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Development of acoustic observation method for seafloor hydrothermal flow

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In October 2009, we conducted seafloor reconnaissance using a manned deep-sea submersible Shinkai6500 in Central Indian Ridge 18-20deg.S, where hydrothermal plume signatures were previously perceived. An acoustic video camera DIDSON was equipped on the top of Shinkai6500 in order to get acoustic movie images of hydrothermal plumes. The acoustic movie images of the hydrothermal plumes had been captured in three of seven dives.

We could identify shadings inside the acoustic movie images of the hydrothermal plumes. Silhouettes of the hydrothermal plumes varied from second to second, and the shadings inside them also varied. These variations were thought to be corresponded to internal structures and flows of the plumes. These are only a few acoustic video images of the hydrothermal plumes. Results from this observation show that DIDSON has a potential of equipment for hydrothermal flow observation.

We performed a tank experiment so that we will have acoustic images of water flow under the control of flow rate. The purpose of the experiment was to understand relation between flow rate and acoustic image quantitatively and to develop a quantitative observation method for seafloor hydrothermal flow.

Water was heated in the hot tub and pumped to the water tank through the silicon tube. We observed water flows discharging from the tip of the tube with DIDSON. Flow rate had been controlled and temperatures of the discharging water and background water had been measured. The proposed method to observe and measure hydrothermal flow is the one to utilize a sheet-like acoustic beam. Scanning with concentrated acoustic beam gives distances to the edges of the hydrothermal flows. And then, the shapes of the flows can be identified even in low and zero visibility conditions.

We will report the overview of the tank experiment and proposed observation method in this presentation.

Keywords: seafloor hydrothermal flow, acoustic video camera, DIDSON