Geophysical Research Abstracts
Vol. 13, EGU2011-2842, 2011
EGU General Assembly 2011

High-resolution shallow marine seismic survey off Yeosu, Korea using an air gun and 8 channel streamer cable

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For the last several decades, high-resolution shallow marine seismic technique has been used for various engineering and geological surveys. To improve the quality of seismic data, a high-resolution multichannel shallow marine seismic survey was designed and carried out off Yeosu, Korea. To achieve high vertical resolution considering penetration depth, a single 30 in3 air gun was selected as a seismic source. To receive high frequency reflected wave, a high-resolution 8 channel streamer cable was used. Seismic signals were recorded, processed and analyzed using a PC-based system.

Test survey was carried out offshore Yeosu, Korea where various sedimentary structures were developed in the Late Quaternary deposits. For the survey, R/V Tamhae II seismic vessel of Korea Institute of Geoscience and Mineral Resources (KIGAM) was used. 240 L-km seismic data composed of 7 lines were acquired.

The energy source was a 30 in3 air gun and the receiver was a 40 m long 8 channel streamer cable with a group interval of 5 m. The offset distance between the source and the first channel was 20 m. The shot interval was 2 seconds corresponding to $\sim$5 m in distance, assuming ship's speed 5 knots. The data were digitally recorded with a sample interval of 0.1 ms and a record length of 1 s. We selected short shot interval and high sampling rate as possible, to acquire high horizontal and vertical resolution data. We used an air gun as a source, because the energy level of the air gun is higher comparing to other sources and the waveform is more effective for data processing.

The processing sequence includes basic processing procedures such as gain recovery, deconvolution, frequency filtering, CMP sorting, NMO correction, static correction and stacking.

The data quality of the shallow marine seismic survey was greatly enhanced through multichannel data acquisition and processing. The improvements are caused by increased S/N, static correction such as swell filtering for better continuity of reflectors and sharpened signals by spiking deconvolution. Specifically deconvolution made thin layers easy to identify.

High-resolution shallow marine seismic surveys using an air gun and a small-scale multichannel system may be an effective way to image shallow subsurface structures clearly and can be used in various engineering and environmental applications, sedimentary research and marine resources exploration.

This study is a part of National Research Laboratory (NRL) project supported by Ministry of Science and Technology (MOST) and Basic Research Project of the Korea Institute of Geoscience and Mineral Resources (KIGAM) funded by the Ministry of Knowledge and Economy (MKE). The authors thank the officers and crew of the R/V Tamhae II for their effort in field survey.