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Pleistocene glaciations in the western Arctic Ocean: Tentative age model of marine glacial landforms

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Recently glacial landforms were presented and interpreted as complex pattern of Pleistocene glaciations in the western Arctic Ocean along the continental margin of the East Siberian and Chukchi seas, (Niessen et al. 2013, Dove et al. 2014). These landforms include moraines, drumlins, glacial debris flows, till wedges and mega-scale glacial lineations. Orientations of some of the landforms suggest the presence of former ice sheets on the Chukchi Borderland and the East Siberian shelf. Here we present a tentative age model for some of the younger glacial events by correlation of sediment cores with glacial landforms as seen in subbottom profiles. The database was obtained during 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. The stratigraphic correlation of sediment cores is based on physical properties (wet-bulk density and magnetic susceptibility), lithology and color. The chronology of the area has been proposed by Stein et al. (2010) for a core from the Chukchi Abyssal Plain (PS72/340-5) and includes brown layers B1 to B9 (marine isotope stages MIS 1 to MIS 7), which are used as marker horizons for lateral core correlation.

Our tentative age model suggests that the youngest and shallowest (480 m below present water level; mbpwl) grounding event of an ice sheet on the Chukchi Borderland is younger than B2 (interpreted as Last Glacial Maximum; LGM). There is no clear evidence for a LGM glaciation along the East Siberian margin because intensive post LGM iceberg scouring occurred above 350 m present water level. On the slopes of the East Siberian Sea two northerly directed ice advances occurred, both of which are older and younger than B2 and B3, respectively. The younger advance grounded to about 700 m present water depth along the continental slope and the older to 900 m and 1100 m on the Arlis Plateau and the East Siberian continental margin, respectively. We interpret these advances as Middle Weichselian glaciations on the Beringian shelf (MIS 4 to 3). Two older glaciations can be dated as Early Weichselian (MIS 5b to 5d), of which the younger event is older and younger than B3 and B4, respectively. This glaciation can be traced by glacial wedges, streamlined lineations in up to 1200 mbpsl and subglacial diamicton along the East Siberian margin, the Arlis Plateau, and the Mendeleev Ridge. There are at least three older glaciation visible in acoustic images from the East Siberian continental margin, which probably predate the Weichselian. The available cores did not penetrate these events and the ages remain speculative.

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