

Ice-sheet grounding on the Yermak Plateau (Arctic Ocean) prior to ca. 600 ka?

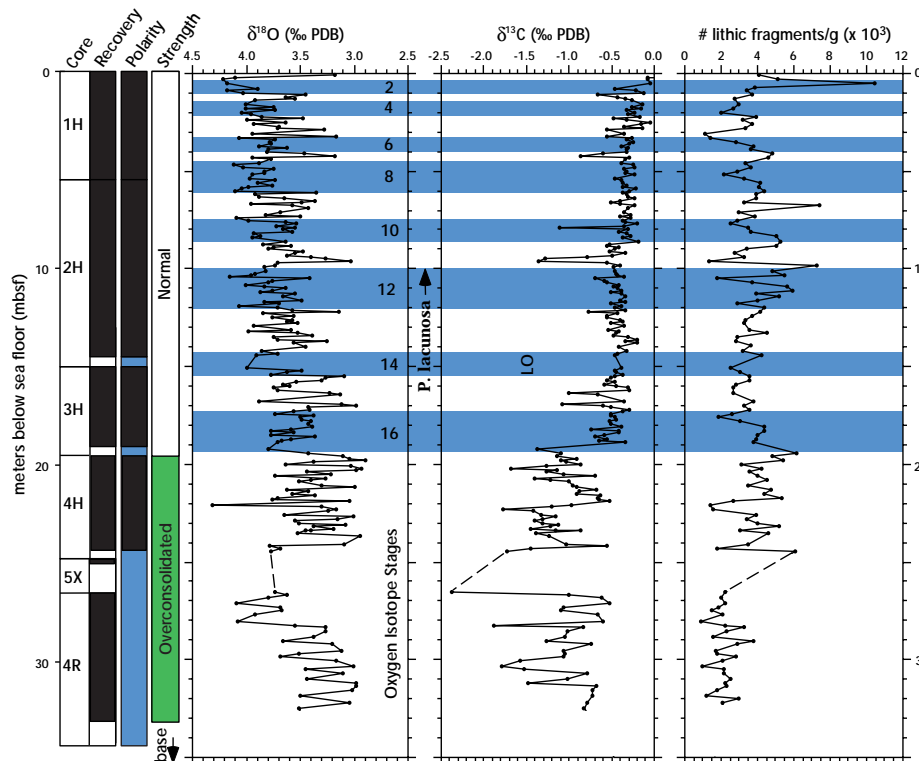
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With the aid of the Finnish icebreaker *Fennica*, the *JOIDES Resolution* obtained the first Ocean Drilling Program cores from the Arctic Ocean on Leg 151 in the summer of 1993. At Site 910 (lat 80°16'N, long 6°35'E; 556 m water depth) on the Yermak Plateau, Leg 151 discovered a remarkable "overconsolidated section" from ~19 to 70-95 m below seafloor (mbsf). The top of this sedimentary section at ~19 mbsf is marked by large increases downcore in bulk density and sediment strength. The Leg 151 Shipboard Scientific Party interpreted the overconsolidated section to be caused by (1) grounding of a marine-based ice sheet, derived from Svalbard and perhaps the Barents Sea ice sheet, and/or (2) coarser-grained glacial sedimentation, which allowed increased compaction [Myhre et al., 1995]. Planktonic foraminiferal $\delta^{18}\text{O}$ data [Flower, 1996] based on *Neogloboquadrina pachyderma* (sinistrally coiling) help date the termination of overconsolidation near the boundary between isotope stages 16 and 17 (ca. 660 ka). No evidence is found for coarser-grained sedimentation, because

the lithic fragments >150 μm exhibit similar mean concentrations throughout the upper 24.5 mbsf [Flower, in press]. The overconsolidated section may reflect ice sheet grounding prior to ca. 660 ka, suggesting a major change in state of the Svalbard ice sheets during the mid-Quaternary. In contrast, the Barents Sea ice sheets are thought to have been grounded during each glacial interval of the late Quaternary. These findings suggest that Svalbard ice sheet history was largely independent of circum-Arctic ice sheet history during the mid- to late Quaternary.

References

- Flower, B.P., Late Quaternary stable isotopic stratigraphy of Hole 910A, Yermak Plateau, Arctic Ocean: Relations with Svalbard/Barents Sea ice sheet history, in Thiede, J., A.M. Myhre, et al., eds., *Proc. of ODP, Sci. Results*, 151, 445-454, 1996.
- Flower, B.P., Overconsolidated section on the Yermak Plateau, Arctic Ocean: Ice-sheet grounding prior to ca. 660 ka?, *Geology*, in press.
- Myhre, A.M, J. Thiede, J.V. Firth, et al., *Proc. of ODP, Init. Rpts.*, 151, 926, 1995.



Stable isotope data and lithic fragment data vs. depth in m below sea floor (mbsf) at ODP Site 910. In left-hand columns, core recovery and normal magnetic polarity are shown in black; intervals of uncertain polarity are stippled. Brunhes-Matuyama epoch boundary was not recorded. Stable isotope data are based on *Neogloboquadrina pachyderma* (sinistrally coiling) in standard δ notation relative to PDB (Peedee belemnite) carbonate standard. Even-numbered oxygen isotope stages are stippled and labelled next to oxygen isotope curve. Lithic fragment concentrations are based on counts of >150 μm size fraction. Core 4R is from Hole 910C; all other cores are from Hole 910A. Overconsolidated sediments are found from ~19.5 to 70-95 mbsf. Note that top of overconsolidated section lies near stage 16- stage 17 boundary.