

Ionic and isotopic analyses of pore waters from gas hydrate-bearing sediment cores retrieved at Tatarsky trough off Sakhalin Island, Russia

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The sediment core sampling operations at Tatarsky trough were conducted as an international collaborative research project (Sakhalin Slope Gas Hydrate Project: SSGH and SSGH II) organized by scientists from Japan (Kitami Institute of Technology), Korea (Korea Polar Research Institute) and Russia (V.I. Il'ichev Pacific Oceanological Institute, FEB, RAS and P.P. Shirshov Institute of Oceanology, RAS) to study shallow gas hydrate (GH) that have accumulated off Sakhalin Island. Four GH-bearing sediment cores (1.9-3.7 m long) were retrieved from the seafloor (ca. 322 m W.D.) during the project (2012-2014). The ionic analyses of anions and cations in sediment pore waters and the isotopic analyses of hydrogen and oxygen of the pore waters were conducted to investigate geochemical feature of the GH-bearing cores and adjacent cores of them. The fact that the chloride concentration decreased with depth within the gas-saturated sediment interval of many cores suggests occurrence of ascending gas as well as water in this interval, but it remains unclear whether they ascended as gas-saturated/low-chloride water or individually. Also it is unclear that if chloride concentration gradient in the gas-saturated interval formed by diffusion or advection process. The observations of enriched δD and $\delta^{18}O$ pore water signatures in a few cores suggest that those pore waters were originated from GH dissociation since GH emits low chloride water with enriched isotopic composition when it dissociates. The finding that a lot of gas flares (hydroacoustic anomalies) were observed at the GH-bearing sites does not contradict this explanation since large quantities of gas emits when GH dissociates. However, the fact that the pore water containing low chloride in combination with depleted δD and $\delta^{18}O$ was detected at the GH-bearing interval does not fit with the forementioned interpretation but suggests complicated geochemistry at the GH-bearing sites.

Keywords: international collaborative research project; gas hydrate; pore water; ionic and isotopic analysis; Tatarsky trough