

Migration methods for passive seismic data

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In exploration seismics, the aim is to obtain an image of the Earth's subsurface. The starting point for this is the seismic reflection response from sources at the surface. When such sources are not present, one can record the response at the surface due to natural noise sources in the subsurface. An image of the subsurface can then be constructed from these passive measurements following two alternative paths. Following the first path, the noise recordings are cross-correlated to reconstruct the impulsive reflection response. This reconstructed reflection response is then used to form an image of the Earth's subsurface, using a process known as seismic migration. Following the second path, the measured noise data can be directly used in a migration scheme. In this procedure, the cross-correlation is integrated in the migration algorithm. Both paths lead to identical results.

Numerical simulations show that by decreasing the number of subsurface noise sources and using shorter recording times at the surface, the quality of the reconstructed reflection response quickly degrades. However, with the same conditions, the migration process (following either path 1 or 2) still delivers a good image of the subsurface.