

Characteristics of hypocenter distribution connected with velocity structures in and around Miyakejima, Kozushima and Hachijojima volcanoes

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The aim of this study was to examine the characteristics of seismic activities in association with the seismic velocity structures in and around the Izu islands. We focused on three seismic activities, the swarm off the west coast of Miyakejima on April 2013, the swarm off the northeast coast of Kozushima on April 2018 and the low frequency earthquakes beneath Hachijojima from 2003 to 2018. To construct the 3-D velocity structure models for Miyakejima and Kozushima we used the data of the swarm accompanied with the 2000 Miyakejima eruption, while for Hachijojima we used the data from 2003 to 2018 based on the Izu islands volcanic observation system. These travel times were adopted to the tomographic inversion method (Zhang and Thurber, 2003). The relocated precise hypocenters on the velocity imaging maps revealed an interesting relationship between seismicity and structure. In the target region, both Miyakejima and Kozushima swarms occur at 5-10 km and 2-6 km depth, in the border of high-velocity zones adjacent to or underlain by the low-velocity zones in figure 1 and figure 2. Their swarm regions were located nearby the two end sides of the 2000 swarm, where the huge seismic activity occurred repeatedly. That suggests the upward moving of magmatic fluids. In contrast, the Hachijojima earthquakes occur at 10-14 km depth in the middle-velocity area around a high-velocity zone in figure 3. This high-velocity zone is supposed to be somewhat cold body beneath Nishiyama volcano in Hachijojima. We interpret that the former low-velocity zones consist of hot magmatic materials and the latter high-velocity zone consists of the solidified volcanic body. On the basis of three case studies, it is suggested that volcanic fluids derived from hot magma or solidified magma caused the upper or surrounding seismic activities through complex crack systems.

Keywords: seismic activity, velocity structure, volcanic fluid, Miyakejima, Kozushima, Hachijojima

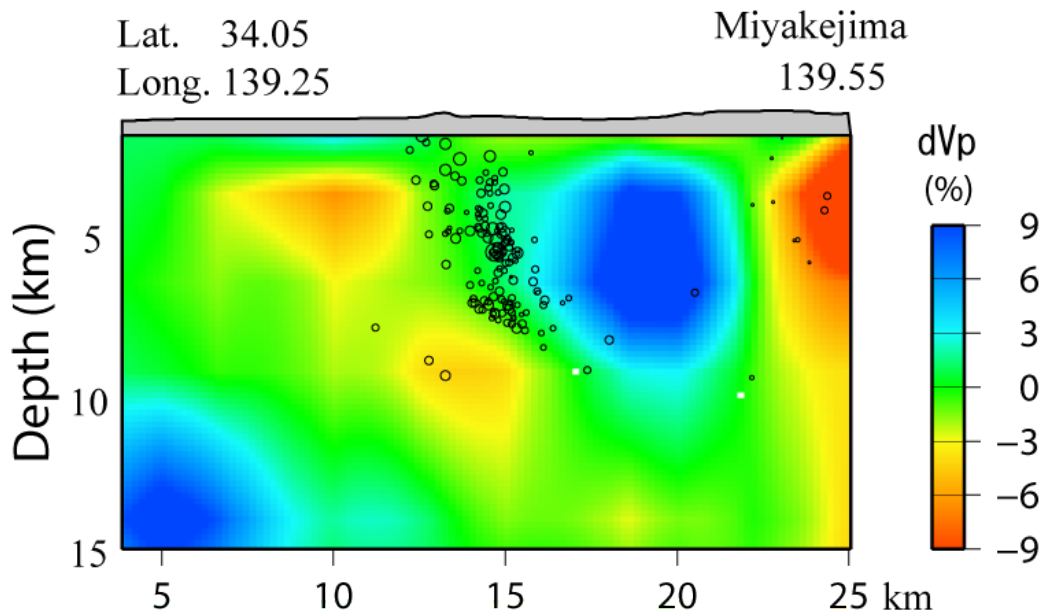


Fig. 1. E-W cross section of the dV_p and relocated seismicity near Miyakejima.

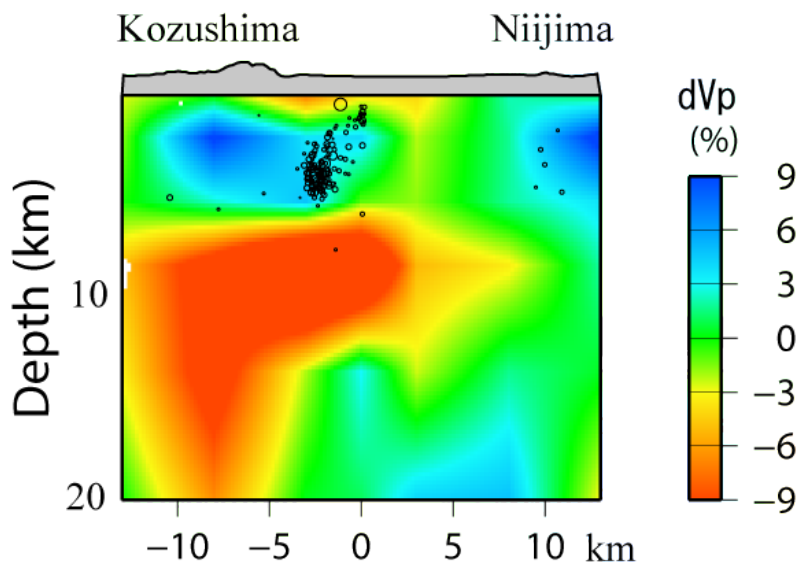


Fig. 2. Cross section of the dV_p and relocated seismicity near Kozushima along the axis passing through Kozushima and Niijima.

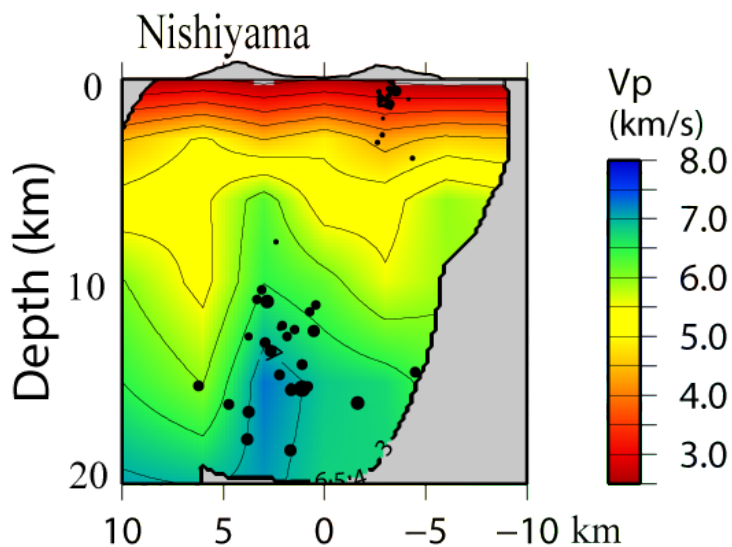


Fig. 3. Cross section of the V_p and relocated seismicity along the long axis of Hachijojima.

