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## Plan Overview

*A Data Management Plan created using DMPTool*

**Title:** Coastal Ocean Processes of North Greenland

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**Template:** Arctic Data Center: NSF Polar Programs

### Project abstract:

I propose to analyze a unique 2014-18 ocean data set to investigate dynamics at this scale with mooring, survey, satellite, and modeling data. We hypothesize that canyon dynamics control across-shelf property and energy flux by the interaction of rotation, topography, and friction at tidal to interannual time scales.

**Start date:** 07-01-2023

**End date:** 06-30-2026

**Last modified:** 08-08-2022

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# Coastal Ocean Processes of North Greenland

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## Roles and responsibilities

1. What parties and individuals will be involved with data management in this project?
2. What will be the roles and responsibilities of each party and or individual with respect to management of the data?
3. Who will be the lead or primary person responsible for ultimately ensuring compliance with the Data Management Plan?

**Note: if you plan to submit data to the Arctic Data Center please refer to the guidance in the panel on the right.**

The principal investigator Andreas Muenchow will be responsible for all data management of this project. He will train project personell including the two graduate students Claire Brizzolara and Michael Copella in proper data handling and management skills. The NSF Arctic Data Center will provide data archival, preservation, access, and metadata authoring services for the project.

## Types of data produced

### What types of data, samples, collections, software, materials, etc. will be produced during your project?

Ocean data used in this project has been collected between 2014 and 2018 as part of a large and international effort led by the Alfred Wegener Institute in Germany with support from the research icebreaker R/V Polarstern. All sensor data are archived in the public domain at <https://www.pangaea.de/> where searches for PS85, PS100, PS109, and PS114 will provide direct access to both survey and mooring data from 2014, 2016, 2017, and 2018. Nevertheless, these data are lightly processed "raw" data that will benefit from additional processing and calibration as done by the Principal Investigator Andreas Muenchow in Muenchow et al. (2020) for a small subset of ADCP mooring data.

Atmospheric and wind data originate from two sources. First, these are standard stations maintained by the Danish Meteorological Institute that are also distributed by the U.S. National Center for Environmental Information. Second, wind data of the European Centre for Medium-Range Weather Forecasting produce ERA-5 will be used.

Remotely sensed optical (LandSat, MODIS), microwave (SSM/I), and synthetic aperture radar (Sentinel-A and Sentinel-B) data from both US and European satellites will be used to describe sea ice distributions. All these data reside in public archives maintained by government organizations in the USA (NASA, USGS) and Europe (ESA, Copernicus).

Software products constitute an essential element to make the science transparent for both research and teaching. Furthermore, my software contains much meta-data and documentation both on the raw data on input as well as the processed data on out. This project includes a software publication effort via GitHub that I plan to streamline with RStudio/Posit. This open-source integrated software environment is platform independent, interfaces directly with GitHub, and naturally facilitates/includes shell scripting both within the integrated development environment of the R-language AND well-defined snippets calling scripts, tool, programs, compilers, other languages, open-source graphics such as the General Mapping Tool (GMT). All codes to transform raw binary from sensors to condensed graphical information will be documented with software with each step fully transparent.

Ideas and philosophies of data and software development and sharing featured prominently in a 3-credit problem-based learning class that I taught in the Fall of 2021 to senior undergraduate and junior graduate students. Using RStudio on a large hydrographic data from around Greenland, I empowered students to implement transparent software and data documentation and development. The schedule of this class serves as an example on how to document data and software within an open peer-driven collaborative environment, e.g., <http://muenchow.cms.udel.edu/classes/Arctic/schedule.html> and links therein.

### What will be the approximate number and size of data files that will be produced during your project?

The "raw" data presently in public German data archives that this project will utilize approaches about 2 TB. We expect that the submission of processes, calibrated, and reduced data will be a factor 1000 smaller, about 2 GB. No high volume satellite or numerical modelling output data will be provided as these data streams are provided and maintained by NASA in the USA and ESA in Europe.

### What type of metadata (information others might need to use your data) will be collected during your project?

**Note: if you plan to submit data to the Arctic Data Center please refer to the guidance in the panel on the right.**

All meta-data will be provided in plain text format. Furthermore, location (longitude, latitude, depth) and time strings (date, hour, minute) are always attached as columns in all ocean mooring and survey files. Additional and partially redundant meta-data are included in pipes of Unix software tools and scripts that call that will be submitted along with test data to ensure transparency of both data and processing. The

## Data and metadata formats

### What format(s) will data and metadata be collected, processed, and stored in?

**Note: if you plan to submit data to the Arctic Data Center please refer to the guidance in the panel on the right.**

All processed and calibrated data will be provided to the Arctic Data Center as Comma or Space Separated Values.

## **Policies for access and sharing**

### **How will data be accessed and shared during the course of the project?**

For the duration of the project all project data not available in public archives will be shared online without restrictions on the server <http://muenchow.cms.udel.edu> that the principal investigator maintains for professional and public outreach purposes and <http://muenchow.cms.udel.edu/ForSohyun/> perhaps serves as an example of internal yet open data sharing. Towards the end of the project the data on that server will transition with modifications to the Arctic Data Center.

**Will any of the data and/or related materials produced need provisions for appropriate protection of privacy, confidentiality, security, intellectual property, or other rights or requirements? If so describe them and detail any requested exceptions from the archiving requirements set for Arctic Sciences research.**

No protections are needed.

### **When is the approximate release date of the data products?**

**Note:** Arctic Observing Network (AON) data must be deposited in a long-lived and publicly accessible archive within 6 months of collection, and Arctic Social Science Program (ASSP) research data must be deposited in a long-lived and publicly accessible archive within 5 years of the award date assuming no exceptions to the archiving requirements are requested.

Value-added, that is processed, calibrated, and condensed data will be submitted to the Arctic Data Center during the last 6 months of the project starting 2026.

## **Policies for re-use and re-distribution**

**How do you anticipate the data for this project will be used? Consider the following:**

1. Which bodies/groups are likely to be interested in the data?
2. What and who are the intended or foreseeable uses/users of the data?

The data will be used by an international community of physical oceanographers, ocean engineers, and government scientist with research, monitoring, or commercial interests in north-east Greenland.

**Will any permission restrictions need to be placed on the data? Consider the following:**

1. Who will be allowed to use the data?
2. How will others be allowed to use the data?
3. Will others be allowed to disseminate the data.

**Note:** If you are planning on restricting access, use, or dissemination of the data, you must explain in this section how you will codify and communicate these restrictions.

The raw data already reside in the public domain and all data products generated by this project will also reside in the public domain after completion of the effort in June of 2026. No restrictions will placed on any data that can be disseminated freely by anyone for any purpose.

## **Plans for archiving and preservation**

### **What is the long-term strategy for maintaining, curating, and archiving the data?**

**Note:** The Office of Polar Programs policy requires that metadata files, full data sets, and derived data products be deposited in a long-lived and publicly accessible archive.

The data manager will follow the NSF Arctic Data Center guidelines to provide accurate and complete documentation for data preservation. The NSF Arctic Data Center will ensure that the data are curated in a relevant long-term archive and ensure data will be available after project funding has ended.