



Pleistocene marine ice sheets and ice shelves at the East Siberian continental margin

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RV „Polarstern“ cruise ARK-XIII/3 (2008) and RV "Araon" cruise ARA03B (2012) investigated an area in the Arctic Ocean located between the Chukchi Borderland and the East Siberian Sea (between 165°W and 170°E). Based on swath bathymetry, sediment echosounding, seismic profiling and sediment coring we present evidence that the western Arctic Ocean had a glaciated continental margin during several glacial periods of the Pleistocene (Niessen et al. 2013).

At the southern end of the Mendeleev Ridge and on the Chukchi and East Siberian continental slopes ice sheets and ice shelves grounded in up to 1200 m present water depth. We found mega-scale glacial lineations (MSGSL) associated with deposition of glaciogenic wedges and debris-flow deposits indicative of sub-glacial erosion and deposition close to the former grounding lines. Glacially lineated areas are associated with large-scale erosion, capped with diamicton and draped by, in places, several metres of pelagic sediments. On the Arlis Plateau, a detailed bathymetric map exhibits several generations of MSGSL, which we interpret as relicts of different Pleistocene glaciations. Traces of former grounding line positions suggest that an ice shelf of approximately 900 m in thickness has spread across the Southern Mendeleev Ridge in a north-easterly direction. According to our results, ice sheets of more than one km in thickness continued onto, and likely centered over, the East Siberian Shelf.

A preliminary age model suggests that the youngest and shallowest grounding event of an ice sheet should be within Marine Isotope Stage (MIS) 3 and clearly predates the Last Glacial Maximum. The oldest and deepest event predates MIS 6. The youngest grounding event on the Arlis Plateau is tentatively dated to have occurred during MIS 4. These results have important implication for the former distribution of thick ice masses in the Arctic Ocean during the Pleistocene. They are relevant for albedo, ocean-atmosphere heat exchange, moisture supply to and freshwater export from the Arctic Ocean and the formation of submarine permafrost on the East Siberian Shelf.

Niessen, F., Hong, J. K. , Hegewald, A. , Matthiessen, J. , Stein, R. , Kim, H. , Kim, S. , Jensen, L. , Jokat, W. , Nam, S. I. and Kang, S. H. (2013) Repeated Pleistocene glaciation of the East Siberian continental margin, *Nature Geoscience*, 6 (10), pp. 842-846.