

Three-Dimensional resistivity structure and its comparison to seismic velocity structure, Hakone volcano, Japan

H. Shigematsu¹, K. Aizawa², T. Inoue², H. Tanabe¹, K. Matsunaga¹, T. Kono¹, K. Nakamura¹, I. Hirata¹, R. Matsubara¹, A. Katsuyama¹, R. Murofushi¹, K. Uchida², M. Uyeshima³, T. Koyama³, T. Hashimoto³, T. Nishimoto³, T. Akiyama³, A. Watanabe³, H. Abe³, D. Muramatsu³, Y. Matsunaga³, T. Oishi³, R. Yoshimura⁴, S. Komatsu⁴, I. Yoneda⁴, T. Miura⁴, Y. Tatsuyama⁴, A. Nagaoka⁴, A. Nada⁴, J. Nakagawa⁴, K. Tomisaka⁴, M. Yoshikawa⁴, H. Ichihara⁵, S. Masuda⁶, N. Kitaoka⁶, N. Yamashita⁷, K. Onaka⁷, M. Sakurai⁷, F. Yoshizawa⁸, R. Senba⁹, & K. Sasaki⁹.

1. Department of Earth and Planetary Sciences, Graduate school of Science, Kyushu University

Mail: shigematsu.hiromichi.035@s.kyushu-u.ac.jp

2. Institute of Seismology and Volcanology, Kyushu University

3. Earthquake Research Institute, University of Tokyo

4. Disaster Prevention Research Institute, Kyoto University

5. Earthquake and Volcano Research Center, Graduate School of Environmental Studies, Nagoya University,

6. Multidisciplinary Resilience Research Center, Tokyo Institute of Technology

7. Earth-Science Laboratory, University of Hyogo

8. National Research Institute for Earth Science and Disaster Resilience

9. Japan Meteorological Agency

SUMMARY

We present a three-dimensional resistivity structure of Hakone volcano, which is located 85 km southwest of Tokyo. This volcano experienced volcanic unrest in 2015, including small phreatic eruptions, seismic swarm activity, and ground deformation. With over 10,000 residents and tourists living within 10 km of the vent, understanding the subsurface structure and volcanic fluid pathways is crucial for managing such events. Previous studies have provided high-resolution seismic velocity structures to a depth of 30 km, but resistivity structures have only been estimated to a depth of 3 km. Recent research has highlighted discrepancies between low-resistivity and low-velocity anomalies at other volcanoes, indicating the difficulty of interpreting volcano structures based solely on resistivity.

We conducted a wide-band Magneto-telluric survey in and around Hakone volcano, deploying 41 observation sites during September and October 2023. Each site recorded Magneto-telluric or telluric data continuously for over a month, with a sampling rate of 32Hz during the day and 1024Hz at night (Japan Standard Time 2:00-3:00). However, due to the dense population, high-voltage power lines, and Direct Current electric railways surrounding Hakone volcano, the Magneto-telluric data was heavily contaminated by artificial noise. Remote-reference processing using geomagnetic data 850 km west of Hakone volcano, coupled with geomagnetic storm events on September 19, enabled us to estimate Magneto-telluric response functions for periods ~1000 seconds. In this study, we present the preliminary three-dimensional resistivity structure of Hakone volcano and compare it with high-resolution seismic velocity structures to a depth of 30 km. Our aim is to better understand volcanic fluid pathways by integrating these complementary datasets.

Keywords: Hakone, Magneto-telluric
