

Fate of elements in marine systems: evidence from salt lake sediments

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Southern Siberia is an area of abundant Mg-Na-Cl and Mg-Na-SO₄-Cl salt lakes produced by transgression of a shallow epicontinental sea which formed in the place of a long-lasting (135 myr) deepwater basin. The lakes are of scientific interest as habitats of extremophilic biota, sources of Li and U, and a model where to study the fate of trace elements in a reduced sea basin. We analyzed Eh-pH depth profiles and major- and trace-element patterns in the lake water.

The Solenoye Lake water has pH from 6.5 to 8.5 and rather high contents of B, Br, I, Li, and Sr [1, 2]. The ecosystem includes an annually evolving microbial community dominated by cyanobacteria [1, 2]. The shallowest lake sediments are rich in organic matter and have high Sc, Se, Zr, Nb, Mo, Ag, Cd, Sn, REE, Hf, Ta, Pb, Th, and U enrichment in pore fluids (100 to 100,000 times the seawater values). Trace elements are unevenly distributed in sediments and in pore fluids. The patterns of Mn, U, and Mo are typical of organic-bearing marine sediments [3]. In addition to Eh variations and Red-Ox-Cline conditions that affect the behavior of Mn, U, and Mo in sediments and pore fluids, the redox state has a microbial control. Eh increases with depth, and U is the highest in more reduced conditions. The activity of microorganisms may be responsible for Mn, U, and Mo accumulation.

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[1] Lazareva *et al.* (2012) *J. of Surf. Invest. X-ray, Synchrotron and Neutron Techniques* **6**, 1009-1018. [2] Bryanskaya *et al.* (2016) *BMC Microbiology* **16**, 618. [3] Klinkhammer & Palmer (1991) *Geochim. et Cosmochim. Acta* **55**, 1799-1806.