Crustal structure and fluid distribution beneath the southern Hidaka collision zone based on 3-D resistivity modeling

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Erimo area, south end of Hokkaido Island is located on the south part of Hidaka collision zone where Kurile and the north-eastern (NE) Japan arcs are collided. This area is an attractive research field to understand mechanism of continent evolution and deep inland earthquakes because 1) ultra-mafic rocks are outcropped although the delamination hypothesis of Kurile arc indicates uplift and down lift of upper-middle and lower crust rocks, respectively, and 2) inland earthquakes occurs anomalously depth (e.g. 1970 Hidaka earthquake M6.7). We conducted wideband and long-period magnetotelluric surveys at 27 sites in the Erimo area and obtained 3-D resistivity models based on inversion procedure. Reliable features of the inverted models and their interpretations are as follows. 1) A low resistivity zone (C-1) is distributed beneath the Hidaka main thrust (HMT) and extends to the uppermost part of subducting Pacific slab. The high seismicity in the subducting slab in C-1 implies dehydration embrittlement. The C-1 around arcs boundary implies upwelling fluid along the HMT, which may affect the deep inland earthquake. 2) Ultra-high resistivity zone (R-1), which probably reflects dry metamorphic rocks, is distributed underneath the Hidaka metamorphic belt. The boundary between C-1 and R-1 is spatially consistent to the boundary between the delamination wedge and delaminated upper-middle crust (Ito, 2000). It supports the proposed collision model based on seismic surveys.

Figure caption: (a) Locations magnetotelluric stations. (b) A vertical cross-section of inverted resistivity model beneath the line X-X’. Gray lines denote geological boundaries based on seismic surveys (Ito 2000). White circles denote hypocenter between 2000 and 2012 by JMA. (c) Interpretation of the resistivity model.

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