

Spatiotemporal velocity changes around Miyakejima and Kozushima in June, 2000 - May, 2001 revealed by 3D seismic tomography

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Spatiotemporal velocity changes around Miyakejima and Kozushima, central Japan in June, 2000 – May, 2001 have been studied using travel time data applied seismic tomography method. Seismic activity began under Miyakejima in June 26, 2000. A few hours later the seismicity shifted northwest towards Kozushima and Niijima. A large number of earthquakes over 30,000 included 5 large earthquakes with magnitude more than 6.0 followed over two months. In addition, the swarm linked Miyakejima eruptions. To obtain better resolution for spatial and temporal changes in the activity, we conducted a series of pop-up ocean bottom seismometer observations. The precise hypocenter distribution obtained as the result strongly showed a northwest-southeastern lineament and repeated seismic migrations between Miyakejima and Kozushima. On the other hand large crustal deformation was detected in Kozushima and Niijima by GPS measurement and also spatiotemporal gravity changes at Miyakejima were detected by repeated microgravity measurement. On the basis of these results researchers proposed the magma migration from Miyakejima toward the northwestern oceanic region and the dike intrusion between Miyakejima and Kozushima. However, the velocity structure of this region was not clearly estimated. Then we perform travel time analyses adopted seismic tomography to examine the velocity structure and to illuminate the magma movement.

The result shows that two dominant low velocity zones which locate in the west of Miyakejima and the east of Kozushima exist and they change temporally their rates corresponding to the hypocenter distribution. In the early period (July 2~ July 5), low velocity zone (LVZ) of Miyake site is powerful and that of Kozu site is very weak. Next period (July 6 – July 20), LVZ of Miyake site decreases and in reverse that of Kozu site increases with seismic swarm. In the period (July 21 – Aug 14), LVZ of Kozu site is very strong and expands up to 5km depth with great swarm. Next, in the period (Aug 15 – Aug 31), LVZ of Miyake site increases its rate with swarm. After then, in the period (Sept.1, 2000 – May 6, 2001), both LVZ decrease their rates and the seismic activity decrease either. We conclude that these low velocity regions indicate magma intrusion and that spatiotemporal changes cause repeated seismic migrations between Miyakejima and Kozushima.