

46°N to 75°N (Quebec City to the Beaufort Sea):
2011 Ocean Mapping Group Operations in the Canadian Arctic, Part III

By Doug Cartwright

Doug Cartwright, Christine Legere and Pim Kuus met up with the CCGS Amundsen in Sachs Harbour, NWT, on September 7, 2011. Their trip to the North was one of the most spectacular parts of the expedition and included stops in Yellowknife and Kugluktuk. From the sky you see the landscape quickly change from tundra to Arctic desert. Twin Otters brought the crew into Sachs Harbour and a Coast Guard helicopter was used to ferry passengers to the ship. The weather was perfectly clear during the flights, so there were beautiful views, especially of the Coppermine River as they approached Kugluktuk.

Leg 2c continued in the Beaufort Sea where Leg 2b left off. The main focus was seabed mapping along the Beaufort Shelf with the CCGS Amundsen. Besides the Amundsen, they also had the opportunity to use a barge for mapping operations. The Amundsen is equipped with a ~30-ft barge, which is normally used by the Coast Guard to transport passengers or goods to and from shore in shallow waters. Earlier in the summer the Ocean Mapping Group had outfitted the barge with an EM3002 multibeam sonar and auxiliary instruments. The barge not only provided the opportunity to run some site-specific surveys while the Amundsen operations took place, but thanks to the EM3002, higher resolution data could be acquired.

The Beaufort continental shelf is dotted with dome-shaped mounds. These features have been coined pingo-like-features (PLFs) because of their morphological resemblance with pingos found on shore. Pingos are ice-cored hills and are quite common in the western Arctic landscape. Despite their common dome shape, geologists are uncertain if PLFs are really pingos; what they really are is unclear. Some PLFs appear to be venting gas or extruding fluids or mud. This activity is particularly interesting for geologists as it can be a source of hydrocarbons. In order to understand the processes involved, the barge was used to find the PLFs and map them in three dimensions.

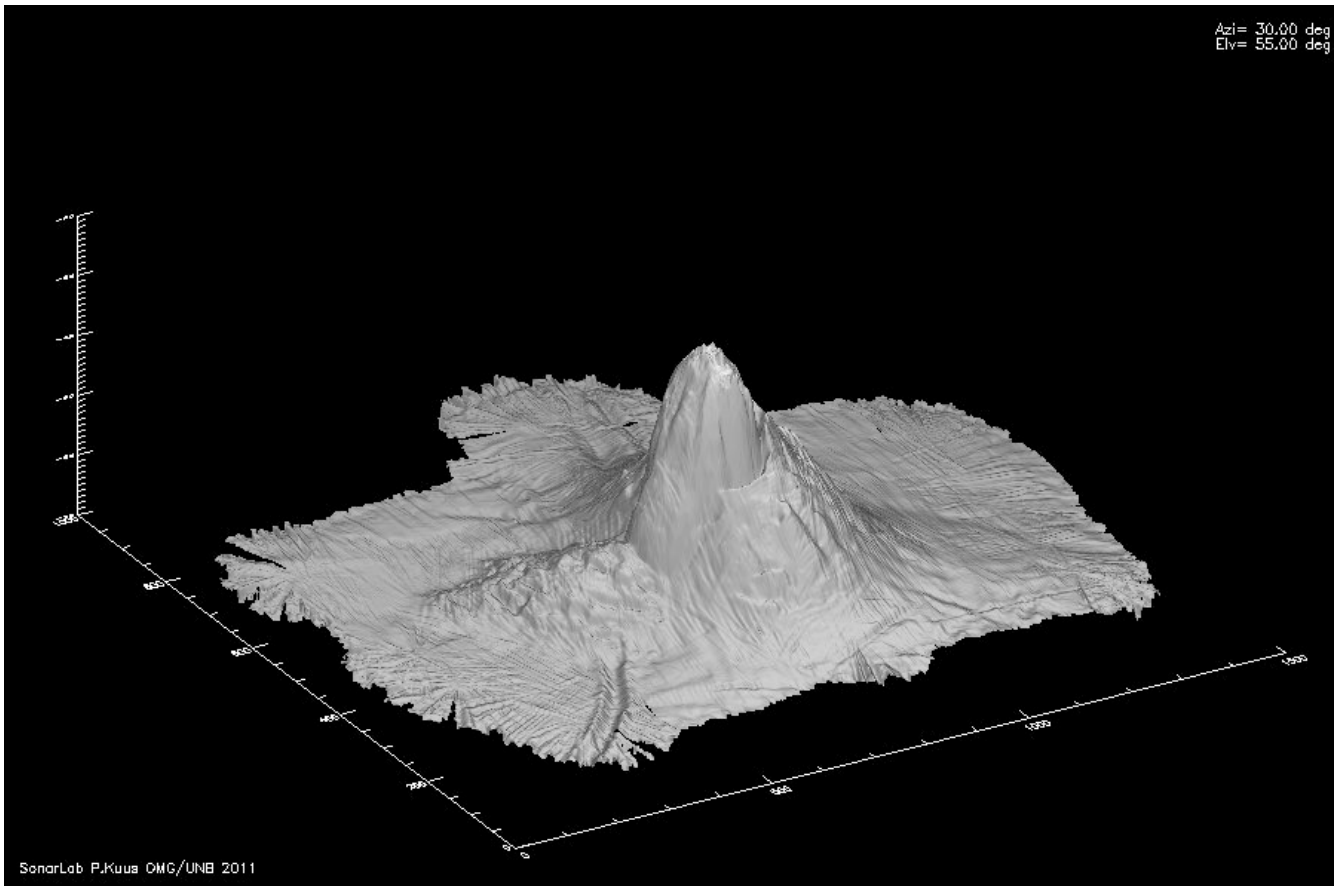
During five barge deployments, 24 PLFs were mapped, of which 16 had never been mapped before. A ridge-like feature was also discovered along the shelf which geologists believe to be remnants of an ancient shore line. One of the PLFs turned out to be a mud volcano. By comparing data with a previous survey a year earlier, it could be determined that the mud volcano had grown; i.e., the lobe of mud extruding from the crest had moved 10-20 m and had grown thicker. (See images of the PLFs at the end of this article.)

