Depleted SSZ type mantle peridotites in Proterozoic Eastern Sayan Ophiolites in Siberia

KUO-LUNG WANG[1], ZHUYIN CHU[2], MARINA A. GORNOVA[3], VASILII A. BELYAEV[1,3], KUAN-YU LIN[1,4], SUZANNE Y. O'REILLY[5]

[1]Inst. Earth Sciences, Academia Sinica, Taipei, Taiwan
[2]Inst. Geology and Geophysics, Chinese Academy of Sciences, Beijing, China
[3]Inst. Geochemistry, Siberian Branch, Russian Academy of Sciences, Irkutsk, Russia
[4]Dept. of Geosciences, Natl. Taiwan Univ., Taipei, Taiwan
[5]CCFS/GEMOC Key Centre, Dept. of Earth and Planetary Sciences, Macquarie University, Sydney, Australia

New whole-rock major-, trace-elemental chemistry, including platinum-group elements (PGE), and Re–Os isotope data from the upper mantle peridotites of Proterozoic (1020 Ma; Khain et al., 2002) Eastern Sayan Ophiolites in Hara-Nur and Ulan-Sardag massifs in Siberia reveal existence of depleted supra subduction zone (SSZ) type ophiolitic peridotites. They consist of depleted harzburgites in Hara-Nur massif, and mainly depleted harzburgites with minor dunite and one orthopyroxenite in Ulan-Sardag massif. Comparing to the Hara-Nur harzburgites having Al_2O_3 contents of 0.48-0.83 wt.% and $^{187}Os/^{188}Os(i)$ ratios from 0.1173 to 0.1242 with Cr contents of co-existing spinel ranging from Cr#=44 to 65, the Ulan-Sardag harzburgites are characterized by lower Al_2O_3 (0.60 and 0.71 wt.%) and $^{187}Os/^{188}Os(i)$ ratios of 0.1151 and 0.1235 with narrower range of spinel Cr# of 53 and 63. The Ulan-Sardag dunite has the lowest Al_2O_3 content of 0.35 wt.% and $^{187}Os/^{188}Os(i)$ ratio of 0.1135. Mineral chemistry and whole-rock trace and PGE data indicate that formation of the Hara-Nur and Ulan-Sardag peridotites cannot be explained by a single stage melting event but at least two-stages of melting and re-enrichment processes are needed to explain their geochemical characteristics. Their trace-element patterns are similar to residual peridotites melted in a SSZ environment (Parkinson and Pearce, 1998; Uysal et al., 2012) indicating these depleted harzburgites and dunites are the product of melting and related re-enrichment took place in SSZ. The Re–Os isotope compositions of the Hara-Nur and Ulan-Sardag peridotites yield model age peaks at ~2300 Ma, 2100 Ma, ~1400-1600 Ma and ~950Ma, which may record major tectonic events prior to and associated with closure of palaeo-Asian ocean at the southern margin of the Siberian craton since the late Mesoproterozoic time.