

Magma transport along structure boundary in the upper crust: Insight from Broadband Magnetotelluric surveys in Unzen volcano

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(上部地殻におけるマグマの移動：雲仙火山における広帯域 MT 観測
からの示唆)

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論 文 内 容 の 要 旨

Abstract

Unzen volcano, located in Shimabara Peninsula, Nagasaki, Japan, is an active volcano and monitored intensively before the last eruption in 1990-1995. Earthquakes and surface deformation have revealed that magma was transported obliquely from the western offset magma. Broad-band magnetotelluric (MT) surveys were conducted at 99 sites around the Shimabara Peninsula. Our 3-D resistivity model shows a broad high resistivity zone beneath Shimabara Peninsula and low resistivity zones in the west and east side of Shimabara Peninsula. Unexpectedly, the high resistivity zone at 3 km to 15 km depth spatially correlates with low-velocity zone (Miyano et al., 2021). By using the composition of melt inclusion of the erupted products, we estimated that < 5% melt may exist in the high resistivity zone and low-velocity zone. Thus, we propose the high resistive zone and low-velocity zone as the highly crystallized mush zone containing < 5% melt fraction with low permeability. The earthquake and pressure sources of the 1990-1995 are distributed along the upper boundary of the high-resistivity and low-velocity zone. Thus, we conclude that the magma migrated along the structure boundary where the permeability is relatively high. It was suggested that eruptible magma is usually transported vertically upward through the center of mush zone, while our result of this study offers new insight that the magma can be transported along the upper boundary of highly crystallized mush zone.

Keywords: magnetotelluric, high resistivity zone, Unzen volcano, highly crystallized mush zone, magma transport, upper boundary