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Mercury in atmospheric precipitation of Eastern Siberia: seasonal and interannual variability of concentrations and fluxes

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The samples of atmospheric precipitation were taken at the monitoring site on the roof of the Institute for Water and Environmental Problems, located within Barnaul city, at the height of 25 meters. Totally 578 samples of unfiltered atmospheric precipitation were analyzed. All sample preparation and analysis procedures were performed in a "clean room" using purified reagents to avoid pollution. The total mercury concentrations were determined in unfiltered samples by US EPA method 1631 using the analyzer "Mercur DUO Plus" (Analytik Jena, Germany). The limit of detection was 0.4 ng/L.

The widest range of Hg concentrations was observed in snow, the most narrow – in the rain. Comparison of average annual volume-weighted concentrations (VWC) demonstrated that minimum Hg concentrations were detected in 2015/2016; the maximum one – in 2018/19. Annual deposition fluxes ranged from 2.3 to 5.1 $\mu\text{g}/\text{m}^2$; the average value for 5 years was 3.8 $\mu\text{g}/\text{m}^2$. Average VWCs of Hg in atmospheric precipitation of Barnaul are on a comparable level with other urbanized areas of the world. However, annual Hg fluxes are lower than in other regions. There is a high positive correlation (0.87) of Hg fluxes with the amount of precipitation in cold periods, which indicates the constant pollution, primarily the emissions from coal combustion, one of the largest sources of Hg released into the atmosphere. In the warm periods, the correlation coefficient is 0.24 due to a wide variety of sources of mercury in these periods.

Keywords: mercury; atmospheric wet precipitation; deposition fluxes.