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Ancient continents among the accretionary complexes of the Central Asia Orogenic Belt: in situ Os isotope evidence

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In this study, we demonstrate in situ Os model ages on sulfides in the peridotitic xenoliths from off-cratonic setting (Tariat and Dariganga, Mongolia; Vitim and Hamar Daban range (HDR), Russia) of the Neoproterozoic-Phanerozoic Central Asia Orogenic Belt (CAOB) to examine lithospheric formation. Both T_{MA} from the least-disturbed sulfides ($^{187}Re/^{188}Os<0.07$) and T_{RD} from higher Re/Os sulfides without later introduction/loss of Os from the Tariat region, yield model ages ranging from 0.5 to 3.0 Ga, with peaks around 1.7-1.5, 1.2 and 0.7-0.5 Ga. These ages suggest that the sub-continental lithospheric mantle (SCLM) beneath the Tariat region formed at least by the Proterozoic time, and that some domains are Archean [1]. The oldest age reported on the Precambrian Tarvagatay Terrane, where is underlain by Tariat volcanic field, is ca 3.05 Ga by Pb-Pb zircon dating in anorthosite [2]. Other zircon U-Pb ages from nearby anorthosites are 1.78 and 1.7 Ga (I. Kozakov unpubl. data). The sulfide Os ages are consistent with these formation events recorded in the overlying crust. Younger sulfide Os ages (1.2 and 0.7~0.5 Ga) may mark the commencement of the Central Asia Orogeny since the Neoproterozoic and involvement of the mantle as suggested by Jahn [3].

For HDR peridotites, both TMA from the least-disturbed sulfides and TR_D from higher Re/Os sulfides 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 HDR region formed at least by the Proterozoic time, and that some domains are Archean. For Vitim peridotites, although their sulfides have younger model ages, which range from 0.6 to 1.8 Ga with peak ages at 1.2-1.0 and 0.5 Ga, these ages still indicate parts of the SCLM beneath Vitim region have resided at least since Mesoproterozoic. The sulfide Os ages are consistent with these formation events recorded in the overlying crust. Younger sulfide Os ages (1.2-1.0 and 0.5 Ga) may mark the commencement of the Central Asia Orogeny since the Neoproterozoic and involvement of the mantle as suggested by Jahn [3]. This could be the first result showing ancient root beneath the HDR region, consistent with dating results of detrital zircons from near-by regions up to 2.9 Ga [4]. However, compiling with Mesoproterozoic Os model ages (up to 2.0 Ga) from the Vitim region, ancient lithospheric mantle domains are prevailing in the Central Asia Orogenic Belt, which might diminish extents of juvenile crustal growth in the Orogeny as expected before.

Sulfides in Dariganga peridotites also have Mesoproterozoic Os model ages (two T_{MA} of 2.0, 1.4 Ga and two T_{RD} of 1.8, 1.2 Ga). Although Proterozoic crustal events have not been reported in this region so far, Proterozoic Nd model ages for basement rocks around the Xilinhot region in the vicinity of the Dariganga Plateau (B. Chen, pers. comm.) suggest that a Precambrian crustal terrain, a counterpart of the

underlying Mesoproterozoic lithospheric mantle, should be expected and might be found by studies of deep-crustal xenoliths in the Dariganga region.

References:

[1] Wang K-L et al (2013) J. Asian Earth Sci. 62: 37-50.

[2] Mitrofanov, F P (1985) Doklady Academii Nauk SSSR 284 (3): 671–674 (in Russian).

[3] Jahn B-m (2004) In: Aspects of the Tectonic Evolution of China: Geol. Soc. London. Spec. Pub. 226: 73-100.

[4] Kovach V P et al (2013) J. Asian Earth Sci. 62: 18-36.