

# Imaging the fault planes of the 2004 Niigata-Chuetsu earthquake by applying DD tomography to dense aftershock observation data

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A destructive large earthquake sequence (2004 Niigata-Chuetsu earthquake) occurred in central part (Chuetsu district) of Niigata Prefecture, central Japan on Oct. 23, 2004. We deployed a dense temporary seismic network composed of 54 stations for aftershock observation just above and around the focal area of the earthquake for about a month. Using travel time data from the temporary seismic network and surrounding routine stations, we obtained precise aftershock distribution and 3D seismic velocity structure in and around the fault planes of the earthquake and its four major M6 aftershocks by Double-Difference tomography. The results show three major aftershock alignments. Two of them are almost parallel and dipping toward the WNW. The shallow and deep aftershock alignments correspond with the fault plane of the mainshock and that of the largest aftershock, respectively. The third alignment is almost perpendicular to the WNW-ward dipping planes and perhaps corresponds with the fault plane of the M6 aftershock on Oct. 27. General feature of the obtained velocity structure is that the hanging wall (western part of the focal area) has lower velocity and the footwall (eastern part of the focal area) has higher velocity. This observation suggests that the 2004 Chuetsu earthquake sequence occurred along faults which acted as normal faults in the Miocene and reactivated as reverse faults under the current compressional stress regime. Major velocity boundary seems to migrate to the west at a location near the central part of the focal area, where main shock rupture started. Some parts of the fault planes were imaged as low velocity zones. This complex crustal structure would be one of possible causes of the complicated occurrence of the 2004 Niigata Chuetsu earthquake sequence.