Detection of S-wave reflectors beneath aftershock area of the 2016 Kaikoura earthquake

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S wave reflectors in the crust may be caused by strong heterogeneous structures such as ones containing fluid. Especially, fluid around an earthquake fault could play an important role for initiation of the earthquake rupture as a mechanism for reducing fault strength. The location and geometry of the reflector can be determined from the travel time of the reflected phases. For detecting the reflections, we need to observe at stations located close to the hypocentre because of sufficient phase separation of the small lapse time of the reflected phases due to a reflector in the crust from direct S wave. In this study, we attempted to detect reflected waves in observed seismograms at the seismic stations in and around the 2016 Kaikoura earthquake (Mw7.6). Seismic records were obtained from the permanent GeoNet stations as well as from seismic stations deployed before the Kaikoura earthquake in the northern South Island. We applied reflection seismology techniques to the data obtained by the network. We used seismograms with smaller epicentral distance than 30 km and obtained dip move-out sections for each station. We detected several reflectors in the mid and lower crust from the sections. Strong reflected phases were observed at the southern edge of the focal area (from a reflector with depth about 20 km). Weak reflectors were detected in/beneath the aftershock area (in the mid- to lower-crust). In addition, the subducting slab might be imaged with dipping angle 20 degree. Reflectors parallel to the slab were also found below the interface.