Variability of biogeochemical characteristics of bottom sediments near the B.Goloustnoe seep (Lake Baikal)

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In order to assess the short-term activity, we studied the area near the methane seep B.Goloustnoe within two winter expeditions, during the ice period, and three summer expeditions. Bottom sediments in the area are saturated in methane (99.3vol.%) of mixed (biogenic + thermogenic) genesis [1]. Methane concentrations in the studied sediments reached 70 mL/L of sediments. Bottom sediments indicated fresher calcium bicarbonate waters, with salinity of up to 100 mg/L, than the water in Lake Baikal. At the same time, bicarbonate ion concentration in the surface layer was less than 1.2 mM. We have determined a temporal variability in chemical composition of pore waters and methane concentrations. Additionally, we have identified the variability in the distribution and number of hydrocarbon oxidizing aerobic and anaerobic microorganisms (HCOM). Trends in concentration profiles of bicarbonate ions consistently changed the directions, from horizontal to left and right inclined. In the surface sediment layer, sulfate ions occurred (being absent), accumulated (up to 0.15 mM), and disappeared again. The profiles of methane curves showed decrease in methane concentration in the near-surface layers of the sediments indicating its consumption. Using pmoA-gene specific primers was obtaned in surface sediments representatives of types I, II, X methanotrophs. Size of the consumption zone was inversely proportional to the methane concentration in the core. At moderate concentrations of methane in sediments, thickness of the consumption zone in the methane seep B.Goloustnoe reached 1.2 m.

These factors suggest the situation variability at this site: change, termination, and renewal of gas flows; and gas discharge is accompanied by the discharge of low-salinity waters. Underlying gas hydrates may be the source of these waters. Intensity of gas-containing fluids changes chemical environment causing fluctuations in the development of aerobic and anaerobic microorganisms.

[1] Hachikubo *et al* (2010) *Geo-Mar Lett* **30,** 321–329.

Tracing industrial atmospheric emissions using radiogenic isotopes

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Large industrial complexes are generators of large economic boost in the area where they establish themselves. But a big industry, such as an aluminium smelting complex inevitably has some environmental impact on its immediate surroundings.

Our study aims at monitoring one aspect of such impact, namely the dispersion of particulate matter in the atmosphere, and their eventual fallout on the regional level. Two radiogenic isotope systems were used in order to do so: osmium (Os) and lead (Pb). These metals were found to be present as traces in the carbon anodes, one of the main raw materials to be used in such Al-smelting industrial process. These anodes are consumed during the electrolytic process and produce CO_2 when reducing Al_2O_3 to liquid metallic Al. Large gas emissions so formed entrain some particulate matter at the stacks, despite the use of high efficiency gas and dust scrubbers.

From our results of osmium content and lead isotopic composition, the main conclusion of our study is that some of the dust generated by this type of industry does escape to the atmosphere, but seems to be falling back very close to its source (e.g. nearby the emitting chimneys) and in this specific case stays nearly completely within the boundaries of the industrial complex.

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