Geophysical Research Abstracts
Vol. 21, EGU2019-558, 2019
EGU General Assembly 2019

Multiyear annual and seasonal variation of Dry Deposition Fluxes of airborne sulphur and nitrogen compounds and their contribution into the total atmospheric deposition at natural forest catchment based on long term experimental observations

Ekaterina S. Zhigacheva (1,2), Sergey A. Gromov (1,3), Hiroyuki Sase (4), Masaaki Takahashi (4), Tsuyoshi Ohizumi (4,5)

(1) Yu.A.Izrael' Institute of Global Climate and Ecology (IGCE), Environmental Pollution Monitoring Division, Moscow, Russian Federation (kosjatko@gmail.com), (2) Russian State Social University, Moscow, Russian Federation, (3) Institute of Geography RAS, Moscow, Russian Federation, (4) Asia Center for Air Pollution Research (ACAP), Niigata, Japan, (5) Niigata Prefectural Institute of Public Health and Environmental Sciences, Niigata, Japan

Dry deposition plays a significant role in the total deposition of atmospheric pollutants. In this study we estimated the Dry Deposition Fluxes (DDF) of gaseous and particulate sulphur and nitrogen compounds for the small catchment at Russian Far East. The river watershed territory is of a weakly disturbed state almost without influence of human activity.

Deposition velocities were calculated for the period from 2005 to 2017 using inferential method been realized in Microsoft Excel macro file by EANET Network Center (ACAP). The most of the Komarovka river catchment area is covered with the broadleaf forest vegetation, and wide open places are practically absent. Therefore, the catchment area was assumed to be 100% covered by forests to do not use separate calculations for grass cover areas.

There were two options been used for calculations taking into account the availability of meteorological data with different time resolution at monitoring station: daily averages (adjusted version of the MS Excel macro file) and time-distributed values on hourly basis with available 1-hour solar radiation measurements. The comparison of the results demonstrates that "daily-based" values are higher than "hourly-based" ones while high correlation of them is maintained. That can be caused both by excessive averaging with the use of "daily-based" data, and by a more coarse adaptation of the calculation method in Macros file for those data.

The results of evaluations show that gaseous compounds make the major contribution into the DDF of sulfur or nitrogen: the gross input of SO_2 is about 75% of total SOx while for nitrogen compounds it's even higher such as about 77% of ammonia in reduced N, and up to 80% of NO_2 in oxidized N. The inter-annual and seasonal variations are presented for period of 2005-2015.

Visible trends of DDF can be distinguished for some compounds. The Mann-Kendall test applied for annual DDF values disclosed the declining trends of sulfates and particulate ammonium with significance level α = 0.01 , and of nitrates and gaseous sulfur dioxide with significance level α = 0.05. By testing the air concentrations the trend can be found for sulfates only (α = 0.05).

Comparison of contributions to the total deposition fluxes of S and N compounds shows that wet deposition exceeds dry one in the most of years, sometimes by several times. But there were the periods when dry deposition was equal or higher than wet one: in 2011 for sulfur compounds, in 2014 and 2010 for nitrogen oxides, 2007 and 2011 for reduced N compounds.