



Long-term continuous monitoring of mercury in the Russian arctic: winter increase of atmospheric mercury depletion events

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Among pollutants mercury is a major environmental concern due to its ecological hazard. The mercury can reside in the atmosphere for a long time high, and it is a reason of its global propagation in the Northern Hemisphere and elevated mercury concentrations are reported in the Arctic environment. First time, in 1995, the effect of atmospheric mercury depletion in the troposphere was found at the Canadian station Alert. This phenomenon (called the Atmospheric Mercury Depletion Event - AMDE) is observed during April-June, when the Polar sunrise starts till the end of the snowmelt. The same effect was reported for other polar stations situated to the north of 60° N. Long-term continuous monitoring of gaseous elemental mercury in the surface air at the polar station Amderma (69,720N; 61,620E) using the analyzer Tekran 2537A has been conducted from Jun 2001 to date. Individual measurements were collected every thirty minutes. It has been shown, that during eleven years of observations the AMDEs were observed every year, from the end of March till early June. For the winter period (Dec-Feb) these events of the atmospheric mercury depletion were registered from 2010 to 2013, which had not been observed before. A large number of hours during the day, when the concentration of mercury was recorded at level of below 1 ng/m³, was registered during Dec-Feb. The sun declination above the horizon is negative, and solar activity is still not enough to trigger the photochemical reactions. The these last 3 years confirmed a tendency to displacement of AMDEs to the winter season, which leads to an additional factor entry of mercury in various biological objects, due to the additional deposition of various forms of mercury on the snowpack. At the same time, especially during the winter seasons, there is a substantial increase (up to 8 times) of AMDEs, compared with the previous years. In particular, in winter 2013 the maximum number of AMDs reached 31 cases. The explanation can be the following: the withdrawal of elemental mercury from the atmosphere may be caused by deposition of mercury on marine aerosol particles. Marine aerosol concentration increases in the case of exemption from coastal ice (Kara Sea) and, simultaneously, at the time when the northern wind direction is dominating. When the southern wind direction is prevailing, the deposition of mercury on anthropogenic aerosols transported from the middle latitudes is taken place.

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