Seismic array observation near the focal area of the 2004 Niigata-Chuetsu earthquake

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Seismic-array observation was carried out in order to detect reflected and/or scattered waves from inhomogeneous structures in and around the focal area of the 2004 Niigata-Chuetsu earthquake. We deployed an array composed by 30 seismometers with a separation of 25 to 50 m in Nagaoka City, and observed aftershocks for about 2.5 months from 27 November, 2004 to 11 January, 2005. Signal from the seismometers was recorded for 60 sec in each case of event detection by using a data acquisition system StrataVisor NX48 (Geometrics, INC.). Waveform files of the events recorded in the data acquisition system were easily copied using internet connection and were analyzed. In aftershock seismograms, we can show many later phases between direct P and S-wave arrivals. Two of the most distinct phases were detected in about -0.4 to -0.5 sec and about -1.2 to -1.4 sec from direct S-wave arrivals for many aftershocks. Results of semblance analysis show that azimuths of these phases are consistent with epicenter directions; apparent velocities of these phases are slightly slower than direct P waves. Furthermore, particle orbits of these phases are similar to those of the direct P waves. Therefore we concluded that the two phases are SP waves transmitted in the seismic-velocity boundary, and estimated that these boundaries were located at depths of about 0.5 km and about 3 to 4 km, respectively.