

Geochemical characteristics of brackish waters and gases of Sakhalin Island (Russia)

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Complex isotope geochemical researches of fluids of the Sinegorsky Spa mineral waters, localized in the southern part of Sakhalin Island were conducted. The alkali carbonated waters ($\text{HCO}_3\text{-Na}$) with TDS - 10,5–23,1 g/l, high contents of B (583 mg/l), Br (10 mg/l) and I (12 mg/l) is overspread in Mesozoic rocks at the depth from 50 to 500 m. The investigations of the water and gases allow us to draw the following conclusions: i) water isotopic composition ($\delta^{18}\text{O}$ from +4.6 to +5.7‰; δD from -18.3 to -19.9‰ V-SMOW) indicates its metamorphic genesis. The tritium concentrations of the surface water is 11 TU, while deep $\text{HCO}_3\text{-Na}$ mineral water have less then detection limit (<0,3 TU); ii) major components of bubbling gases are CO_2 (81-98 vol%), CH_4 (0,5-13 vol%) and N_2 (0,5-10 vol%). Carbon isotopic composition of CO_2 (-30.6‰, VPDB), CH_4 (-27,5‰, VPDB) and for the first time the executed definitions $\delta^2\text{H}_{(\text{CH}_4)}$ (-84,2 ‰ VPDB) in associated gases testifies in favor of the thermogene nature of methane; iii) the brackish waters aquifer of $\text{HCO}_3\text{-Na}$ waters relates to the transformation of organic matter in the host rocks. Data on content and behavior of rare-earth elements show that the chemical composition of waters is caused by both litologo-geochemical structure of the water-bearings rocks, and processes of mixture with meteoric waters.

A soil radon monitoring was carried out for the first time in order to study the correlation between radon anomalies and the seismic activity of the region. A decrease of water conductivity and low soil radon emission (0-150 Bq/m³) have been being observed over 3 months before seismic event wich took place at 3.07.2015 21:07 UTC. Soil radon emission and water conductivity have drastically grown 41 hours after the earthquake. During next 14 days soil radon emmanations reach up 620 kBq/m³.

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