

Strong Ground Motion Generation for the 2014 Northern Nagano Earthquake

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The 2014 Northern Nagano earthquake (JMA Magnitude 6.7, Mw 6.2) on 22 November caused strong ground motions in Hakuba of the Nagano prefecture. Damaged wooden houses are reported at the Horinouchi region in Hakuba, Active fault surveys, InSAR analyses, and aftershock observations suggest the relation of source fault and the Itoigawa-Shizuoka Tectonic Line. Near-source strong ground motions are observed by K-NET/KiK-net of NIED and seismic intensity sensors of local governments.

Observed ground motions generally agreed with ground motion prediction equations. Long-period ground motions in the Kanto and Nobi basins are not significant, but we confirmed surface waves in the Matsumoto and Suwa basins at the southern part of the Itoigawa-Shizuoka Tectonic Line.

Hi-net Hakuba-Kamishiro station is located at the Mikka-Ichiba region, where is the south of the Horinouchi region. However, the borehole velocity sensor at the depth of 50 m can measure up to around 4 cm/s, the mainshock records are saturated. We have installed a temporary strong motion station at the Hakuba cross country field (Snow Harp) since 12 November 2014. The portable measurement consist of JAP-6A3-10 and LS-7000XT. The continuous ground motions are transmitted every second as WIN packets. Most aftershock records have dominant periods of around 1 s.

One of concerns is that both K-NET/KiK-net Hakuba stations observed larger NS velocity component rather than EW velocity component. This is hard to explain by a simple reverse faulting. This feature is only seen in the mainshock records, not for the foreshock and aftershock ones, suggesting complex mainshock rupture. Based on the source inversion by Kobayashi et al. (2015, this meeting), we estimate strong motion generation areas by the empirical Green's function simulation for broadband ground motions. We also simulate the mainshock ground motion at the temporary station from the strong motion generation area.

Keywords: 2014 Northern Nagano earthquake, strong ground motion, continuous strong motion observation, ground motion prediction equation, empirical Green's function method