

Report to the Norwegian Petroleum Directorate regarding the ARTofMELT expedition in the Norway Economical Zone, permit 847/2023 from 01.05.2023 - 05.07.2023.

ARTofMELT expedition

The aim of the ARTofMELT expedition was to capture the onset of sea ice melt in the Arctic Ocean. In connection to the expedition, information about the water column, the seafloor, and the sub-bottom were collected within the Norway EEZ between 7 May – 15 June 2023.

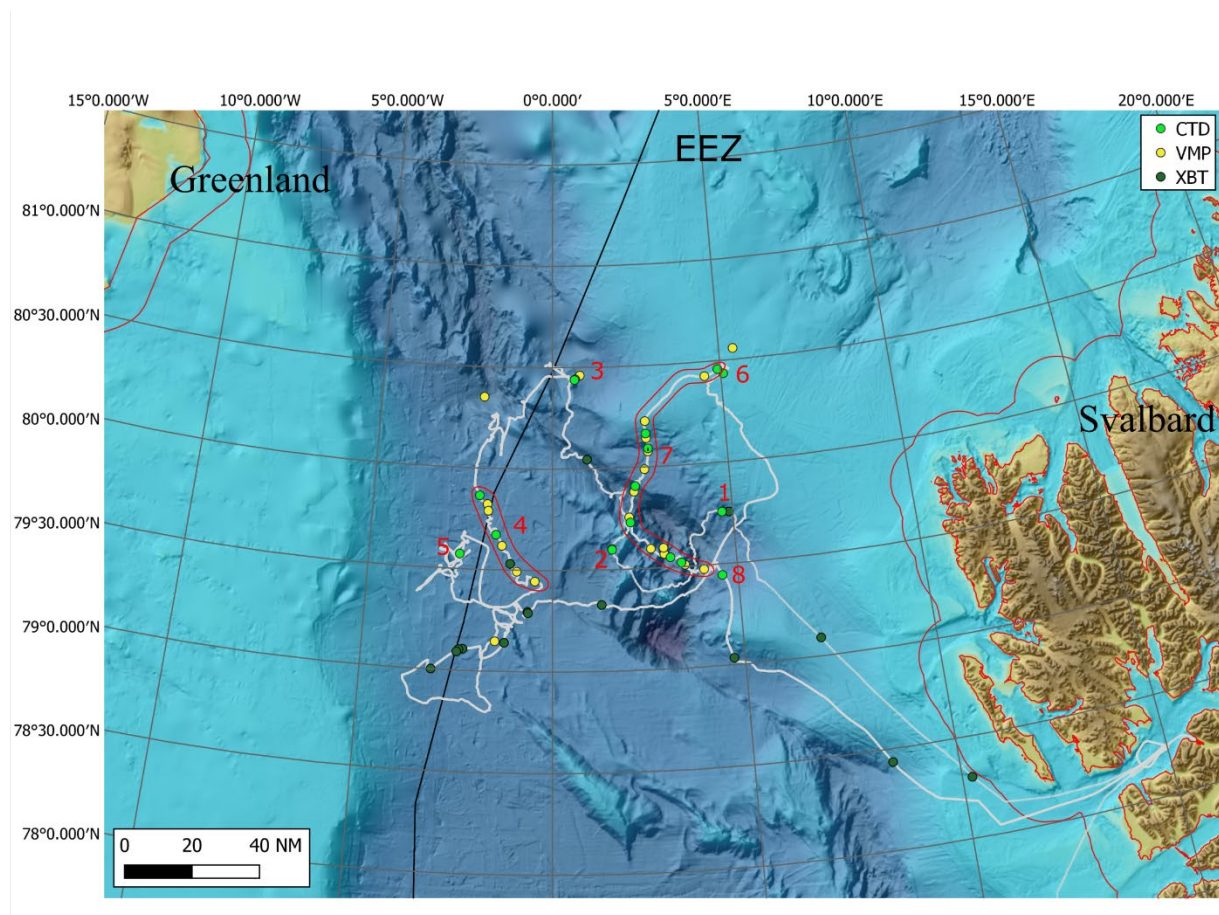


Figure 1: Cruise track of I/B Oden during the ARTofMELT expedition and sampling points (dots). Ship stations are marked and labelled in red.

Work package 10 Physical Oceanography & 11 Geophysical Mapping

Operators onboard IB *Oden*: Aileen Bohan and Julia Muchowski

Short project description

WP10 and WP11 combined acoustic geophysical observations with in-situ conductivity, temperature, and depth (CTD) as well as vertical microstructure profiler (VMP) measurements to investigate: 1) thermohaline stratification and vertical mixing; 2) the ocean surface mixed

layer depth (MLD) and its variability; 3) methane gas plumes in the water column; and 4) the seafloor and sub-bottom habitats.

Methodology

IB Oden has the following hull-mounted echosounders installed: a Kongsberg EM122 multibeam echosounder, a Topas SBP120 sub-bottom profiler, and a Simrad EK80 broadband mid-water echosounder with ES18, 38, and 70 kHz center frequency transducer, and a Teledyne 75 kHz Acoustic Doppler Current Profiler (ADCP). All acoustic systems were running continuously throughout the cruise. With those systems, we collected geophysical data of the seafloor, the sub-bottom and the water column. In addition, CTD (Conductivity, Temperature, Depth) measurements were collected from a CTD rosette (Fig. 1 bright green dots) as well as from a portable microstructure profiler (VMP, Fig. 1 yellow dots), which in addition also measures shear which can be used to infer dissipation rates of turbulent kinetic energy. Furthermore, water temperature was measured using eXpandable BathyThermographs (XBT, Fig. 1 dark green dots).

During most CTD casts, we also collected UVP (Underwater Vision Profiler) data, which are images of small particles in the water, such as zooplankton. During some CTD casts as well as on some occasions connected to VMP measurements, we also collected videos with a fish camera and red light.

Preliminary results

The high-resolution bathymetry of the expedition will be made available as processed grids with a grid cell size of 100 m in IBCAO Polar Stereographic projection (epsg: 3996) on the Bolin Centre Database.

Raw and processed data is included in the delivery of the hard disk. Multibeam raw data and provided sound-speed profiles were used to produce the gridded multibeam data (folder K:\ARTofMELT2023_DATA\MBES\processed\grid). The expedition report will be published on the Polar homepage: <https://www.polar.se/en/expeditions/previous-expeditions/arctic/artofmelt-2023/>.

We aim to use the collected data to publish the results in scientific, peer-reviewed journals, and as part of the IBCAO (International Bathymetric Chart of the Arctic Ocean) and GEBCO (General Bathymetric Chart of the Oceans) projects.

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