ACTIVE観測結果から見る2014-2016年阿蘇山活動期の地下熱水系の変化
Evolution of the hydrothermal system of Aso volcano during the 2014-2016 eruption period, as inferred by the ACTIVE observations

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Electrical resistivity structures provide important information about hydrothermal systems of volcanos. Previous studies using the magnetotelluric method have revealed shallow resistivity structures associated with conductive cap rocks underlain by hydrothermal reservoirs (e.g. Nurhasan et al. 2006). However, evolution of such a hydrothermal system over volcanic eruptions has never been understood in detail.

We have intermittently conducted observations of an electromagnetic volcano monitoring system, ACTIVE (Utada et al. 2007), in Aso volcano for about half a decade. ACTIVE system consists of transmitter dipoles for controlled-source electric currents and an array of induction-coil receivers for measuring the vertical component of the induced magnetic field dependent on the subsurface resistivity structure. ACTIVE system in Aso volcano recently succeeded in detecting temporal variation in the resistivity structure over the magmatic eruptions that started in November 2014 and ceased in May 2015 (hereafter referred to as the magmatic eruption period (MEP)). In our previous study, three-dimensional inversions for the two sets of ACTIVE responses obtained in August 2014 and August 2015 revealed (1) a broad increase in resistivity ~400 m below the bottom of the first Nakadake crater and (2) a decrease in resistivity ~100 m beneath the western rim of the crater (Minami et al. 2018). Both changes in resistivity presumably originated before MEP because the corresponding variation in the ACTIVE response happened mainly between the two observation campaigns in August 2014 and just after the starting of MEP, say, on November 26, 2015. The decrease of resistivity at shallow level implies presence of a temporal fluid reservoir which appeared prior to MEP and possibly contributed to the phreatomagmatic eruptions in September 2015 and October 2016. We are now analyzing the ACTIVE responses after MEP to resolve evolution of the hydrothermal system of Aso volcano over the active period spanning from November 2014 to October 2016.

In the presentation, we comprehensively discuss evolution of the hydrothermal system of Aso volcano from August 2014 to August 2017, including MEP from August 2014 to May 2015 and the two phreatomagmatic eruption events in September 2015 and in October 2016, by using ACTIVE data sets.

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