



Development of Vertical Cable Seismic System

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In 2009, Ministry of Education, Culture, Sports, Science and Technology(MEXT) started the survey system development for Hydrothermal deposit. We proposed the Vertical Cable Seismic (VCS), the reflection seismic survey with vertical cable above seabottom. VCS has the following advantages for hydrothermal deposit survey.

- (1)VCS is an effective high-resolution 3D seismic survey within limited area.
- (2)It achieves high-resolution image because the sensors are closely located to the target.
- (3)It avoids the coupling problems between sensor and seabottom that cause serious damage of seismic data quality.
- (4)Various types of marine source are applicable with VCS such as sea-surface source (air gun, water gun etc.) , deep-towed or ocean bottom sources.
- (5)Autonomous recording system.

Our first experiment of 2D/3D VCS surveys has been carried out in Lake Biwa, JAPAN, in November 2009. The 2D VCS data processing follows the walk-away VSP, including wave field separation and depth migration. Seismic Interferometry technique is also applied. The results give much clearer image than the conventional surface seismic. Prestack depth migration is applied to 3D data to obtain good quality 3D depth volume. Uncertainty of the source/receiver positions in water causes the serious problem of the imaging. We used several transducer/transponder to estimate sensor positions. The VCS seismic records themselves can also provide sensor position using the first break of each trace and we calibrate the positions.

We are currently developing the autonomous recording VCS system and carried out the trial experiment in actual ocean at the water depth of about 400m to establish the procedures of deployment/recovery and to examine the VC position or fluctuation at seabottom. The result shows that the VC position is estimated with sufficient accuracy and very little fluctuation is observed. The second VCS survey will be scheduled over the actual hydrothermal deposit with deep-towed source in February, 2011.