

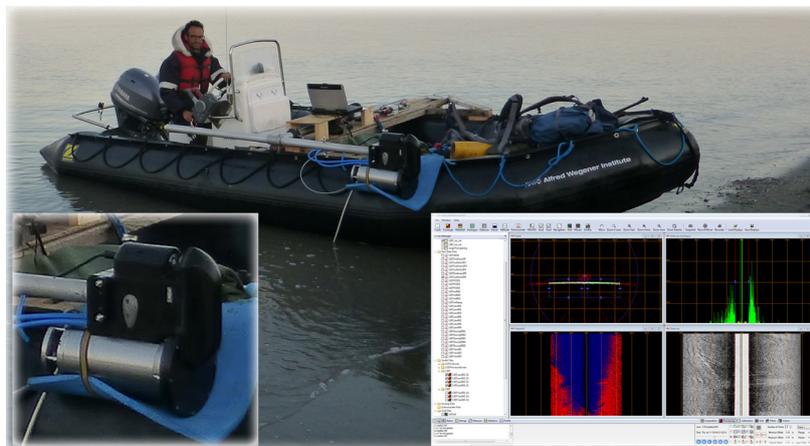
### Seabed mapping in permafrost - a natural laboratory in the Arctic

#### Seabed Mapping in Permafrost - Herschel Island, YT, Canada

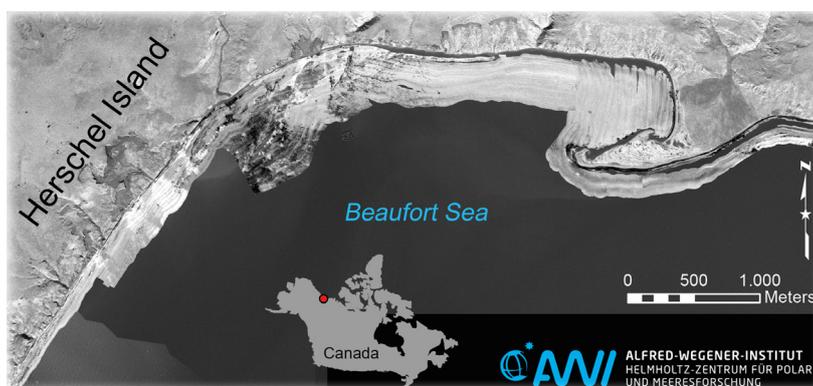
In 2012, the Alfred Wegener Institute for Polar and Marine Research (AWI) in Germany began assessing the pace of coastal erosion and the nature of sediment and organic matter transfer in near-shore areas of the southern Canadian Beaufort Sea. The research was held within the Coastal Permafrost Erosion research project (COPER), funded by the Helmholtz Association.

Coastal dynamics on arctic coasts is highly seasonal. Ice is present from October to late June, which means that the coast is armoured against wave erosion during almost three quarters of the year. In the short open-water season the coast is subject to the combined effects of mechanical and thermal processes resulting in high erosion rates along ice-rich permafrost coasts, such as the western Canadian Arctic.

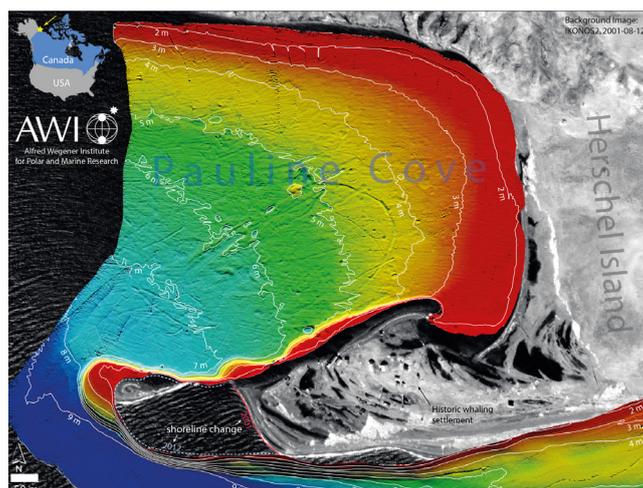
Of special interest is the potential climate feedback triggered by carbon release into the near-shore zone by coastal erosion, in a region that according to many climate change models will experience disproportionate warming. Current estimates show that there is about twice



