Spectra and Source Parameter of High-Frequency Events at Kuchinoerabujima Volcano

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Kuchinoerabujima volcano is located at Ryukyu Islands, south off Kyushu, Japan. There are three craters at the volcano, which the active one is Shindake crater. Historical records of eruption at Kuchinoerabujima started in 1841. Since then, several eruptions occurred in Shindake crater such as in 1931-1934, 1945 and 1966. The eruptions were dominated by phreatic eruptions. Last eruption occurred at the fissure east of the summit crater in 1980.

Seismicity of the volcano kept the high level from 1999 until now. Volcanic earthquake recorded at Kuchinoerabujima typically is high-frequency (HF) events, which have high-frequency component. This type of earthquakes dominate the seismicity. The other volcanic earthquakes are Low-frequency (LF) events that have low-frequency component in range between 1-4 Hz, and monochromatic event, which show a slowly decaying coda part.

The 2006 volcanic crisis at Kuchinoerabujima started in August, remarked by the occurrences of 115 monochromatic events. Then, it was followed by the increased number of LF events in October up to 55 events and finally the number of HF events reached 450 events in November. Hypocenters are distributed beneath the Shindake crater with the depth of 0-600 meter for HF events meanwhile LF and monochromatic events are shallower than HF events at depth of 0-300 meter and 0-400 meter, respectively.

Spectra of HF events are calculated by applying FFT method on the waveform. Corner frequency of HF events are estimated, due to their spectra have a wide spectrum. From August to December, corner frequencies are shifted to a lower value, from about 23 Hz to 10 Hz. It suggests that a decrease of corner frequencies of HF events is caused by a change of crack size.

From pull-push P-wave first motions distribution, HF events are generated by normal fault mechanism. Using the result of focal mechanism and following Brune's circular fault model, the source parameters i.e. seismic moment and stress drop are analyzed.