Poster / 718

Composition of pore waters of lake baikal bottom sediments sampled at the Gorevoy Utes hydrocarbon fluid seepage area

Author(s): Ekaterina Kazak[1]

Co-author(s): Yana Sorokoumova [1] ; Grigorii Akhmanov [1]

[1] *Moscow State University*

Corresponding Author(s): kanigu@mail.ru, akhmanov@geol.msu.ru, yana1992@gmail.com

International expedition of the Class@Baikal project took place on the Lake Baikal in 2018; bottom sediments and surface waters were sampled within the Gorevoy Utes hydrocarbon seepage area. The pH and Eh of the "bottom sediments pore waters" system were measured immediately after opening the sampler. Then, the composition of bottom sediments, surface and pore waters were analyzed in the laboratory.

The Lake Baikal surface water has bicarbonatecalcium composition with low salinity (up to 125 mg/l). Clay minerals, quartz, plagioclase, K-feldspar, pyrite, gypsum are found composing the bottom sediments. Carbonate minerals are not detected. The sediment cation exchange capacity is up to 32 mg-eq/100g and depends on the clay mineral content and composition.

The pH changes with depth from 7.06 to 5.5 and is related to increase in CO_2. Eh decreases with depth due to limited oxygen supply from lake waters and oxidation of organic and inorganic components of the sediments (diatoms, CH4, etc.).

The studied pore water macro-component composition differs radically from the surface water composition and pore waters of areas not related to intensive fluid-discharge. It is characterized by high salinity (up to 2 g/l), abundant sulfates, calcium, and magnesium. Sulfate reduction is almost totally missing in these sediments. In areas without fluid seepage pore water composition is bicarbonatecalcium and inherits the lake's surface water composition. Low mineralization (less than 150 mg/l) is characteristic for the pore waters as well as sulfates are virtually absent due to biological consumption for organic matter oxidation (Pogodaeva et al., 2017).

Isotopic composition of the pore waters indicates their meteogenic origin (δ2HVSMOW from -127‰ to -125.5‰, δ18OVSMOW from -16.3‰ to -17.7‰). In pore solution a presence of bromine (to 0.26 mg/l), boron (to 1.1 mg/l), iodine (0.004 mg/l), abundant rare-earth elements (REE) (over 400 µg/l) are found. The light REE excesses over heavy for all pore water samples and positive europium anomaly is determined in some.

Probably, deep ground-waters discharge together with hydrocarbon fluids through the sediments in the Gorevoy Utes, forming anomalous composition of pore water. It is resulted also in unusual authigenic gypsum formation in bottom sediments. Presence of gypsum was forecasted with thermodynamic calculations in PHREEQC software and, then, confirmed by XRD analysis of the sediments (up to 5 wt.%).

The anomalous pore water composition in the areas of gas-hydrate formation and oil seeps is known (Pogodaeva et al., 2017). However, pore water with high salinity (up to 2 g/l) is found in the study area for the first time.

References

1. Pogodaeva, T.V., Lopatina I.N., Khlystov O.M., Egorov A.V., Zemskaya, T.I. Background compostion of pore waters in Lake Bailak bottom sediments Journal of Great Lakes Research – 2017. – V. 43. – p. 1030–1043.