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## Development of Vertical Cable Seismic System for Hydrothermal Deposit Survey

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Hydrothermal vents are commonly found near volcanically active places, areas where tectonic plates are moving apart, ocean basins, and hotspots. Potential new deposits of lead-zinc-copper sulfide are generated by cooling hot water around the vents. There are about ten hydrothermal deposits founded around the water depth of 1000m along Izu-Ogasawara Trench and Okinawa-Trough in Japan. The deposits often exists in very thin layer and spatially limited area surrounded by complex seabottom feature like volcanic caldera. Some hydrothermal vents form roughly cylindrical chimney structures.

In order to evaluate hydrothermal deposit, we have proposed the reflection seismic survey with vertical cable recording geometry, which is named as VCS (Vertical Cable Seismic). It has following advantages for hydrothermal deposit survey.

- (1) It achieves 3D image within limited area. The target of hydrothermal deposit is within 1km x 1 km around the depth of 1000m. The conventional 3D seismic is not effective. 3D image is necessary for the estimate the complex hydrothermal area.
- (2) Seabottom condition is too rough to deploy ocean bottom sensors, such as OBC or OBS. Vertical cables are located on the seabottom, but the sensors are in the marine water. It avoids the coupling problems. The vertical hydrophone array can separate the wavefield. It can separate upgoing(reflection) and downgoing wave (direct wave and ghost) and distinguish the scattered waves in complex feature in hydrothermal area.
- (3) Various types of marine source are applicable with VCS such as sea-surface source (air gun, water gun etc.) or marine vibrator or ocean bottom source.

This paper discusses the design of the surveys that can best 3D image of the target in the most economic way. We are interested in geometry of source and receiver distribution and the resultant target coverage. The first experiment is planned in November. We will test the several types of sea surface source. The final resultant images should be evaluated if it has enough quality and resolution for the hydrothermal deposit survey.

Keywords: Vertical Cable, Hydrophone Array, Reflection Seismic, Hydro Thermal Deposit