

Seismic interferometry for near surface imaging

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Imaging near surface earth strata (depth < 100 m) in land seismic surveys is a challenging task and these intervals are often non-coherent if not absent in a typical survey. The problem is mainly caused by large reflection event statics and arrival of strong and dispersive linear noise that overshadow low amplitude reflections particularly at short offsets. Large event statics are associated with rapid variation in P-wave velocity in shallow levels (lateral heterogeneity). Dispersive noise is related to the generation of surface waves (Rayleigh and Love waves) as a result of the activation of seismic energy source on the surface. To lower the noise related to surface waves, seismic source for each shot can be buried and activated at the bottom of a shallow hole if the extra cost of drilling can be justified. Here, we show that in a walkaway vertical seismic profile (VSP or inverse VSP) survey, seismic interferometry can be applied to transform its data to virtual surface seismic data with no noise contamination related to surface waves. Disappearance of surface wave related noise from virtual shot records significantly enhances the level of reflection signals at shallow levels and results in improved imaging of these intervals.