On September 22, Pim and James departed the Amundsen and Doug and Christine carried on with science activities for the remaining two weeks of the leg. During this next period, the priority was taken away from mapping and put towards other science activities, including identification and retrieval of seabed mooring installations and marine mammal surveys.

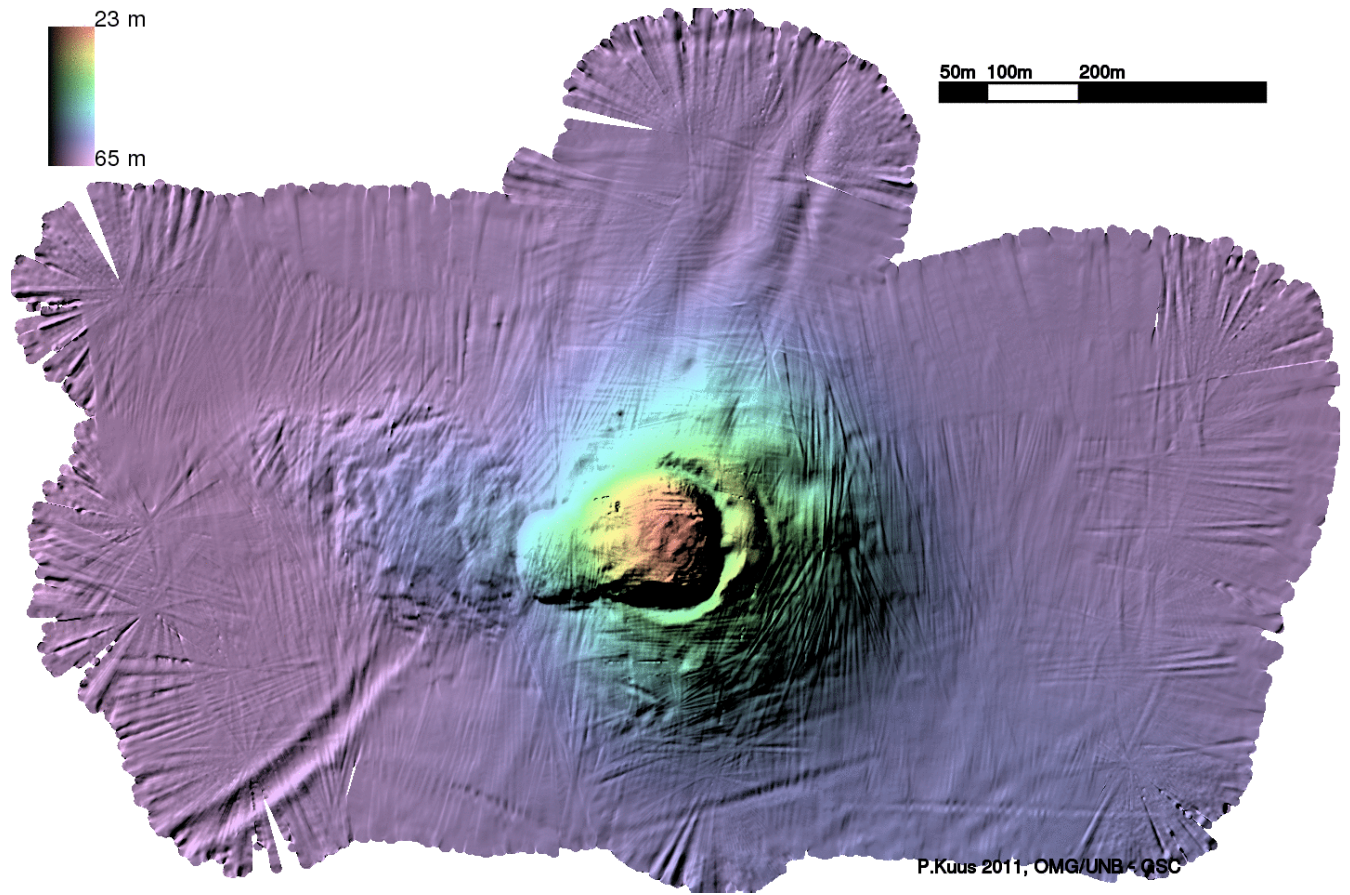
This leg of the journey also included the “Schools on Board” program (<http://www.arcticnet.ulaval.ca/sb/index.php>) that provides Canadian high school students with the opportunity to experience science sampling and research activities first hand onboard the icebreaker. Doug provided a presentation on acoustics and seabed mapping to the group that was well received.

