



Hydrocarbon gases in soils of geodynamically active zone

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Soil organic matter (SOM) is wide category that includes many different organic compounds. It is not only remains of living organisms, but also compounds created by soil biota. Moreover, SOM includes both solid substances and hydrocarbon gases (HCG), that can be food and products of vital activity of soil organisms. These substances can come from different components of landscape. Emission of some hydrocarbon gases from the soil surface is well studied, because of their ecological importance (for greenhouse effect). But HCG income from lithosphere is less investigated. In current work we present the investigation of hydrocarbon gases content on the territory which is geologically unstable and where we expect hydrocarbon gases ascending flow. This study was supported by Russian Science Foundation (project 14-17-00193)

Samples were taken from automorphic soils of two sites in 2016-2017. «Istra» site is situated in geodynamically active zone (Istra morphostructural node). Such Earth crust structure usually makes favourable conditions for hydrocarbon gases to reach the soil. Soil sampling is located on the automorphic position with indigenous vegetation. «Zvenigorod» site is in 24 km of «Istra» and is geomorphologically and botanically similar, but more geologically stable.

Samples were taken 4 times a year from humus horizon, middle one and parent material. From every horizon we have taken 3 samples. In laboratory conditions they were degased. The gas was analyzed with gas chromatography. Main results and conclusions:

1. Seasonal and profile distribution of HCG on two sites are different.
2. the main difference is following: on the territory of morphostructural node all investigated HCG are present in the coldest season; the amount of all gases increases downwards. For example, propane content increases from 0,4 ppmv to 6-8 ppmv, n-butane – from 0,2 ppmv to 1,5 ppmv, ethane – from 0,1 ppmv to 1,9 ppmv. In other seasons all HCG are either absent, or present only in the upper horizons on both sites.
3. We suppose that all investigated gases have two main sources: biotic ant emanation. Methane comes from both sources on both areas. Ethylene is mainly biogenic. Profile distribution and seasonal dynamics of n-butane and propane look like these gases come from deeper layers of lithosphere. On background site “Zvenigorod” they are identified only in upper soil horizons, which is considered to show their biogenic nature, while in “Istra” site they are found in deeper horizons. Ethane is found rarely, but its distribution seems to be similar to propane and n-butane.

We can conclude that seasonal and profile distribution of hydrocarbon gases on two areas are different. Profile distribution of hydrocarbon gases shows that most of them come from biogenic source, but some properties of geodynamically unstable area soils show the emanational effect.