

## Acoustic Surveys of Methane Plumes and the Estimate of the Seeping Amount of the Methane Hydrate Bubbles

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In methane hydrate exploration and research, remote and on-board acoustical surveying and monitoring of methane hydrate can be easily and economically conducted by using a quantitative echo sounder. Simultaneously, the composition and the floating-up speed of methane plumes can be obtained from analysis of acoustic data.

We conducted a survey of methane plumes from 2004 through 2008 in a spur situated southwest off the coast of Sado Island (tentatively called Umitaka Spur) and in the Joetsu Knoll. In 2007 and 2008, we performed experiments by releasing methane hydrate bubbles and methane hydrate crystal structures to let them float upward. Consequently, we demonstrated that acoustical reflection from the methane plumes correlates with water temperature and depth, that floating-up speed is constant but depends on the conditions of methane hydrate, that the discharge of methane hydrate bubbles changes, and that there are wide scattering matters below the seafloor where methane plumes are. Furthermore the seeping amount of the methane hydrate bubbles was estimated by the preliminary calculation.