Marine ice sheets of Pleistocene age on the East Siberian Continental Margin *(Invited)*

Details

Meeting	2013 Fall Meeting
Section	Paleoceanography and Paleoclimatology
Session	Paleoclimatic History of the Pacific Sector of the Arctic II
Identifier	PP42B-04

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Index Terms

Ice sheets [0726]
Seafloor morphology, geology, and geophysics [3045]
Glacial [4926]

Abstract

Based on swath bathymetry, sediment echosounding, seismic profiling and sediment coring we present results of the RV "Polarstern“ cruise ARK-XIII/3 (2008) and RV "Araon" cruise ARA03B (2012), which investigated an area between the Chukchi Borderland and the East Siberian Sea between 165°W and 170°E. At the southern end of the Mendeleev Ridge, close to the Chukchi and East Siberian shelves, evidence is found for the existence of Pleistocene ice sheets/ice shelves, which have grounded several times in up to 1200 m present water depth. We found mega-scale glacial lineations 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, accentuated by a conspicuous truncation of pre-glacial strata typically capped with mostly thin layers of diamicton draped by pelagic sediments. Our tentative age model suggests that the youngest and shallowest grounding event of an ice sheet should be within Marine Isotope Stage (MIS) 3. The oldest and deepest event predates MIS 6. According to our results, ice sheets of more than one km in thickness continued onto, and likely centered over, the East Siberian Shelf. They were possibly linked to previously suggested ice sheets on the Chukchi Borderland and the New Siberian Islands. We propose that the ice sheets extended northward as thick ice shelves, which grounded on the Mendeleev Ridge to an area up to 78°N within MIS 5 and/or earlier. These results have important implication for the former distribution of thick ice masses in the Arctic Ocean during the Pleistocene. They are relevant for global sea-level variations, albedo, ocean-atmosphere heat exchange, freshwater export from the Arctic Ocean at glacial terminations and the formation of submarine permafrost. The existence of km-thick Pleistocene ice sheets in the western Arctic Ocean during glacial times predating that of the Last Glacial Maximum (LGM) also implies significantly different atmospheric circulation patterns, in particular availability and distribution of moisture during pre-LGM glaciations.

Cite as: Author(s) (2013), Title, Abstract PP42B-04 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.