

Geochemistry of pore water at Tanegashima mud volcano

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During the R/V Hakurei-maru No.2 cruise conducted as a part of the JOGMEC geochemical survey, pore water from sediments collected at one of the Tanegashima mud volcanoes was analyzed for $\delta^{13}\text{C}$ (PDB) of dissolved CH_4 together with other chemical components, Cl^- , SO_4^{2-} , and the $\delta^{18}\text{O}$ and $\delta^2\text{H}$ (SMOW). The concentrations of CH_4 were generally higher than 100 nmol/kg. Its highest concentration (715 $\mu\text{mol/kg}$) was found in the crest core of the mud volcano with $\delta^{13}\text{C}$ values ranged around -40 permil. C_2H_6 was detected only in the pore waters collected from the crest and vicinity of the mud volcano. The $\delta^{13}\text{C}$ of CH_4 and low C_1/C_2 concentration ratios (less than 100) measured at the crest site were supporting the thermogenical production of methane. Other geochemical anomalies were also observed in the crest pore water. The concentrations of Cl^- in the pore water at this site were extremely depleted to a minimum of 350 mmol/kg. The Cl^- anomaly has not been previously reported for pore water from mud volcanoes around Japan. These results and geophysical condition in this site will support to the existence of methane hydrate. An endmember of isotopic composition of the fluid is estimated to be +12 permil for $\delta^{18}\text{O}$ and -40 permil for $\delta^2\text{H}$. From these results we conclude that the most likely process to reduce pore water salinity is primarily the mixing of clay mineral dehydration water with seawater. The thermogenic methane found in the crest pore waters of the Tanegashima mud volcano may be brought from the depths of sediments due to the migration of fluid evolved by mineral the dehydration process.