Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SIT002-09 Room:301B Time:May 27 11:00-11:15

Active mantle upwelling at fast-spreading ridge deduced from seismic images of old oceanic lithosphere in the NW Pacific

Shuichi Kodaira[1*], Gou Fujie[1], Naoto Noguchi[1], Mikiya Yamashita[1], Takeshi Sato[1], Tsutomu Takahashi[1], Yuka Kaiho[1], Yujiro Yamamoto[1], Narumi Takahashi[1], Daisuke Nishiura[1], HIde Sakaguchi[1]

[1]JAMSTEC

One of long-standing questions about the mantle flow, which governs an accretion process of oceanic lithosphere, at the mid-oceanic ridges has been whether the mantle upwelling is active or passive. Although there are lines of geological and geophysical evidences which support dominantly passive upwelling at the mid-oceanic ridges in a sense of the global plate tectonics, it is also possible that, when decompression melting occurs, low density melt is preserved in the mantle to create local buoyancy which forms mantle convection near the spreading axis. A few study about ophiolite and gravity anomalies in the East Pacific Rise demonstrated a possible active upwelling diapirs at the ridges, but yet no seismological evidence which directly indicates the active upwelling has been observed. Here, from seismic data acquired at the old Pacific plate (120 ? 130 Ma) off the Kuril trench, we show very high P-wave velocity (Vp = 8.6 km/s) and strong anisotropy (7 %) in the uppermost mantle immediately below the oceanic crust having lower crustal reflectors (LCRs) dipping toward the paleo-ridge with dominantly uniform spacing and dipping. Similar LCRs have been reported by previous seismic studies in the northwestern and eastern Pacific. Based on geometry and distribution of the LCRs, there has been much debate about an origin of the LCR. For example, thermal and chemical modeling predicted that the LCRs were lithological layering formed by downward and outward flow from an axial magma chamber due to passive upwelling of mantle. On the other hand, based on ophiolite studies, it is proposed that ridge-ward lower crustal fabrics may be formed by a basal shear at the crust due to the active mantle upwelling. Our new observations present the first direct seismological evidence indicating strong basal share of the oceanic crust due to the active upwelling of mantle at the mid-oceanic ridge.

Keywords: Oceanic lithosphere, Seismic imaging, Crust, Mantle, Anisotropy