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Distributions of *in situ* photoproduction rate constants and dissolved gaseous mercury concentrations in surface seawater of Beaufort Sea, Arctic Ocean

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Evasion of dissolved gaseous mercury (DGM) constitutes a major sink of mercury (Hg) in the Arctic Ocean. Although distributions of DGM in relation to seawater properties in the Arctic Ocean have been reported in a few studies, those of photoreduction rate constant (kr) of Hg(II) have not been investigated; thus, there are limitations in the prediction of the potential changes in the DGM production and evasion rates induced by climate change. To understand the linkage between seawater properties and DGM production rate (and concentrations) in the Arctic Ocean, the DGM concentration and kr of seawater, which are greatly affected by Mackenzie River plume and permafrost thawing, were measured in the southern Beaufort Sea. Seawater samples were collected using a rosette sampling system equipped with acid-cleaned 10 L Niskin bottles from 15 stations in August and September 2022 on the R/V Araon. The kr values and DGM concentrations were immediately measured on board during the cruise. The concentrations of total Hg (THg), dissolved organic carbon and inorganic nutrients, and other ancillary parameters, including excitation emission matrix fluorescence and inorganic nutrient concentrations, were later measured in the Trace Metal Biogeochemistry Laboratory at the Gwangju Institute of Science and Technology (GIST). The concentrations of THg and DGM in the surface layer were higher in the western than the eastern transect, which suggests that both Hg species could be transported following the eastward coastal current from the Bering Sea. On the contrary, kr tends to be higher in seawater with higher proportion of autochthonous dissolved organic matter without strong correlation with salinity. Overall results suggest that sources of DGM in the Beauford Sea surface layer include lateral transport from Pacific Ocean and *in situ* photoproduction positively affected by algal-decomposed dissolved organic matter.