Numerous seabed mooring installations were retrieved on this leg of the trip. Seabed moorings are strings of instruments, which are fastened to the seabed for years at a time. During this period they collect data about the properties of the water column. The data can include suspended sediments, temperature and salinity profiles, water currents, and ice thickness. The moorings are not always where you expect them to be after a couple of years, therefore before retrieving the moorings, the Amundsen steams over them in multiple directions to try to identify them in the multibeam water-column imagery. The flotation buoys on the moorings act as excellent point scattering targets and the moorings show up clearly in the water-column imaging. This shows the mooring recovery crew how much of the mooring is still there and what they can expect when they release the unit.

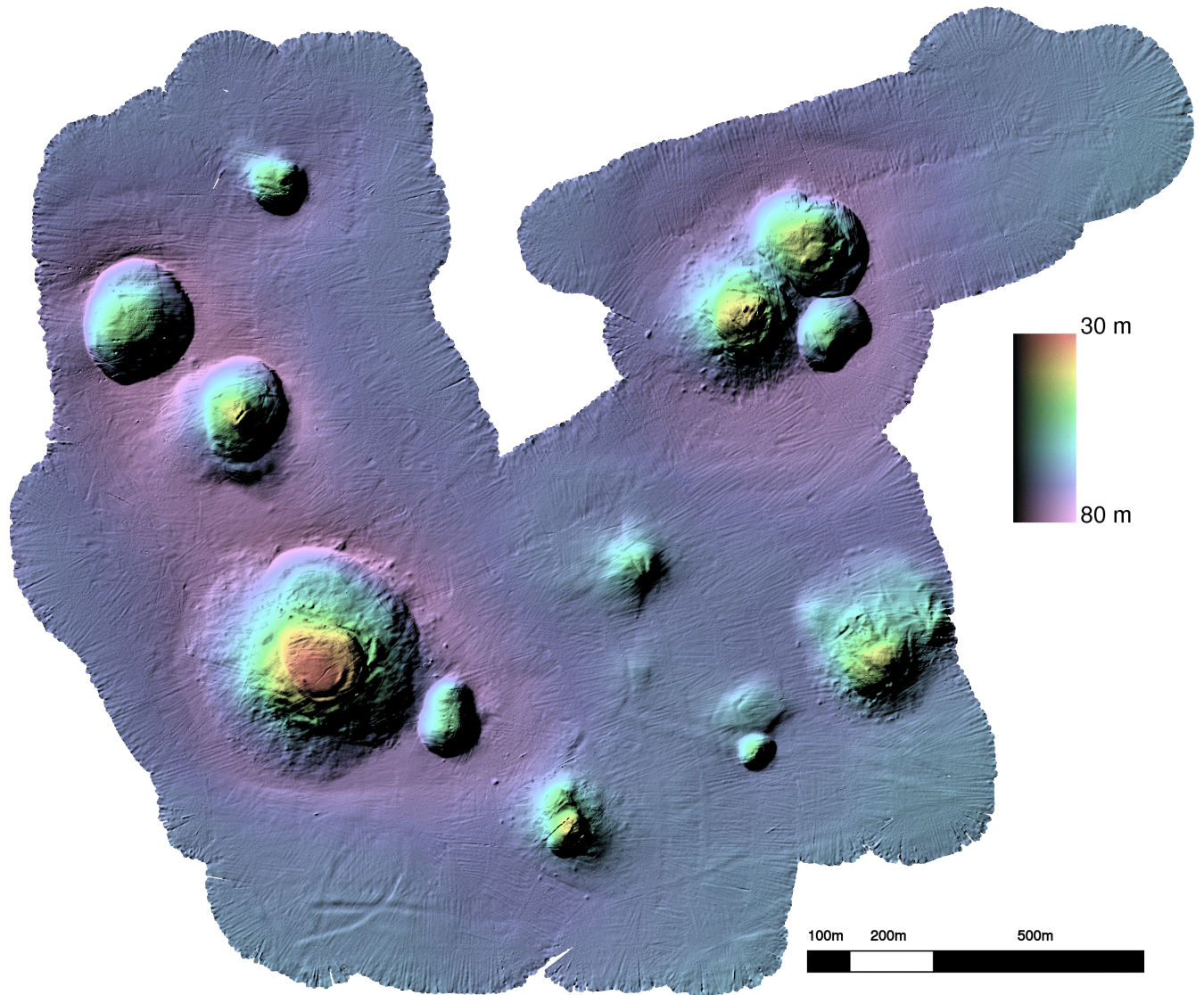
On October 4, Doug and Christine left the Amundsen in Kugluktuk and welcomed Steve and Danar aboard.



