Composition of the lithospheric mantle beneath the Khamar Daban Ridge, south Russian Siberia: Constraints from mantle xenoliths

K.-L. WANG[12]*, S. D'RIL[3], S.Y. O'REILLY[2], M. I. KUZMIN[3], W. L. GRIFFIN[2] AND N. J. PEARSON[2]

[1]Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan (*correspondence: kwang@earth.sinica.edu.tw)
[2]CCFS/GEMOC, Macquarie University, Sydney, Australia
[3]Institute of Geochemistry, SB Russian Academy of Sciences (RAS), Irkutsk, Russia

Mantle xenoliths from basaltic lavas of the Miocene Tumusun Volcano in the Khamar Daban Ridge (KDR), south Russian Siberia, have been studied to characterize the subcontinenal lithospheric mantle (SCLM) beneath the Slyudyansky terrane. These xenoliths are dominantly spinel-bearing lherzolites, with equilibration temperatures from 950 to 1100 °C. The Fo contents of olivine range from 89.2 to 90.4 with Cr# in spinel ranges from 0.08 to 0.14. Although most lherzolies fall in the "Phanerozoic" field of the Boyd diagram, a few plot toward to the Proterozoic range. The Os isotope compositions of sulfides in these lherzolites reveal the presence of Proterozoic SCLM beneath the KDR region. Their in-situ Os isotope compositions ($^{187}Os/^{188}Os$) range from 0.1063 (±8)to 0.1431 (±48) with $^{187}Re/^{188}Os$ ratios of 0.004-0.862. Both T_{MA} from the least-disturbed sulfides ($^{187}Re/^{188}Os<0.07$) and T_{RD} from higher Re/Os sulfides, which assume no later introduction/loss of Os, yield model ages ranging from 0.7 to 3.0 Ga, with peaks around 2.0 and 1.2-1.0 Ga. These ages suggest that the SCLM beneath the KDR region formed at least by Proterozoic time, and that some domains are Archean. The sulfide Os ages are consistent with events recorded in the overlying crust. Younger sulfide Os ages (1.2-1.0 Ga) may mark the commencement of the Central Asia Orogeny since the Neoproterozoic and involvement of the mantle as suggested by Sengor et al. (1993) and Jahn (2004). These are the first results showing an ancient root beneath the KDR region, and they are consistent with ages of detrital zircons up to 2.9 Ga from the Slyudyansky terrane (Kovach et al., 2013). A compilation of other at least Mesoproterozoic lithospheric mantle Os model ages from the Vitim, Tariat and Khanka regions (Wang et al., 2011, 2013, 2014) suggests that ancient micro-continents are prevailent in the Central Asia Orogenic Belt, which might diminish the extent of juvenile crustal growth previously estimated to have occurred during this Orogeny .