Time-series analysis of pore water from shallow gas hydrate area on the Umitaka Spur, Japan Sea

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Active gas venting (seepage) from the seafloor and outcropping of massive gas hydrate have been observed on the Umitaka Spur in the eastern margin of the Japan Sea. Submersible observation revealed that the strength and location of gas venting had changed within a few days, geochemical environment near gas venting including gas hydrate might have also changed within a short period compared to geological time scale. We have deployed a long-term osmotic fluid sampler (OsmoSampler) near the gas venting site on the Umitaka Spur from September 2013 to March 2014 (160 days, NT13-E02 and NT14-E03 cruises) and collected pore waters continuously to examine the potential changes of pore water geochemistry and the impacts on the near-surface environments.
Concentrations of dissolved ions change shortly, for 3~5 days, through the entire sampling period, which are controlled by the input of saline water from gas hydrate formation and of fresh water from gas hydrate dissociation. Gas venting was observed 10 m away from OsmoSampler, however, concentrations of methane dissolved in pore water were low during the first 20 days and occasional high methane concentrations were observed only from the 20th to 40th day. Rapid gas hydrate formation caused by high gas flux might plug the path delivering gas-rich fluids to the seafloor, contrary, the reduced gas flux (venting) caused the dissociation of gas hydrate. After the 70th day on, methane concentration was constant at low level, <1 mM, indicating that the location of gas venting had been moved due to the gas hydrate plugging. Significant concentrations of ethane during that period also indicate the gas hydrate plugging and subsequent change of major gas source from biogenic-rich to thermogenic-rich. Geochemistry of pore water has changed dynamically and shortly in response to the change of gas venting activity.
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Keywords: Time-series analysis, pore water, Shallow gas hydrate, gas venting

