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Effects of non-reflection events and stationery source locations on virtual seismic reflection images

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To notice key obstacles and suggest effective processing methods for virtual reflection images, numerical modeling was performed by the 2-D finite difference method with time and space intervals of 0.2 ms and 1.25 m, respectively. Vertical sources of the Ricker wavelet with a main frequency of 20 Hz were assumed to be detonated independently at five buried locations with intervals of 500 m. Vertical components of the particle velocity were computed at 99 receivers at 10 m depth with intervals of 20 m. Synthetic data show that maximum amplitudes of reflection signals are less than 2% of those of direct Rayleigh waves on an average. This indicates that the non-reflection events should be attenuated as much as possible before correlating traces to compute virtual seismic data. For attenuating both direct and diffracted Rayleigh waves in the synthetic data, a median filter with a time window of a 0.1-s length was effective. Because stationery-phase source locations for virtual reflections concentrate near receiver locations, only common midpoint gathers close to the sources should be used for good virtual stack images.