Fractionation of Rare-earth elements during karst groundwater formation at Lozovyj ridge, Russian Far East

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Experiment on the leaching of water-bearing rocks was conducted to determine the characteristics of the fractionation of rare earth elements in groundwater of karst massifs. The results are shown in figure below.

Result of water-rock interaction shows a rapid saturation of the solution with most REEs on first stages and then gradual reduction of most REE except Eu. More noticeable decrease in concentrations of LREE is observed leading to a slight tilt of the profile towards the accumulation of HREE. This is due to a better migration ability of heavy REE, because of their smaller ion radius [1, 2]. Equilibrium between water and rock is being established after a certain time, wherein the salinity and pH value can be compared with one's in the natural spring. However, the final REE distribution profile is somewhat different from the natural one, because the final experiment's Eh total value turned out lower, causing increasing depletion of LREE and, accordingly, a greater profile inclination towards accumulation of HREE. Thus, it was confirmed earlier suggestion of the authors that the REEs in groundwater can provide an excellent tracer of their host rocks and pH-Eh conditions [3].

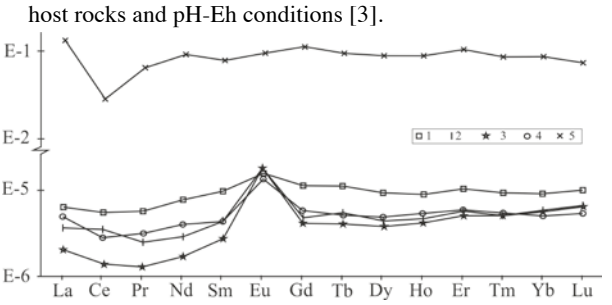

Figure 1: NASC-normalized patterns of REE in groundwater, 2, 236 hours after experiment start; 4 – natural spring; 5 – water-bearing rock. Ordinate axis is logarithmic

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[1] Bau (1991) *Chemical geology* **93**, 219-230. [2] Sholkovitz (1995) *Aquatic geochemistry* **1**, 1-34. [3] Bragin *et al*. (2016) *Acta geologica sinica* **90**, 276-284.