

Temporal changes of seismic velocity structure after the 2016 Kumamoto earthquake

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Seismic velocity structure often changes after large earthquakes or during seismic swarms. On April 2016, a large earthquake (Mjma7.3) occurred at Kumamoto Prefecture in the Kyushu district. Aftershocks have been occurred around the Futagawa fault and the Hinagu fault, which are located at southwest part in the source area. For northeast part of the source area, aftershock activity seems to reach to near Mt. Aso. Induced earthquakes have also been activated in the northern Oita prefecture, which is located northeastward from the aftershock area. Using the seismic interferometry method, we detected co-seismic velocity changes after the 2016 Kumamoto earthquake in the Kyusyu district.

We use seismic records of Hi-net, which were provided by National research Institute for Earth science and Disaster resilience (NIED). We use Auto-Correlation-Functions (ACFs) of the ambient seismic noise record to calculate velocity fluctuation of the subsurface structure. To obtain an ACF, we applied a 1 - 3 Hz bandpass filter to 1 hour waveform data, and applied one-bit amplitude normalization to the filtered data to reduce effects of large seismic signals. To avoid daily pattern of ambient seismic noise, we calculate one-week average of the ACFs. These stacked ACFs were calculated every day, and they were compared to the referenced ACF through the stretching method. The referenced ACF was reproduced from average of the ACFs obtained in 2013. Temporal velocity change was calculated if the velocity change was larger than twice the standard deviation of the velocity fluctuation obtained one month before the 2016 Kumamoto earthquake.

Our preliminary result demonstrated the co-seismic velocity changes at the source region of the Kumamoto earthquake, Mt. Aso, and a part of the northern Oita prefecture. For the southwest part of the source area, we obtained 0.5 -3.0 % velocity decreases at three stations: N.MSIH, N.MSMH, and N.TYNH. For the northeast part of the source area near Mt. Aso, significant velocity decreases of 1.5 -6.0 % were obtained at stations N.ASVH, N.HKSH, and N.NMNH. In a part of the northern Oita prefecture, velocity decreases of 0.5 -1.0 % were obtained at stations N.KKEH and N.SNIH, which are located at a seismic gap between the swarms of Mt. Aso and northern Oita prefecture.

Keywords: The 2016 Kumamoto earthquake, temporal changes of seismic velocity structure, Auto Correlation function, Hi-net