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Atmospheric mercury (Hg(0)) concentrations and Hg(0) fluxes in the Sea of Japan and the Okhotsk Sea in fall 2019

Evgeny Lopatnikov¹, Viktor Kalinchuk¹, Anatoly Astakhov¹, Yang Gang², and Jianjun Zou²

¹V.I.Ill'ichev Pacific Oceanological Institute of Far Eastern Branch of Russian Academy of Sciences, Vladivostok, Russia (pacific@poi.dvo.ru)

²First Institute of Oceanography China, Qingdao, China (guojichu@fio.org.cn)

Continuous measurements of gaseous elemental mercury (Hg(0)) in the marine boundary layer (MBL) and Hg(0) fluxes were conducted in the Sea of Japan and the Sea of Okhotsk from September 7 to October 17, 2019. All Hg(0) measurements were carried out using two RA-915M mercury analysers (Lumex LLC, Russia). Hg(0) concentrations in the air were measured at two levels (about 2 m and 20 m above the sea surface) with a time resolution of 30 minutes. Hg(0) fluxes were measured at five sample stations using a dynamic flux chamber.

During the cruise Hg(0) concentrations varied in the range from 0,47 ng/m³ to 1,55 ng/m³, and from 0,31 ng/m³ to 2,71 ng/m³ with medians of 0,92 ng/m³ for 2 m and 20 m, respectively. Atmospheric Hg(0) concentrations in measurements sites were strongly depended on the regions from where air masses came to the study areas. As a result of the Concentration Weighted Trajectory (CWT) analysis we established 2 regions that influenced the Hg(0) concentrations during the cruise: the Northeast China with the Yellow Sea region and the Kurile Islands sector of the Pacific Ocean. The arrival of air masses from China and the Yellow Sea region caused an increase in Hg(0) concentrations in the air in the Sea of Japan and the Sea of Okhotsk. Elevated concentrations were also observed in the Sea of Okhotsk during the periods air masses came from the Kurile Islands sector of the Pacific Ocean.

Hg(0) fluxes were measured at 3 stations in the Sea of Japan and at 2 stations in the Sea of Okhotsk. The values ranged from 0,57 ng/m²/h to 1,55 ng/m²/h, with median value of 1,32 ng/m²/h. A positive relationships between Hg(0) flux and air and water temperature were observed.

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