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Radiocarbon dating Arctic deep marine sediment to refine the usage of Mn pattern as a stratigraphic tool

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The distinctive pattern of Mn content in Arctic deep marine sediment has been used as a proxy to indicate glacial-interglacial cyclicity (Löwemark et al., 2014). As has been observed in many sediment cores, Mn peaks correspond to warm interglacial periods. In order to improve the preciseness of Mn pattern as a proxy, we collected the foraminifera Neogloboquadrina pachyderma (sinistral) from brownish, Mn-rich layers, and performed radiocarbon dating on selected cores collected during the LOMROG07, LOMROG09 and LOMROG12 expeditions. Additional cores form the YMER and AO96 expeditions are also included. Based on our general understanding of the Mn system in the Arctic Ocean, we predicted a Mn pattern with a high peak in the uppermost core top, representing the Holocene. This Holocene peak in Mn is separated from the underlying warm period MIS 3 by a Mn-poor interval also characterized by a drop in Ca. This Mn and Ca poor interval reperesents MIS 2 and the LGM. Older warm periods, such as MIS 3, 5, 7 etc will display a similar pattern with distinct Mn peaks, separated by Mn minima representing cold iperiods For example, the MIS 5 sometimes shown a distinct pattern with three Mn peaks representing MIS 5a, 5c and 5e.
However, there are still some limitations in the applicability of Mn stratigraphy, such as the remobilization of the Mn layer and the core-top loss during coring.
We performed AMS carbon 14 dating on more than 10 cores, and the result revealed several cases of lost core tops, leading to depletion or complete loss of the Holocene interval. In several cores, our AMS dating revealed a hiatus in the MIS2 interval. The complete lack of MIS2 sediment likely is the result of extremely slow sedimentation rate due to severe sea ice conditions, while places with records of LGM may be the result of polynyas within the sea ice, or certain circulation pattern. Consequently, although Mn pattern can be used as a preliminary tool to identify glacial-interglacial cycles, the loss core tops and glacial hiatuses limits the usage and accuracy of the correlation of Mn stratigraphies. Therefore, additional radiocarbon dating can refine our understanding of the Mn patterns in Arctic marine sediment and help to make it a better proxy for both paleoenvironmental reconstructions and for the age models. Further study on the cause of hiatus often encountered in the LGM interval is necessary to ensure the usefulness of Mn stratigraphy.