sandven, Stein, Danielsen, Finn, Ottersen, Geir, Beszczynska-Moller, Agnieszka, Morvik, Arnfinn, Yamakawa, Asuka, Schewe, Ingo, & Enghoff, Martin. (2021). Deliverable 1.8 Data Management Plan V2. Zenodo. <https://doi.org/10.5281/zenodo.7015039>. NERSC Technical Report 409.

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Sagen, Hanne, Sandven, Stein, Hamre, Torill, Storheim, Espen, Halpaap, Felix, Frøysa, Kjell Eivind, Jeddi, Zeinab, Sørensen, Mathilde, Sandven, Håkon, Petit, Tristan, Monsen, Frode, Falck, Eva, & Pulsifer, Peter. (2020). UAK 2020: Research School in the Barents Sea with KV Svalbard. Zenodo. <https://doi.org/10.5281/zenodo.7405805>. NERSC Technical Report 405.

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