

Pole-to-Pole observations of atmospheric mercury in the marine boundary layer over the Pacific and the Southern Ocean

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Anthropogenic emission is the major source of the atmospheric mercury (Hg) which ends up being deposited on the surface and converted to toxic methylated Hg. In the food chain of the marine ecosystem this accumulates gradually and may critically affect final consumer, human beings. Covering 70% of the Earth surface, Hg concentration and species in the marine boundary layer (MBL) give us an idea of how much Hg ends up being deposited on the ocean surface. Automated analyzing system for Hg species were mounted onboard Araon, the first Korean Ice-breaking research vessel, and surveyed from the Arctic Ocean to the Ross Sea and the Amundsen Sea in the Southern Ocean along the meridional cruise transect, starting from 2011. Although the instrument can measure 3 different species of gaseous elemental Hg (GEM), reactive gaseous Hg (RGM), and particle bounded Hg (PBM), we mainly focus here on total gaseous Hg (TGM) which is composed of primarily GEM with trace amount of RGM. TGM in the MBL shows strong north-south gradient along the meridional cruise transect with higher concentrations in the Northern Hemisphere indicating the strong impact of anthropogenic emission. Zonal separation of the TGM distribution is clearly visible in the northern hemisphere (NH) and gradual decrease in the southern hemisphere (SH), supporting significant emission by human activities. To our surprise, TGM in the Amundsen Sea and the Ross Sea which are located in the far southern latitudes was approximately 0.4 ng/m^3 larger than that in the mid-latitudes of the SH. In case of the Arctic Ocean, TGM was relative lower than that in the mid-latitudes of the NH, which is opposite to the meridional distribution in the SH.

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