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Seismic beam-forming method with Cosine amplitude distribution

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Seismic signals from controlled source seismic exploration are often weak in strong noise background. Beam-forming is useful to solve problems as above. Time domain seismic beam-forming based on receiver array (TSBBRA) method is helpful to improve signal-to-noise ratio (SNR) in seismic exploration with controlled source. If the background-noise is very strong, SNR can be improved in main beam direction by increasing quantity of seismic source used in TSBBRA processing. However, the seismic beam will become narrower. When the main beam does not cover the receiver array, the average SNR of seismic records will decline and couldn't meet the requirements of seismic data processing. In order to get higher SNR in each shot record, we propose "Seismic Beam-forming with Cosine Amplitude Distribution" (SBCAD) to extend seismic beam width, so that SNR could be increase in most channels. SBCAD generates directional seismic records by introducing cosine amplitude distribution in beam-forming processing. We simulate the seismic data of TSBBRA and SBCAD, and the results show that while beam from TSBBRA can't cover the receiver array, SBCAD works well. SNR increases 2.49dB averagely in synthetic seismic record. Seismic reflected target at 350ms can be identified clearly after SDBCAD method although it is invisible in raw seismic data. It concludes that SBCAD is competent in beam shape control, SNR and resolution enhancement and deeper seismic signal detection.

References:

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