



Non-photochemical sink of atmospheric isoprene: sorption by underlying surface

V. Isidorov (1), V. Povarov (2) and A. Stepanov (2)

(1) Institute of Chemistry, BiaŁystok University, Poland (isidorov@uwb.edu.pl/ Fax: +48 85 747 01 13)

(2) Chemical Department of St. Petersburg University, St. Petersburg, Russia

Isoprene (C_5H_8) is one of the compounds which emit into atmosphere the biggest amount of organic carbon. Its global emission is estimated to be about 500 TgC/yr. In atmosphere, isoprene is easily oxidized in reactions initiated by ozone, HO and NO_3 radicals. Nowadays these reactions are considered to be the only sink of isoprene from the atmosphere. In the present communication the cited data proves the existence of irreversible non-photochemical sink of isoprene onto underlying surface.

In the experiments, intact fragments of soil from forests, meadows, and swamps with living plants and leaf litter, as well as arable soils were put into a chamber of volume 16 dm^3 . The changing content of isoprene in the chamber was determined by GC-FID method. The initial concentration of isoprene being $0.145 \mu\text{g}/\text{dm}^3$, rate constant of its decrease from the gas phase of the chamber was $(30.6-715) \cdot 10^{-5} \text{ s}^{-1}$. Its deposition rate on the soil covered with leaf litter and moss is estimated to be $(0.6-15.3) \cdot 10^{-4} \text{ m/s}$. According to our estimation, isoprene flow on the underlying surface under forest canopy can be $120-3300 \mu\text{g}/(\text{m}^2 \cdot \text{day})$.

A one-dimensional model of isoprene distribution under forest canopy has been worked out. In the model it has been accepted that the rate constant of pseudo-first order of gas phase oxidation C_5H_8 is 10^{-4} s^{-1} , its emission rate by arboreal plants is $10 \mu\text{g}/(\text{m}^2 \cdot \text{s})$, coefficient of turbulent diffusion under forest canopy is $0.05 \text{ m}^2/\text{s}$. According to our calculations, the contribution of isoprene absorption by underlying surface can be 2-25% of phyto-genous emission of this hydrocarbon.