

GPS observation of postseismic deformation following the 2004 Niigata Chuetsu Earthquake

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The 2004 Niigata Chuetsu Earthquake (M6.8) occurred in the seismic gap of the Niigata-Kobe Tectonic Zone, a large compressive strain zone detected by GPS observation. Physical mechanism of earthquake generation in this area has not been understood well. It is important to investigate a rheological structure of the source region and deformation processes at a deeper part of the seismogenic fault. Postseismic deformation is useful in studying these aspects. We installed five GPS observation sites around the southern part of the source region of the 2004 Niigata Chuetsu Earthquake during October 24-26. We analyzed our data with those from surrounding GEONET stations. The analysis result indicates E-W compressive deformation occurs after the main shock. Interestingly, the postseismic displacement was the largest in Ogni, which is located about 10km west of the main shock source area. The postseismic displacement was fast in the first 1 month but slowed down afterwards. It may reflect effects of active aftershocks. But it is more likely that the postseismic deformation is related to a crustal structure because significant deformation occurs at the western side of the source region. This western part is covered by thick sediments by several kilometers and a detachment fault may exist at a deeper part of the crust. Stress change due to the main shock and aftershocks may cause afterslip of the detachment. Such a structure has important implications to the loading mechanism of the Chuetsu Earthquake.