



Hydrocarbon status of soils on the territory of kerosene shales deposit

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Soil organic matter (SOM) turnover is complicated multistage process. That is why investigating SOM requires a complex evaluation of all its components. It is well-known that SOM components are not only generated in soils, but also come from other parts of landscape. Presence of hydrocarbon deposits, even at great depth, can affect the content of some hydrocarbon components of SOM in soils. For example, emanations of hydrocarbon gases can reach the surface, and this information is used for geological research. However, investigating this issue is developed only for oil and gas deposits and presupposed evaluating of only gaseous components.

Hydrocarbon status (HCS) conception says that long-term existence of hydrocarbon resources deposit can lead to hydrocarbon anomalies formation in subsoil space. This anomalies can include not only gaseous, but also liquid and solid compounds. Complex study of HCS of soils has shown differences in bitumoids, solid alkanes and polycyclic aromatic hydrocarbons (PAHs) contents between background and deposit territories.

In current study we consider HCS of soils on the territory of oil shale deposit (Samara oblast', Russia). This type of mineral resource is less common than oil and gas, and its effect on soils is hardly investigated.

Soils of three geomorphical positions were investigated within the deposit, also one background point was taken in 5 km distance from the deposit. Soil samples were analyzed for hydrocarbon gases, bitumoids and PAHs. The study was supported by Russian Science Foundation (Project №14-17-00193 «Hydrocarbon status of soils in landscapes»).

Background soil has very low content of solid hydrocarbons. The sum of bitumoids is lower than detection limit of our methods. PAH contents are insignificant. Distribution of hydrocarbon gases is following: methane and ethylene prevail, ethane, propane and n-butane are identified in trace quantities only in upper horizon. Such distribution is typical for background territories.

The sum of hydrocarbon gases in deposit soils is less than on the background (10,5 and 61,9 ppmv), but it is mainly due to methane contents. Quantities of heavy gases is less, but they are found in both upper and lower horizons. Bitumoid content is higher than on the background (from 5 to 9 ppm). Light to heavy compounds ratio varies from 2,8 to 6,3 with maximum in the center of soil profile.

Quantity of PAHs on deposit soils is also higher than on the background. We have identified 7 PAHs: fluorene, naphthalene homologous, phenanthrene, chrysene, anthracene, pyrene, benz[a]anthracene. We have counted some ratios that are described in literature (heavy PAHs to light ones, phenanthrene to anthracene, benz[a]anthracene to the sum of benz[a]anthracene and chrysene).

In general, HCS of soils of shale deposit and nearby territories is different from background HCS. On background territories we identify high contents of the lightest gaseous components of HCS. Heavier and solid components are either missed, or present in trace quantities. On the territory of the deposit bitumoids and PAH content is higher. Their quantities and profile distribution confirm the effect of emanation processes.