Two types of volcanic tremor changed with eruption style during 1986 Izu-Oshima eruption

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Izu-Oshima Island is one of the most active volcanoes in Japan. The most recent eruption occurred in 1986, when the most active stage consisted of three eruption episodes at different craters. The eruption initially began at the summit crater in a strombolian style with a continuous lava fountain, which gradually became intermittent explosions accompanied by infrasound and shock waves with a decreasing rate of magma discharge. The summit eruption suddenly ceased four days after the onset. In parallel with the decrease in the summit activity, two subplinian eruptions occurred producing fissures in the caldera floor and in the flank of the outer rim. So far, the only reported precursor phenomenon to the fissure eruptions was an increase in seismicity in shallowparts of the caldera just 2 h before the first fissure eruption (Yamaoka et al., 1988). The shifts in eruption style and eruption site during the course of eruption are not so peculiar phenomena but commonly observed at other volcanoes. How to monitor and predict these shifts is one of the imminent tasks assigned for volcanology. 1986 Izu-Oshima eruption should be an indispensable test case to check this even now.
In order to explore possible prospects for the eruption sequence, we have analyzed volcanic tremors occurred during 1986 Izu-Oshima eruption using recently digitized data. This study demonstrates that eruption style, waveform characteristic, and source location of volcanic tremor are consistently related in the most active stage of the 1986 Izu-Oshima eruption. During the summit eruption, the tremor is continuous and the source is located around the summit while the correlation between the magnitude of amplitude and the effusive rate disappears with change in the eruption style from strombolian to vulcanian. Then tremors become episodic occurring along the fissures during the stage of the subplinian fissure eruptions. Based on the finding about the relation, it was revealed by extracting episodic tremors superimposed on the continuous tremor during the summit eruption that precursory migration of tremor sources along fissures occurred 5 days prior to the fissure eruptions. On the other hand, Linde et al., (2016) insist that the precursory changes in seismic activity starting 2 h before the first fissure eruption is consistent with the ground deformation and explained by propagation from a deep (10 km) reservoir to a long sub-surface dike. However, the precursory activity of the tremors, which suggests injection of magma below fissures cannot be explained by the scenario because it preceded the seismic activities. The fact demonstrates the importance of tracking temporal changes in volcanic tremor on a priority basis. Since Izu-Oshima has approximately 30-year eruption cycle in recent history and 30 years have passed since the last eruption, the implications of this study should be incorporated into adaptive monitoring in anticipation of the next eruption.

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