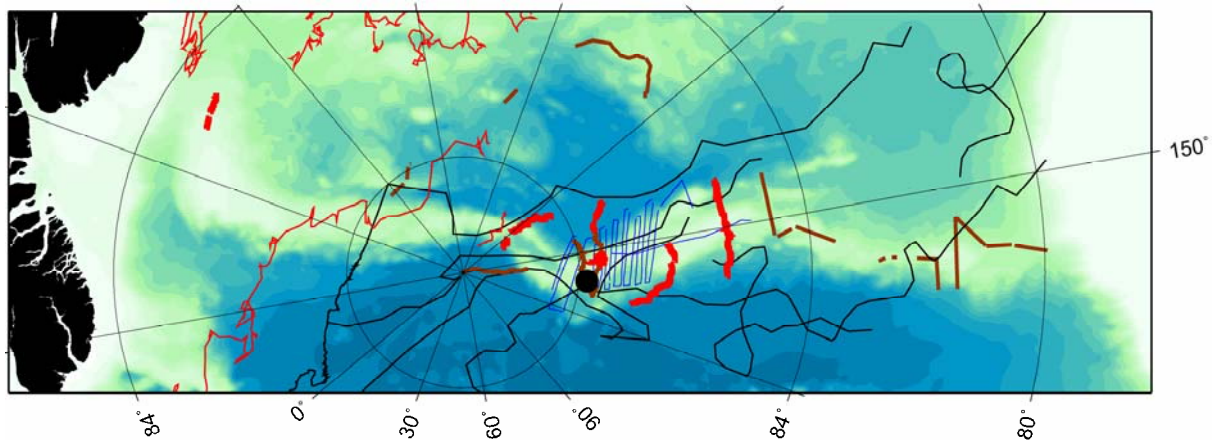


## Lomonosov Ridge - work in support of scientific drilling



Lomonosov Ridge: University of Bergen have been involved in acquisition of seismic lines shown by thick red colour. Lines acquired by AWI only indicated by brown colour. Drift tracks of US ice stations T-3 and Arlis-2 (thin red lines) and Russian North Pole stations (thin black lines). Location of ACEX drill site indicated by black dot.

A new era in geoscientific exploration of the Arctic Ocean opened up when diesel driven icebreaking research vessels first reached the North Pole in September 1991 and demonstrated capability to operate in the central deep polar basin.

Three events were important contributions to what matured into an ODP proposal for scientific drilling on the Lomonosov Ridge:

- **acquisition of the first multichannel seismic profiles across the ridge by "Polarstern" in 1991;**
- **a test of the capability for maintaining position in drifting sea ice by "Oden" in 1991;**
- **an attempt to sample the sediments by shallow drilling from "Oden" in 1996.**

The first multichannel seismic reflection profiles across Lomonosov Ridge were acquired by the German research icebreaker "Polarstern". After having to abort collection of seismic data shortly after entering the ice edge north of Kvitøya, we built a new towing system underway across the Eurasia Basin and were back in business on approach to Lomonosov Ridge. The first results strongly supported the proposal of J. Tuzo Wilson (1963) of Lomonosov Ridge being a continental sliver rifted off from the margin north of Svalbard. The data was published by:

*Jokat, W., Uenzelmann-Neben, G., Kristoffersen, Y., and T. M. Rasmussen, 1992: Lomonosov Ridge - A double-sided continental margin. Geology, 20: 887-890.*

During the 1991 expedition, we approached Captain Anders Backman on "Oden" with the need to make a test of the station keeping capability of an icebreaker in drifting sea ice. We pointed out the importance of such an exercise in planning future geoscientific projects. Backman took the challenge and the results were published by:

*Kristoffersen, Y., Backman, A., and Brass, G., 1992: Logistics of scientific drilling in the Arctic Ocean: Station keeping test opens new perspectives. The Nansen Icebreaker, No. 3: 1.*  
<http://www.geo.uib.no/hjemmesider/yngeve/docs/AO91position.pdf>

Building on the results from a station keeping test of icebreaker "Oden" and also on successful shallow drilling on the Antarctic continental margin in early 1996, a proposal was submitted jointly with Dr. Jan Backman, Stockholm University to attempt shallow drilling on the Lomonosov Ridge from "Oden". The Swedish Polar Secretariat was positive to the idea and the Swedish National Maritime Administration contributed to installation of a 0.6 m diam. moon pool on the starboard side behind the reamer of the icebreaker. On the Lomonosov Ridge, we were able to set the riser in 962 m water depth, and were underway with about 250 m drill string out when the attempt unfortunately had to be aborted due to ice. The effort was reported in:

*Kristoffersen, Y., 1997: A pilot project for shallow drilling during Arctic Ocean-96. Yearbook 1995/96, Swedish Polar Secretariat, p. 72-74.  
<http://www.geo.uib.no/hjemmesider/yngve/docs/LRdrilling96.pdf>*

A proposal (533) for scientific drilling on the Lomonosov Ridge was submitted in March 1998 based on the single seismic reflection transects collected in 1991. The proposal received good reviews, but the consensus at the ODP Site Survey Panel meeting in February 2000 was:

*.....However, seismic reflection cross lines for the proposed drill sites have not yet been collected. ....*

The Swedish Polar Secretariat kindly offered to include a 5 day site survey into the expedition plan for 2001 provided funding (\$ 150 k) could be found for the extra days of ship time. Despite the noble cause, the site survey would not have materialized if it had not been for an unselfish private donation (\$ 50 k) from the Margareth Blodgett Kendrick Foundation. Other contributions were from Norwegian Research Council, Statoil, Norwegian Petroleum Directorate and U.S. Science Support Program at the Joint Oceanographic Institutions. About 100 km of seismic data were acquired in the target area. As a result of relatively difficult ice conditions, data collection was only realized during 2.5 of the five days available and 400 m of hydrophone cable were damaged. The survey was reported in:

*Kristoffersen, Y., 2001. An ODP-site survey on Lomonosov Ridge during Arctic Ocean 2001. Swedish Polar Secretariat Yearbook 2001: 64-66.  
Kristoffersen, Y., Coakley, B., and Hall., J.K., 2001. Lomonosov Ridge, Arctic Ocean: New data for definition of targets for scientific drilling. **Poster** AGU Fall Meeting, San Fransisco, Dec. 2001.*

Future scientific drilling in the Arctic Ocean is crucially dependent on site surveys as a basis for mature proposals. A Joint European Ocean Drilling Initiative (JEODI) Workshop on "Preparing for Scientific Ocean Drilling in the Arctic Ocean: The Site Survey Challenge" was held in Copenhagen in January 2003. The workshop report outline primary scientific questions and the geophysical and geological data base relevant to scientific drilling. The report:

*Kristoffersen, Y. and Mikkelsen, N., 2004: Scientific drilling in the Arctic Ocean and the site survey challenge: Tectonic, paleoceanographic and climatic evolution of the Polar Basin. JEODI Workshop, Copenhagen, 2003. Geological Survey of Denmark and Greenland Special Publication, pp. 85*

is available at: <http://www.geus.dk/program-areas/nature-environment/international/reports/>