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Lateral degassing inferred from electric resistivity surveys

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Recently, the volatiles in magma are considered to be important for understanding volcanic eruptions, because they may control the occurrence and the style of eruptions (e.g., Eichelberger et al., 1986; Jaupart and Allegre, 1991). The highly degassed magma results in the calm eruption such as lava dome formation and lava flow, while magma containing large fraction of gas can lead to the explosive eruptions. For predicting the volcanic activities, it is important to monitor not only the subsurface magma movement but also the subsurface degassing.
The volcanic gas measurement can infer the gas volume vertically emitted from the crater. However, it is usually difficult to measure the laterally degassed volatile. The measurement of CO 2 flux from soil (e.g., Baubron et al., 1990; Hernandez et al., 2001) is an alternative approach. However CO2 flux from soil does not represent entire degassing because some amount of the volatile is trapped in the groundwater by dissolution. The gravity change is directly related to the subsurface mass movement, in which the degassing process is involved. Indeed, from the repeated gravity measurement, the subsurface lateral fluid release from magma (degassing) is suggested in the Teide volcano (Gottsmann et al., 2006). However, its time resolution is presently not so high due to the difficulty to conduct continuous gravity measurement.
We think that electric resistivity monitoring by magnetotelluric technique may bring the additional information in investigating the lateral degassing beneath a volcano. The laterally degassed volatiles are absorbed by groundwater at the shallow level beneath the volcano by dissolution. As a result, the amount of dissolved ions changes, and subsequently may cause the groundwater resistivity change. We will discuss the possibility of above scenario with the results of resistivity surveys at Sakurajima and Mt. Fuji.