*Survey boat equipped with battery-powered GeoSwath Plus Compact bathymetric sonar. Transducer head, motion reference, sound velocity sensor and GPS antenna are mounted on a retractable pole. Splash-proof sonar electronics is operated with a ruggedised laptop running GS+, GeoSwath Plus acquisition and processing software.*



*Compensated acoustic backscatter map of the Southern Coast of Herschel Island. The backscatter data was processed using GeoTexture software suite, which is optimised for GeoSwath Plus backscatter data.*



*Bathymetry map of Pauline Cove on Herschel Island, chosen as the natural laboratory for coastal erosion processes in permafrost.*

as much carbon stored in permafrost as in the atmosphere. A portion of the released carbon is deposited on the continental shelf, yet the near-shore dynamics and the possibility of sequestration in shallow waters remains an open question.

An integral part of the fieldwork is seafloor mapping, for which AWI chose the Kongsberg GeoAcoustics GeoSwath Plus Compact system. The system delivers high-resolution bathymetry with coverage of up to 12 times the water depth in this shallow

water environment and co-registered, geo-referenced backscatter data.

Decisive factors in operating in remote and harsh environments are the portability and reliability of the equipment. The remote location makes it necessary to airlift all equipment and personnel.

Seafloor maps were produced using GS+, GeoSwath Plus acquisition and processing software. Compensated acoustic backscatter mosaics were created with GeoTexture software.

## GeoSwath Plus Compact

The GeoSwath Plus Compact shallow water multibeam sonar offers efficient simultaneous wide swath bathymetry and side scan seabed mapping with accuracies that exceed the IHO standards for hydrographic surveys. The lightweight, splash protected system is readily installed on small vessels of opportunity including inflatable crafts, RIBs and jet-skis.

## Features

- Ultra high resolution swath bathymetry
- IHO SP-44, special order
- Co-registered geo-referenced side scan
- Frequency versions: 250, 500 kHz
- Up to 12 times water depth coverage
- 240° view angle
- Compact splash protected deck unit
- 24 V power supply, 40 W
- Operation from laptop PC
- Dual transducer sonar head
- Full software solution included: data acquisition, processing, presentation

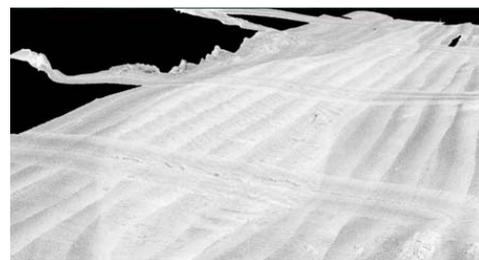
## GeoTexture

GeoTexture is side scan data processing software for normalisation, mosaic creation and seabed classification. Its most common applications are found in civil engineering and geological and environmental site surveys, where high quality seafloor imagery, sediment classification and habitat mapping are key requirements.

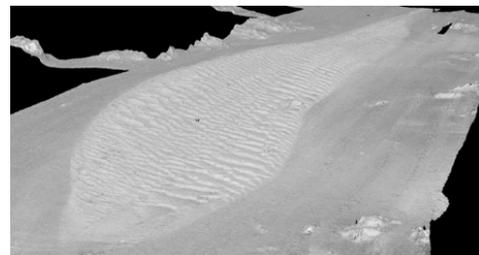
The performance of the software has been optimised for the analysis of the GeoSwath Plus phase measuring bathymetric sonar side scan data, although it supports a wide range of side scan and generic image formats.

## Features

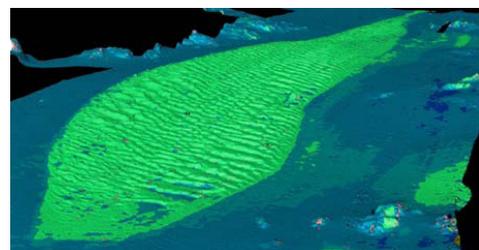
- IHO SP-44, special order
- Side scan data processing
- Seabed classification
- Repeatability
- Wide range of input and output formats (XTF, BMP, JPG...)
- Minimisation of vessel track artefact in mosaics
- Optimised for GeoSwath Plus side scan data



Side Scan Mosaic



Normalised Side Scan Mosaic



Classified Image

- Mosaic ASCII export in dB for compliancy with 3rd party seabed classification packages



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