Geophysical Research Abstracts
Vol. 13, EGU2011-4735, 2011
EGU General Assembly 2011

An OBS survey line across Bohai Bay

Chuanchuan Lu, Tianyao Hao, and Qingyu You

Key Laboratory of Petroleum Resources Research, Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China (chuanchuanlv@gmail.com)

In 2010 an active seismic survey line across the Bohai Bay was designed to show the style of the lithospheric thinning in east China due to late Mesozoic subduction of the Pacific plate in the east. As a part of the North China Craton Geophysical Survey, we used 44 OBSs and 120 land stations to record the signal generated by the air gun and explosive. The data are used to study the crustal and uppermost mantle structure and provide a link between the lower crust delamination and magmatism. Arrival times of wide-angle reflected and refracted event from OBSs and land stations are used to construct a 500-km long crustal velocity model.

Together we used three types of OBSs which were supplied by a German company, a French company and ourselves. The coupling methods of the three types OBSs are the same, single glass sphere hooked with a flat plate. Due to the shallow depth and thick sediment, the signal quality was degraded by the water current, ocean waves and soft sediment deformation.

After we analyzed the hydrophone and geophone data, we found the noise level was so high that in order to extract refraction arrivals the data had to be severely filtered. These geophone data show a very high noise peak about 2-5 Hz and the particle motion is elliptical and non-uniform in azimuth. In despite of the cross coupling factor, the particle displacement plotting shows that the Stoneley waves are the dominant noise energy interfered with the signal. And it has a much narrow band. The reason is seabed sediment as a band pass filter to the signal. For the low-end of the frequency band, the sediment would even cause the OBSs to be decoupled from the seabed.

In order to increase the S/N of the data, determining the phase velocity of the wave is important. But in this case the approach is tricky. It was to take the frequency wave number spectrum of the data gather and establish the phase velocity by the wave number spectrum. However, due to the large volume of the air gun, the spacing of the shot sample was not enough to yield stable results. As a suggestion of the OBS survey in the shallow water, it would be better to let the OBSs stay a low profile on the sediment and minimize the usage of the high frequency air gun in order to produce a better S/N data.