

On self-potential variation coincident with the 2000 summit eruption on Miyakejima Island

Makoto Uyeshima[1], Yoichi Sasai[1], Observation Group of Miyake-jima Volcano (Working Group on Thermal and Electromagnetic Measurement) Tsuneomi Kagiya

[1] Earthq. Res. Inst., Univ. Tokyo

Since microearthquakes were activated on Jun. 26, 2000, a series of volcanic activities have taken place on and around Miyakejima island on the Izu-Bonin arc. In order to elucidate physical processes of the volcanic eruption, we monitored long-baseline voltage differences throughout the island. Almost all the repeated tilt-step events, i.e. abrupt uplifts around the summit area, were accompanied by voltage difference variations, very similar to the velocity waveform of the ground motion. Sense of the potential variation was again negative for the inland site and remarkable linear correlation was detected between intensities of the voltage difference variation and the velocity variation.

Since microearthquakes were activated on Jun. 26, 2000, a series of volcanic activities have taken place on and around Miyakejima island on the Izu-Bonin arc: 1) sea floor eruption on Jun. 27, 2) rapid subsidence of the summit area on Jul. 8, 3) successive deepening and widening of the subsidence area from Jul. 8 to Aug. 18, in which period repeated stepwise changes of tilt and coincident long period earthquakes occurred, 4) the most intense summit eruption on Aug. 18, and 5) subsequent voluminous SO₂-gas emission from the summit, which continues up to now. Intermittent summit eruptions occurred from the subsidence on Jul. 8. In order to elucidate physical processes of the volcanic eruption, we monitored long-baseline voltage differences throughout the island by using telephone line network.

Coincident with the summit subsidence, stepwise decrease was observed in the voltage difference of a site on the SW foot of the central cone minus coastal sites.

Almost all the repeated tilt-step events, i.e. abrupt uplifts around the summit area, were accompanied by voltage difference variations, very similar to the velocity waveform of the ground motion. Sense of the potential variation was again negative for the inland site and remarkable linear correlation was detected between intensities of the voltage difference variation and the velocity variation.

During the summit eruption on Aug. 18, potential of the inland site first decreased and subsequently increased as much as 160mV and kept the level until Sep. 4, when the measurement stopped due to power cut.

All those negative potential variations can be interpreted as due to electric currents generated by forced injection of water from the pressure source into the surrounding medium (electrokinetic phenomena). The last positive variation implies that any definite change occurred in the hydrothermal system of the volcano.