

Marine magnetotelluric data supports melt at the LAB as the origin of the petit-spot in the northwestern Pacific

*馬場 聖至¹、阿部 なつ江²、平野 直人³、市來 雅啓⁴

*Kiyoshi Baba¹, Natsue Abe², Naoto Hirano³, Masahiro Ichiki⁴

1. 東京大学 地震研究所、2. 海洋研究開発機構 海洋掘削科学研究開発センター、3. 東北大学 東北アジア研究センター、4. 東北大学 大学院理学研究科 地震・火山噴火予知研究観測センター

1. Earthquake Research Institute, The University of Tokyo, 2. Research and Development Center for Ocean Drilling Science, Japan Agency for Marine-Earth Science and Technology, 3. Center for Northeast Asian Studies, Tohoku University, 4. Research Center for Prediction of Earthquakes and Volcanic Eruptions, Graduate School of Science, Tohoku University

Small-scale volcanoes possibly associated with flexure of oceanic lithosphere are called “petit-spots” and petit-spot volcanic fields have been recognized in many places in the world since the first discovery in northwestern Pacific (NWP) (Hirano et al., 2001; 2006). We have investigated the electrical conductivity structure of the lithosphere and asthenosphere through marine magnetotelluric (MT) survey to elucidate the magma generation and migration process of the NWP petit-spot. The MT array that consists of nine sites and covers about 1,000 km times 1,000 km area around the petit-spot. The data were collected during several periods in 2002–2008. A one-dimensional (1-D) representative structure in the array was first estimated to explain the averaged MT responses in the array. The 1-D profile suggest that the resistive layer, which may be interpreted as cool lithosphere, is likely thicker than predictions by typical models for thermally conductive cooling of the lithosphere having a finite thickness over time since its creation at a mid-ocean ridge (Baba et al., 2017). We have further analyzed the data using a three-dimensional inversion approach (Siripunvaraporn et al., 2005; Tada et al., 2012; Baba et al., 2013). The results show that the resistive lithospheric layer is thinner beneath the area off the outer rise along the Japan –Kuril Trench and the conductive anomaly may be centered just beneath the petit-spot field. This feature may suggest that the melt in the lithosphere –asthenosphere boundary (LAB) cumulates in the area as the result of the plate flexure. The model also shows a robust conductive anomaly in the upper most mantle depth beneath the petit-spot field, which encourages us to associate the volcanic activity at the seafloor and the anomaly in the LAB. Therefore, our result should be the first geophysical evidence directly supporting that the origin of the petit-spot magma is in the LAB although the origin has been discussed only based on geochemical evidences obtained from the lava samples. Further quantitative interpretation of electrical conductivity in terms of temperature, melt fraction and volatile (H₂O and CO₂) contents in the mantle will also be attempted and presented in the conference.

キーワード：電気伝導度、プチスポット、部分溶融、リソスフェア・アセノスフェア境界

Keywords: electrical conductivity, petit-spot, partial melt, Lithosphere - asthenosphere boundary