Temporal change of long-period tremor at Aso Volcano-2002-2004-

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Volcanic tremors have been observed around many active volcanoes in the world. They are considered to be generated by the motion of fluid, such as magma, geothermal fluid and volcanic gas.

At Aso volcano, Kyusyu, Japan, several different types of volcanic tremor have been observed for many years. Amomg these tremors, the long-period tremor (LPT) , which was detected by Sassa(1935) first, has a spectrum peak at 7.5 seconds, 5 seconds, and 3 seconds with a fundamental period of 15sec (Kaneshima et al. 1996). In order to understand the dynamics of the volcanic system, it is very important to clarify the mechanism of LPTs in Aso Volcano.

Spatial variation of LPTs amplitudes are explained by a combination of isotropic expansion and inflation of a tensile crack beneath the craterlets of the Naka-dake. And from the calculation of the oscillation style of a fluid-filled-crack by boundary integral method, it was shown that the source of LPT is the resonance of the crack, which exists just beneath the Naka-dake crater, with a length of 2.5.km, a width of 1.0 km and a thickness of 25m (Yamamoto, 2005). Since the acoustic velocity of the fluid in the crack is about 400 m/s, it is presumed that the fluid in a crack is the mixture of H20 gas and gas with large densities, such as CO2, SO2 or the mixture of gas and ash(Yamamoto, 2005).

It is very important to investigate temporal change of LPT, when knowing whether the character of these fluid will change according to volcanic activity. Therefore, in this research, the waveform data of STS-1 installed in Hondo's underground tunnel from November, 2002 to July, 2004 was analyzed and investigated.

Although about 600 LPT s per day had occurred in November, 2002, the number decreased gradually in 2003 and 100 or less per day occurred in April, 2003. The amplitude of LPTs also became small gradually in 2003. Then, the number of LPT increased rapidly in July, 2003 (500 per day), and amplitude also became large followed by a small eruption on July 10.

Next, the amplitude spectrum of 1 day was calculated by FFT. And it was found that the fundamental period of LPT from November, 2002 to June, 2003 is 16-18 seconds and was slightly longer than 15 seconds pointed out by the past research. The so-called 7.5 mode also has a slightly longer period(8.0sec) in this term. Furthermore, it became clear that a spectrum peak at 10 seconds exists at the greater part of this time.

15s mode and the 7.5s mode suddenly became into the short period at the time of the eruption in July, 2003, and returned to the long period gradually. The period of vibration of fluid-filled crack changes with the configuration of a crack (especially aspect ratio), and with the physical properties of a crack (ratio of the elastic wave speed of a crack wall to the acoustic velocity of internal fluid). Among these, since the acoustic velocity of the fluid in a crack changes a lot within a volcano, that the period of LPT became long from July 2003 to December has a high possibility of responding to the acoustic velocity of the fluid in a crack having become small.