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Measurement of suspended particulate matter under near-inertial drifiting sea ice

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This study has attempted to investigate the dynamic behavior of suspended particulate matters (SPM) under the sea ice. Main objectives are (1) to report the role of rapidly-melting summer sea ice as a new source of SPM, and (2) to estimate the vertical and temporal variation in size and settling flux of SPM under sea ice using novel holographic and acoustic techniques.
Mooring observation of hydrography, hydrodynamics and suspended particles distribution under a drifting sea ice revealed the mixing and entrainment pattern in the upper mixed layer of the marginal ice zone. The ice floe where the mooring system was installed drifted as near-inertial motion with approximately 12-h cycle. Due to the high melt rates of the sea ice during the summertime, a large amount of particulate matters embedded in the sea ice were released into the underlying water column. Using the mooring package, an on-ice experiment was performed to estimate the vertical and temporal variation in SPM. SPM concentration under the sea ice fluctuated in the range of 60–100 mg/l during the rapidly-melting summertime. Results suggest that combined effects of the increase in insolation, ice algal production, and the decrease in ice and snow cover and multi-year sea ice extent could create favorable conditions for enhancing the concentration and flux of SPM during the rapidly-melting summer season. With the thinning and retreat trend of Arctic sea ice, it is expected that under-ice water column will in future receive a much higher rate of discharge of particulate matters from melting sea ice.