Near-surface structure revealed by ground penetrating radar profiling across an inland active fault ruptured one month after the 2011 Tohoku-oki earthquake, southern Fukushima, NE Japan

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The 11 March 2011 Tohoku-oki earthquake (Mw = 9.0) ruptured a 500 km-long and 200 km-wide thrust of convergent boundary between the North American and Pacific plates. The earthquake caused crustal stress field changes and triggered widespread seismic activity in the northeast Japan. The southern Fukushima area was struck by many earthquakes. The largest normal faulting (Mw = 6.6) in the area ruptured the NW-trending Yunodake fault and the NNW-trending Itozawa fault on 11 April 2011. The coseismic surface ruptures were observed along active and presumed active faults identified previously. To investigate the near-surface structure of the Itozawa fault, we conducted ground penetrating radar (GPR) profiling across the fault, and we carried out two drilling surveys in hanging and foot walls of the fault. The survey line, which length was about 50 m, was located nearby a trench site (Toda and Tsutsumi, 2013). The GPR data were collected by common-offset modes using 50, 100, and 200 MHz GPR systems (pulseEKKO PRO made by Sensors and Software Inc.), and the station spacing was 0.05 m. Furthermore, we carried out wide-angle measurements, and acquired common mid-point (CMP) ensembles at the both sides of the surface rupture to estimate the electromagnetic wave velocity used in the depth conversion of the GPR sections. The GPR sections after careful data processing show detailed structure above a depth of about 10 m. We interpreted some horizons as an event showing coseismic deformation on 11 April 2011, the past seismic event reported by Toda and Tsutsumi (2013), that informing the former event, respectively. The horizons explain accumulation of vertical displacement on the Itozawa fault.