Imaging of scatterer distribution around the active faults in Japan

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Seismic reflection profiling is a powerful tool for the imaging of subsurface structure of active faults. Complicated structure near faults has a tendency to produce strong scattered waves, and scattering wave analysis has potential to become an effective tool to reveal the structure around active faults. The aim of this study is to reveal subsurface structures across some active fault systems using seismic scattering wave analysis and to understand the relationship between the seismic scatterers and the geological structure. Case studies by the seismic scattering method were carried our across the active reverse faults; Median Tectonic Line (MTL), southwestern Japan and Nishne fault system, northern Honshu, Japan. The seismic sources of our experiment s were Mini-vibrator (T-15000: IVI) and Mini-Yuatsu-Impactor (CJM-MINI65: JGI), and Digital telemetry seismic recording system (G-DAPS4: JGI) was used for collecting seismic data. We applied a semblance analysis to estimate the distribution of seismic scatterers using the stacking velocity for the seismic reflection processing. The semblance coefficient at a particular point in the profile is related to the magnitude of scattering there. A high semblance coefficient implies effective excitation of scattered waves. The results of these analyses suggest that the geometry of the high/low semblance zone accords well to one estimated by seismic reflection profiling and geologic data. The high semblance value regions correspond to crashed rock or the conglomerate-predominant layer, whereas the low zone and the just to the shear zone (near the MTL) or mud-predominant layer. According to the observations of the cropping out shear zone, the materials in the shear zone are severely crashed into small (less than 20 m) breccias and gauge, more homogenized in size than the surrounding regions.