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Chronostratigraphy of glaciomarine sediments off the West Greenland Shelf: a key to the understanding of the Quaternary evolution of the Greenland ice sheet

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Six gravity cores (GC) and four sea-floor drill rig (MeBo) cores from water depths of ~1800–1400 m have been successfully collected off the outer Disko Bay fan in eastern Central Baffin Bay during the research expedition MSM111 in 2022. These sediment cores provide an up to 125 m long (MeBo 14, 20 and 23) record potentially reflecting the late- and mid-Pleistocene dynamics of the Western Greenland ice sheet. Besides the presence of a few turbiditic sequences a continuous sedimentation is well supported by the parasound seismostratigraphy as well as by lithostratigraphic log correlation based on X-ray Fluorescence (XRF) and magnetic susceptibility (MS). Establishing a chronostratigraphy of the Baffin Bay glaciomarine sediments is, however, challenging as e.g., carbonate dissolution impedes reliable foraminiferal $\delta^{18}O$ stratigraphy.

Here, we present our preliminary chronostratigraphic framework established by combining three stratigraphic tools: radiocarbon ages, relative paleointensity (RPI), and characteristic basin-wide detrital carbonate layers (BBDCs). BBDCs represent periods of elevated terrigenous deposition in response to increased meltwater discharge that can be well identified by XRF Ca/Ti. The GC 12&22 and MeBo 14&20 cores contain rhythmic alterations between sandy-rich detrital carbonate layers and clayish layers, which are clearly represented by Ca/Ti and MS data. Intriguingly, these cyclic alterations also display significant correlation with marine isotope stages (MIS), where higher Ca/Ti and MS values correspond to warmer periods. We thus estimated that our 125-m composite core lasts until MIS 16 or ~700 ka. This long duration is also partly supported by our RPI data from MeBo 20&23. Nevertheless, two major difficulties were encountered: (1) RPI data of GC 24&21 do not reveal an unambiguous match with global RPI reference stacks and/or regionally established RPI records, probably due to condensed sedimentation of these two deeper gravity cores; and (2) recurring BBDCs of the studied cores can be interpreted as high-frequency events reflecting the intrinsic dynamics of the North American Arctic-ice sheet complex, or, alternatively as glacial-interglacial cycles. In order to solve the current chronostratigraphy controversy between a Late Pleistocene age or of deeper mid-Pleistocene age, further carbon-14 ages from the condensed GC24 and collect RPI data from the more expanded MeBo 14 will be obtained.