Deep low-frequency earthquakes and seismic velocity strucutre beneath Fuji and Iwate volcanoes

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We present the relationship between low-frequency (LF) earthquakes and anomalies of seismic velocity structure beneath Fuji and Iwate volcanoes.

We first compare hypocenters of LF earthquakes with a fine S wave velocity structure of the crust and uppermost mantle of Iwate volcano from a receiver function analysis [Nakamichi et al., 2002]. The distribution of velocity perturbations in relation to the hypocenters of the LF earthquakes helps our understanding of deep magmatism beneath Iwate volcano. A high-velocity region exists around the volcano at depths of 2 - 15 km, with the bottom depth decreasing to 11 km beneath the summit. Just beneath the thinning high velocity region, a low-velocity region exists at depths of 11 - 20 km. Intermediate-depth LF (ILF) earthquakes are distributed vertically in the high-velocity region down to the top of the low-velocity region. This distribution suggests that a magma reservoir situated in the low-velocity region supplies magma to a narrow conduit that is detectable by the hypocenters of LF earthquakes. Another broad low-velocity region occurs at depths of 17 - 35 km. Additional clusters of deep LF (DLF) events exist at depths of 32 - 37 km in the broad low-velocity zone. The DLF and ILF events are the manifestations of magma movement near the Moho discontinuity and in the conduit just beneath Iwate volcano, respectively.

We obtained the three-dimensional P (VP) and S wave velocity (VS) and P wave to S wave velocity ratio (VP/VS) structure beneath and compared between hypocenters of LF earthquakes and the velocity structure [Nakamichi et al., submitted]. A low-VP, VS and VP/VS anomaly at depths of 7-17 km exists beneath Mount Fuji, corresponding to locations of low-frequency (LF) earthquakes. Supercritical CO2-H2O volatile fluid may be abundant in the low-VP/VS region and play important role for generating the LF earthquakes. A low-VP, VS and high-VP/VS anomaly at depths of 15-25 km beneath Mount Fuji suggests a zone of basaltic partial melt.