

Sedimentary instabilities associated with cryospheric oscillations over the Lomonosov Ridge, Arctic Ocean

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Variability of the cryosphere in Polar Regions leads to large changes in the tectonic and oceanographic settings that, in turn may influence major changes of the global climate. The Lomonosov Ridge extends across the central Arctic Ocean and constitutes a double-sided passive continental margin, seismologically inactive according to the earthquake catalogue of the International Seismological Centre (ISC). Detailed interpretation of the sparse available sub-bottom profiles in the area shows, however, the occurrence of mass transport deposits (MTDs). These MTDs are represented as transparent to semi-transparent acoustic bodies in the upper 50 m of the sedimentary record. The most recently deposited MTDs are concentrated along the central Lomonosov Ridge, adjacent to areas where the crest is <1000 m deep. The shallowest areas are here characterised by the presence of an acoustically transparent unit with similar facies as the MTDs, which previously has been interpreted as reworked sediments due to grounding ice. This layer is thinner at the central Lomonosov Ridge (~8 m) than close to the Siberian margin (~24 m), where it is also covered by a thicker acoustically stratified layer (~4 vs ~12 m). At the Siberian margin, vertical structures of about 8 m height and with a diameter of <200 m are referred to as pagodas. They may be related to vertical fluid migration associated with gas hydrates or permafrost destabilisation. The waxing and waning ice shelves and deep drafting icebergs over the Arctic Ocean could generate MTDs in the vicinity of grounding-ice areas and features such as pagodas may form after the retreat of thick ice.