Tectonic implications around Mt. Fuji inferred from wide-band magnetotelluric sounding

Koki Aizawa[1]; Ryokei Yoshimura[2]; Ken-ichi Yamazaki[3]; Tomofumi Uto[4]; setsuro Nakao[5]; Naoto Oshiman[2]; Yasuo Ogawa[6]; S. Bulent Tank[7]; Wataru Kanda[8]; Takeshi Hashimoto[9]; Shin'ya Sakanaka[10]; Makoto Uyeshima[11]; Tsutomu Ogawa[12]; Shigeru Koyama[11]; Tsuneomi Kagiyama[13]; Ichiro Shiozaki[14]

[1] Earth and Planetary Sci.Kyoto Univ; [2] DPRI, Kyoto Univ.; [3] Science., Kyoto Univ; [4] RCEP DOPRI Kyoto Univ.; [5] RCEP, DPRI, Kyoto Univ.; [6] TITECH, VFRC; [7] Earth and Planetary Sci., Titech; [8] DPRI,Kyoto Univ; [9] Inst. Seismol. Volcanol., Hokkaido Univ.; [10] Engineering and Resource Sci., Akita Univ; [11] Earthq. Res. Inst., Univ. Tokyo; [12] Eri, Univ. Tokyo; [13] Earthquake Research Institute, University of Tokyo; [14] Dept. of Civil Eng., Tottori Univ

Mt. Fuji (called Fuji-san) is the highest and largest stratovolcano in Japan, and its eruption rate (about 1000km³/100,000years) is larger than most other island-arc volcanoes by one order of magnitude [Fujii, 2001]. Mt. Fuji has emitted only basalt [e.g., Tsuya, 1971; Takahashi et al, 1991] for its entire history of about 100,000 years despite the fact that it is an island-arc type volcano. It has been suspected that these unique features may be due to the special tectonics settings around Mt. Fuji.

The tectonics of the region around Mt. Fuji is very complex with three converging plates, the Eurasia (EUR), the North American (NAM), and the Philippine Sea (PHS) plates. Beneath Mt. Fuji, the PHS plate is subducting along the Sagami and Suruga troughs toward the northeast, and Pacific plate is subducting along the Japan Trench toward the west. This region also can be regarded as a cross over area between the volcanic front and plate boundary regions. Furthermore this region is a zone of collision where the Izu block is colliding with the Honshu block and is pushing it north-northwestward since the early Quaternary (2Ma to present) [Matsuda, 1978]. Naturally, this region is characterized by a highly deformed zone with many historic earthquakes, but a remarkable lack of seismicity is recognized around Mt. Fuji, so many previous studies disagree on the exact location of the plate boundary and the detailed configuration of the PHS plate [e.g., Sugimura, 1972; Nakamura and Shimazaki, 1981; Seno, 1986; Iidaka et al., 1990; Ishida, 1992]. Whether or not the PHS plate exists in this aseismic area is also not clear.

In order to clarify the subsurface structure, and understand the relation between tectonic processes and the unique features of Mt. Fuji, we carried out wide-band magnetotelluric (MT) soundings across Mt. Fuji along a 70km observation line trending northeast to southwest.The profile shows that a conductive body is located between two resistive bodies at depths greater than 15km. Low frequency earthquakes occur at the top of the conductor. We interpret these results in a model similar to Takahasi [2000], where beneath Mt. Fuji the subducting Philippine Sea plate is split into two parts, and a magma chamber is located in the gap. Due to this unique structure, Mt. Fuji may be able to emit the high rates of basalt magma throughout its entire history.