## Problems the Izu-Oshima eruption in 1986 left to volcanology about magma supply systems

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The 1986 eruption of Izu-Oshima Volcano left interesting problems for both scientific studies and hazard mitigation. Considering discussions made at the time of the eruption and new information added after the present paper reexamines some problems related to magma supply to the eruption.

The eruption consists of a sequence of events. On November 15-19, 1986 effusing magma first filled the summit crater and overflowed the summit cinder cone. In the climax of the eruption on November 21, magma generated new fissures on a line from the summit to the northwest flank and violently effused with eruption columns higher than 10 km. More than ten thousand people living in this volcanic island evacuated during the night of this volcanic activity and stayed outside the island for a month. Four small events followed the activity each with sudden subsidence of lava in the summit crater till October, 1990. At that time it was considered without doubt that there was a magma chamber just below the summit crater. According to leveling surveys made in the northwest part of the volcano the summit area had subsided over several years before the eruption. Although anomalous electric resistance and volcanic gases as well as volcanic tremor were observed several months before the eruption the coordinating committee of volcanic eruption prediction inferred that there would be no big eruption because of the evidence of summit subsidence. Actual big eruptions denied this prediction.

Noting that the leveling data covered only the northwest side of the volcano and that seismic activities were dominant in this area during and before the summit eruption the author proposed that the eruption might be fed with magma in a chamber below the northwest flank of the volcano (Ida, JVGR, 66, 53-67, 1995). This idea was consistent with the tilt observation at two points along the caldera rim that showed subsidence of the northwest flank during the summit event. At the small event on November 18, 1987 that was accompanied by a 40 m subsidence of lava a clear uplift was observed around a point 3 km northwest of the summit with the newly installed tilt network. This phenomenon was explained by the model that magma had been drained back to the predicted magma chamber during this event. However, many volcanologists still kept a firm belief of magma chamber below the summit.

After the eruption some evidence favorable to the magma chamber northwest of the summit is added. A high-density GPS network revealed that uplift had started in the northwest area of the volcano implying that inflation of the same magma chamber began toward the next eruption. It was also accepted that the Unzen eruption in 1991-95 was supplied with magma from a chamber below Tachibana bay and that there was a deep magma chamber of Sakurajima below Kagoshima bay. A magma chamber that does not sit just below the summit crater is now not regarded as abnormal at all.

The fissure eruption on November 21, 1986 gave another problem about magma supply system. Many volcanologists assumed that there should be another magma chamber for the eruption that had been more explosive and had ejected more andesitic lava than the summit eruption. The author supposed, however, that the same chamber as in the summit event worked because the fissures were located over the chamber. The explosive nature of the event with andesitic lava can be explained by crystallization differentiation of magma during ascent processes in newly generated cool paths. This interpretation is consistent with observed large scattering of lava compositions that may reflect different cooling processes. Unfortunately, the idea has not yet well examined among volcanologists.

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