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Swell effect correction for the high-resolution marine seismic data acquired using an airgun and an 8-channel streamer cable

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High-resolution marine seismic surveys are used for the imaging of the detailed subsurface geological structure in engineering and marine geological survey. When the sea state gets worse, the quality of the seismic data become worse due to the sea swell. We corrected the swell effect to enhance the quality of seismic data. To remove the swell effect, we picked the sea bottom location automatically, averaged the picked sea bottom times of the adjacent traces and corrected the differences between the calculated and averaged sea bottom location.

To make high quality seismic section, we used high-resolution marine 8-channel airgun seismic data acquired off Yeosu, Korea. The energy source was a 30 in3 airgun 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. The processing sequence includes basic processing procedures such as gain recovery, deconvolution, frequency filtering, CMP sorting, NMO correction, swell effect correction and stacking.

To select sea bottom location for the swell effect correction, we pick maximum amplitude within the expected range including sea bottom location and find the first location at which the amplitude is larger than the threshold that is 40% of the maximum amplitude. We averaged these two-way travel times of sea bottom and corrected the differences. The range of the swell effect correction was -0.5 $\sim$ 0.4 ms. After correction the continuity of reflectors were improved and high quality of the seismic data was produced.

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