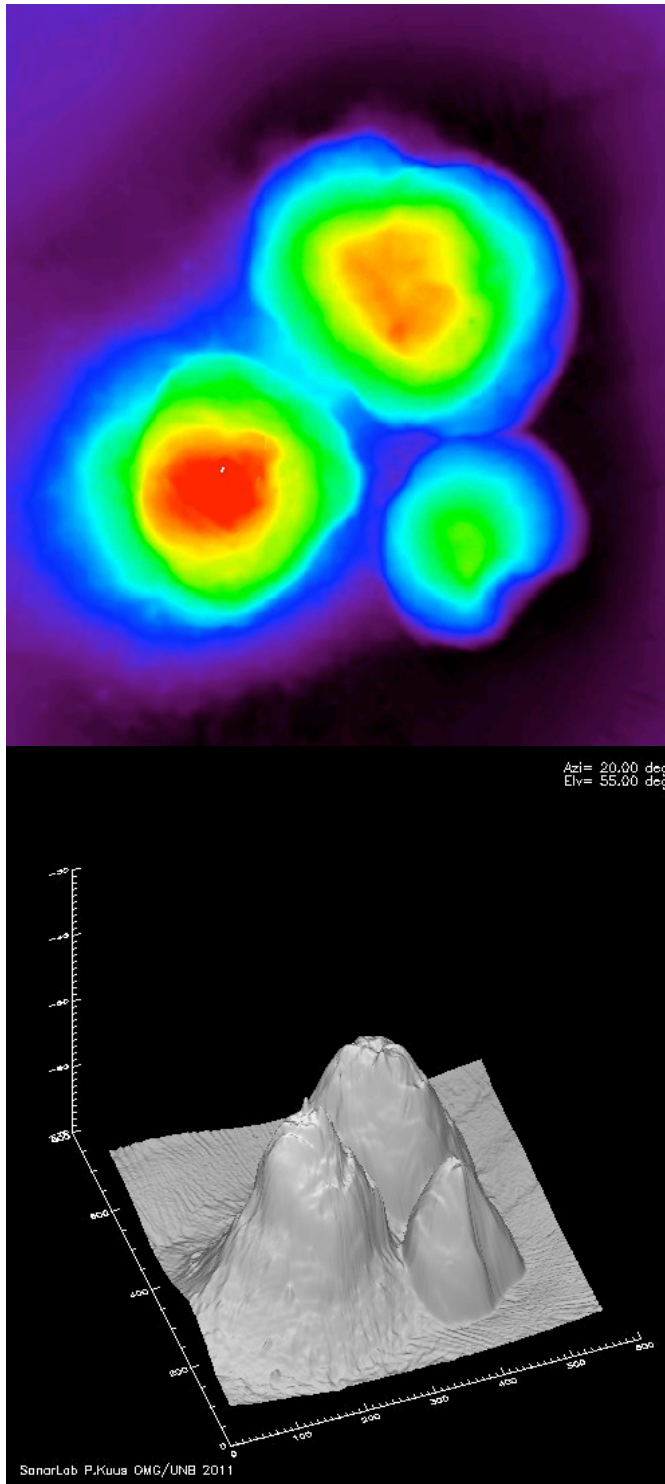
3D sun-shaded image of the mud volcano. The slump and lobe seen in the foreground have buried an ice-keel scour.



Multibeam bathymetry of same mud volcano as above.



Barge EM3002 multibeam bathymetry of Kugmalit Pingos.



“Three Sisters” pingo-like-features.