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Towards the development of a consensual chronostratigraphy for Arctic Ocean sedimentary records

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Deciphering Arctic paleoceanograpy and paleoclimate, and linking it to global marine and atmospheric records is much needed for comprehending the Earth's climate history. However, this task is hampered by multiple problems with dating Arctic Ocean sedimentary records related notably to low and highly variable sedimentation rates, scarce and discontinuous biogenic proxies due to low productivity and/or poor preservation, and difficulties correlating regional records to global stacks (e.g., paleomagnetic). Despite recent advances in developing an Arctic Ocean sedimentary stratigraphy, and attempts at setting radiometric benchmark ages of respectively $\sim$ 300 and $\sim$ 150 ka, based on the final decay of 230Th and 231Pa excesses (Thxs, Paxs) (Not et al., 2008), consensual age models are still missing, preventing reliable integration of Arctic records in a global paleoclimatic scheme. Here, we intend to illustrate these issues by comparing consistent Thxs-Paxs chronostratigraphic records from the Mendeleev-Alpha and Lomonosov ridges with the currently used age model based on climatostratigraphic interpretation of sedimentary records (e.g., Polyak et al., 2009; Stein et al., 2010). Data used were collected from the 2005 HOTRAX core MC-11 (northern Mendeleev Ridge) and the 2014 Polarstern core PS87-30 (Lomonosov Ridge). Total collapse depths of Thxs and Paxs are observed by a factor of $\sim$ 3 deeper in core PS87-30 vs core MC-11, indicating average sedimentation rates $\sim$ 3 times higher at the Lomonosov Ridge site. Litho-biostratigraphic markers, such as foraminiferal peaks and manganese-enriched layers, show a similar pattern, with their occurrence $\sim$ 3 times deeper in core PS87-30 than in core MC-11. These very consistent downcore features highlight a gaping difference between the benchmark ages assigned to the total decay of Paxs and Thxs and the current age model based on climatostratigraphic approach involving significantly higher sedimentation rates. This discrepancy begs for its in-depth investigation that would potentially result in a development of the consensual chronostratigraphy for Quaternary Arctic Ocean sediments, critical for integrating the Arctic into global paleoclimatic history.