Will increase the knowledge of the Arctic Ocean

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The work of the Fram expedition in 2012 covering a piece of the Lomonosov Ridge. The seismic line AWI 91-091 illustrates the lack of cover of the Mesozoic sediment layers at its polar continental margin. Credit: Yngve Kristoffersen

Our knowledge of the Arctic Ocean floor rocks is mainly based on interpretation of geophysical data. But while the amount of multi-channel seismic data over time has passed 20,000 km, is tangible geological information, however limited to some loose sand from the ACEX drill site on the Lomonosov Ridge, and fist-sized fragments of transformed basalt from two localities on the Alpha Ridge and an undersea mountain in the east flank of Mendeleev Ridge. All samples are dated to the late Cretaceous.

Two large basins

Eurasian Basin, the area between the Barents-Kara Sea north margin and the Lomonosov Ridge, is associated with a pattern of linear magnetic anomalies due to seafloor spreading in the Cenozoic. Amerasia Basin located south of the Lomonosov Ridge and is dominated by an irregular magnetic pattern with relatively high amplitude.

In a pre-reconstruction operation is therefore the Barents Sea north margin in Mesozoic represented by the slope of the Lomonosov Ridge to Amerasia Basin, just the way that J. Tuzo Wilson proposed in 1963 in his article Hypothesis on the Earth's behavior. A seismic profile across the central part of the Lomonosov Ridge documents sedimentary sequences against the Amerasia Basin.

The tectonic evolution of Amerasia Basin is however controversial. The reason is that it has not been documented fossil plate boundaries, and this has given rise to many different models.

Only one suitable site

In the Amerasia Basin appears the Lomonosov Ridge, which is unique in terms of opportunities for stratigraphic sampling. The explanation is that the margin had negligible sediment supply throughout the Cenozoic.

The existence of seismic data from Canada's northern margin, Beaufort margin, Alaska margin and the margin of Chukchi Borderland and the Laptev Sea on the other hand, show progradation and aggradation. There is thus no possibility of access to older stratigraphy without the use of the drilling rig.

A small exception is the Chukchi Borderland on the east and northern side, where Arthur Grantz from the USGS for the period 1987-1992 was the only previously known stratigraphic sampling effort in the Arctic Ocean with conventional equipment.
Two months in the ice

New insight must come from stratigraphic sampling, and this is the focus of this year's expedition into the Arctic Ocean. From mid-July to mid-September this year, the air cushion boat Sabvabaa operate together with the Swedish icebreaker Oden and conduct geological sampling on the flanks of the Lomonosov Ridge. We plan to use a new sampling technique of gravity corer and bottom dredge.

In addition, Gaute Hope's master's project, with an array of hydrophones in the water, bound together in a local Internet solution, represent a first attempt at 3D seismic data in the Arctic Ocean.

The expedition is supported by the Norwegian Petroleum Directorate in a joint venture with the Nansen Center and University of Bergen and carried out in connection with the Norwegian Academy of Science of Polar Research. The participants of the expedition is a professor emeritus Yngve Kristoffersen, Department of Earth Science / NERSC and student Gaute Hope, Department of Earth Science, University of Bergen. Samples will be distributed after the expedition to the relevant Norwegian research.

In memory of an achievement

FRAM-2012 will be the first Norwegian research expedition ever in the central part of the Arctic Ocean beyond the North Pole (Nansen reached 86°-14'N, while Amundsen came up to 87°-44'N).

The expedition testing a new concept for future Norwegian research in the Arctic Ocean where the air cushion boat works with an icebreaker expedition. The icebreaker is the base for fuel, temporary storage of equipment and a contact point of relevance for the operation.

The synergy of this joint activity will make it possible for Norwegian scientists to carry out stand-alone applications on their platform and also through cooperation vertsisbryterens streamline research efforts.

In honor of Fridtjof Nansen's daring expedition through the Arctic Ocean 119 years ago ("With Fram across the Arctic Ocean"), and with a desire to carry on the tradition, we suggest the name of this and future expeditions into the central part of the Arctic Ocean will be FRAM- and the current year. This year's expedition is called FRAM-2012.