

Seismic observation at Kuchierabujima volcano during the period from December 2000 to March 2001

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Kuchierabujima is an andesitic volcano in Ryukyu Islands and has repeated phreatic. We conducted seismic observation with 8 stations from Dec. 2000 to Mar. 2001. HF events have high frequency contents of 10-25 Hz. Hypocenters of the HF events were concentrated in the crater and S-SW rim of the crater with the depth of <0.5km. The focal zone corresponds to a geothermal area. HF events may be generated by shear fracturing of rocks due to geothermal or hydrothermal activity. A monochromatic event has common spectra peaks at all the stations, and this suggests that the spectra are caused by the source. High frequency pulses of >20 Hz at the spasmodic initial part suggests that the repetition of the high frequency pulses excite a resonator as a source of the monochromatic coda part.

Kuchierabujima volcano is an andesitic stratovolcano located in Ryukyu Islands. Historic records of eruptions were started in 1841. In the 20th century, phreatic eruptions occurred at the summit crater of Shindake or a fissure beside the crater in 1934-34, 1945, 1966 and 1980. Especially, the 1933-34 eruptions were the biggest and 8 people were killed and 26 were injured. Sakurajima Volcanological Observatory has continued seismic observation by a 3-component short period seismometer at a station 0.4 km west of the Shindake crater since December 1991. Most of the earthquakes occurred beneath the summit crater. Monthly numbers of the volcanic earthquakes were <20 before 1995. The seismicity increased in March to June, 1996 and the monthly numbers attained >80. After the quiescence of 3 years, the seismicity suddenly increased again in August 1999 and the monthly numbers peaked to 320 in October. Seismicity also increased in the sea area between Kuchierabujima and Yakushima islands in December. In the Joint Geophysical Observation 2000 under the Project of Volcanic Eruption Prediction, Kyoto University, Hokkaido University, Tohoku University and Kagoshima University conducted seismic observation at Kuchierabujima volcano during the period from December 2000 to March 2001. In addition to the permanent station, 4 seismic stations were installed around the summit crater and 3 broadband seismometers were installed at the flank of the volcano. Volcanic earthquakes recorded during the period were classified into 4 categories, as observed by the continuous observation, that is, A-type, high frequency (HF), low frequency (LF) and monochromatic events.

A-type earthquakes have clear P and S phases like local tectonic earthquakes. S-P time intervals of the A-type earthquakes were 2 s and were located in the sea area between Kuchierabujima and Yakushima. HF events have high frequency contents of 10-25 Hz. Hypocenters of the HF events were concentrated in the Shindake crater and S-SW rim of the crater with the depth of <0.5km. The distribution of polarities of the P-wave first motions suggests a focal mechanism of normal fault. Geothermal area with minor fumaroles is located at S-SW part of the summit crater, and the hypocentral zone corresponds to the geothermal area. It is possible that the HF events are generated by shear fracturing of rocks due to geothermal or hydrothermal activity of the volcano. LF events are dominated by lower frequency with peaks of 1 and 3 Hz. The P-wave first motions were dilatations at all the stations, and the fact suggests a mechanism of deflation volume source (Yamamoto et al., 1997). Monochromatic events have long coda part with a dominant spectrum peaks and a constant decay of the amplitude. Similar events occurred at Asama and Kusatsu-Shirane volcanoes. An events recorded on December 25, 2000 has a dominant peak at 8 Hz and some minor peaks at 1.5, 3.1, 4.7, 6.0 Hz. The peaks of the spectra appeared at all the stations, and this suggests that the characteristics of the spectra are caused by the source. The event has spasmodic part of 6 s and monochromatic coda part of 40 s. High frequency pulses of >20 Hz repeated at the spasmodic initial part were observed by a seismometer beside the crater. It is possible that the repetition of the high frequency pulses excite a resonator as a source of the monochromatic coda part.