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Characteristics of sediment mercury methylation in the East Siberian Sea and Beaufort Sea, Arctic Ocean

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The extent of submarine permafrost on the Arctic shelves has been declining in recent decades due to global climate change; however, the influence of submarine permafrost thawing on methylmercury (MeHg) production in surface sediment has been understudied to date. In this context, the total Hg (THg) and MeHg concentrations and conventional sediment properties in the shelf and slope sites of the East Siberian Sea were observed to identify the seasonal permafrost thawing effect on the methylation of Hg(II)in sediment overlying discontinuous permafrost zones. The top (0–2 cm) of the sediment was collected from the 12 sites on the East Siberian Shelf and Slope on the icebreaker R/V Araon in August 2019. THg in surface sediment was higher in the slope than in shelf sites due to the hydrodynamic sorting of fine particles enriched with Hg and manganese and iron oxides. In contrast, the highest MeHg/THg ratio in surface sediment was noted at 50–60 m isobaths of the shelf sites, identified as a continuous–discontinuous transition zone. The same sediment also showed greater fractions of labile humic in the pore water and organic sulfur content in sediment than in the surrounding sites. This suggests that a copious supply of dissolved organic matter in the active layer of the transition zone between continuous and discontinuous permafrost may promote the *in situ* methylation rate of Hg(II). To confirm this hypothesis in the Beaufort Sea, thirteen 50 cm sediment cores were collected in August to September 2022 on the R/V Araon. Similar to in the East Siberian Sea, THg in surface sediment tends to increase toward the slope. The highest MeHg/THg ratio in surface sediment was noted at 50–60 m isobaths, presumed to be a continuous–discontinuous permafrost transition zone that was confirmed by the observation of pingos, a periglacial landform formed through processes of freezing and thawing of sediment pore water. We are currently analyzing km values in each sediment core to identify whether the MeHg production rate increases in the sediment overlying the permafrost transition zone.