The Upper Main Central Thrust as a plate boundary: Nd isotopic geochemistry in Nepal Himalaya

Takeshi Imayama[1]; Kazunori Arita[2]

[1] Dept. Natural History Sci., Hokkaido Univ.; [2] The Hokkaido University Museum, Hokkaido Univ.

The Main Central Thrust (MCT), a present tectono-metamorphic boundary between the Higher Himalayan crystallines (HHC) and Lesser Himalayan metasediments (LHS), is an Early Paleozoic plate boundary which was reactivated in the Tertiary (DeCelles et al., 2000; Imayama and Arita, 2007, in press). We define so-called MCT as a ductile-brittle shear zone (MCT zone) between the upper MCT (UMCT) at the top and lower MCT at the base.

To investigate the nature of the MCT, we analyzed whole-rock Nd isotopic ratios of rocks from the MCT zone and its footwall and hanging wall in far-eastern, central, and western Nepal. In far-eastern Nepal, their eNd (0) values of different lithologic units are as follows; HHC (-10.0 to -18.1), MCT zone (-18.5 to -26.2), upper LHS (-17.2), and lower LHS (-22.0 to -26.9). There is a distinct gap in the eNd (0) values across the UMCT except for the southern frontal edge of the Ilam nappe. In central and western Nepal, different lithologic units and their eNd (0) values are as follows; HHC (-13.9 to -17.7), MCT zone (-23.8 to -26.2 except for an outlier of -12.4), upper LHS (-15.6 to -26.8), and lower LHS (-24.9 to -26.8). These isotopic data clearly distinguish the lower LHS from the HHC across the UMCT.

Most rocks of the MCT zone have Nd isotopic ratios similar to those of the LHS, but quite different from those of the HHC. The spatial patterns in the distribution of eNd (0) value around the UMCT suggest no substantial tectonic mixing of the HHC and LHS during the MCT activities in the Tertiary. These facts support the idea that the UMCT was originally a material boundary between the HHC and LHS, and suggest the UMCT was a plate boundary.

DeCelles et al., 2000, Science, 288, 497-499; Imayama and Arita, 2007, Tectonophysics, in press.