MIDO

Multidisciplinary Ice-based Distributed Observatory


Principal investigator

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Areas of contribution

Polar atmospheric processes
Oceanic processes
Modelling and forecasting
Observations
Sea ice processes
Data assimilation
Data archiving

Summary

The aim of MIDO is to deploy several multi-disciplinary buoy arrays in the ice-covered oceans of both hemispheres between 2017 and 2020. The core of this project is the continuous monitoring of several key parameters across the atmosphere-snow-sea ice-ocean interfaces, linking physical and biogeochemical processes. (Update: only northern hemisphere)
Description

In order to achieve multi-domain observations, we plan to use four main types of platforms, which together will build an observational system:

1. Autonomous Weather Stations (AWS): Different instruments have been used and are well established for atmospheric and snow observations in polar regions. Additional efforts are currently made to combine several different systems into more compact and reliable platforms.

2. Ice Mass-Balance Buoys (IMB): Different instruments are used to measure sea-ice and snow thickness, and sea-ice physical properties. The main component is a high-resolution thermistor chain. Advanced systems include a camera for documentation of general sea-ice conditions (e.g., melt pond formation, ridging events).

3. Ice Tethered Bio-optical Buoys (ITBOB): These platforms monitor ice internal and uppermost ocean biogeochemical parameters with different sensor packages; including radiation, bio-optics and dissolved oxygen above, within, and under sea ice.

4. Upper ocean bio-profiler: ice-based upper ocean profiling systems, based on the well established profiling float technology, additionally incorporating a bio-optical/biogeochemical sensor package, including a fluorometer, a PAR sensor, an oxygen optode, and a nitrate sensor.

The central node of each observational system consists of a full suite of sensors of all four types on one ice floe. In order to capture the spatial variability at different scales in the atmosphere, the sea ice, and the ocean, the central node is surrounded by 3 sub nodes within 100 km. Each subnode consists of an AWS and an IMB (Figure 2).

To allow a quasi-synoptic survey resolving seasonal to decadal variability in the Eurasian Basin, 2 full systems will be deployed in the Arctic every year.

The AWS will report their data into the Global Telecommunications System (GTS) in near real time, which is of critical importance for weather forecasts and reanalysis efforts in notoriously undersampled areas. Other crucial parameters, such as ice thickness and snow depth, are currently looked into being also added to the GTS by JCOMMOPS. Once this is achieved, the IMB data will also available within the GTS.

The combination of physical and biogeochemical observations are expected to yield unique insights into the linkages between the physics on the one hand, and the evolution of the associated biosphere on the other.

Timeline

2017-08-01 - 2020-12-25

Regional emphasis

Northern hemisphere: Yes

Southern hemisphere: No
Key project deliverables

Availability of crucial parameters within the GTS in especially underrepresented areas of the polar oceans throughout and beyond YOPP. Unprecedented datasets combining physical (air and ocean temperatures, barometric pressure, ocean salinity, sea-ice thickness, snow depths) and biological/biogeochemical (Chl-a, CDOM, oxygen, nitrate, PAR) parameters, as well as their seasonal evolution in both polar oceans.

Data management

The data will be archived within the online information system PANGAEA, which is hosted by the Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research (AWI) and the Center for Marine Environmental Sciences (MARUM), University of Bremen. PANGAEA is operated as an Open Access library aiming at archiving, publishing and distributing georeferenced data from earth system research. The system guarantees long-term availability of its content through a commitment of the operating institutions. Authors submitting data to the PANGAEA data library for archiving agree that all data are provided under a creative commons license.

Is data provided to WMO Global Telecommunication System

Yes

Real-time provision

Data will be available in near real time through data.seaiceportal.de, as well as through a data portal currently being developed in the framework of the Frontiers in Marine Monitoring infrastructure program hosted by AWI. Selected parameters will be fed into the Global Telecommunication System (GTS) in near real time, representing critical additions for operational weather prediction and future reanalysis efforts in both hemispheres. The data further contribute to the IABP and IPAB databases, which are widely used by the polar research community.

Timelines

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<tr>
<th>Location</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Start date</th>
<th>End date</th>
<th>Activity</th>
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<td>2018-08-01</td>
<td>2018-08-30</td>
<td>Operation of 2 observational systems in the central Arctic Ocean, deployed from onboard the Oden 2018 expedition</td>
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<tr>
<td>Eurasian Basin, Arctic Ocean</td>
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<td>2019-09-01</td>
<td>2021-12-30</td>
<td>Operation of 4 observational systems in the central Arctic Ocean, deployed from onboard the Polarstern TransArc III expedition and the MOSAiC drifting experiment.</td>
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