

Composition of the Lithospheric Mantle in the Northern Siberian Craton: Constraints from Peridotites in the Obnazhennaya Kimberlite

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The characteristics of the sub-continental lithospheric mantle (SCLM) post-date the Siberian plume event (250 Ma) is still unclear; nearly all published data for mantle xenoliths are from a single kimberlite erupt before the Siberian plume (Udachnaya). We report major elements of the whole rock, trace elements data of clinopyroxene and Re-Os isotope and PGE concentration of mantle xenoliths from the Obnazhennaya kimberlite pipe (160 Ma). The Obnazhennaya mantle xenoliths, including spinel harzburgites, spinel dunites, spinel lherzolites, spinel-garnet lherzolite. The spinel harzburgites and dunites have refractory compositions, with 0.23-1.35 wt.% Al_2O_3 , 0.41-3.11 wt.% CaO and 0.00-0.09 wt.% TiO_2 . Clinopyroxenes in harzburgites and dunites have lower Na_2O but higher Cr_2O_3 contents. Modeling of the Y and Yb contents in clinopyroxenes indicates that the spinel harzburgites and dunites have been subjected to ca. 12-17% degrees of partial melting. The spinel harzburgites and dunites have $^{187}\text{Os}/^{188}\text{Os}$ of 0.11227-0.11637, giving a T_{RD} age of 1.6-2.2 Ga. This suggests that old cratonic mantle still existed beneath the Obnazhennaya. In contrast, the lherzolites (both spinel- and spinel-garnet-) have more fertile compositions, containing 2.16-6.55 wt.% Al_2O_3 , 2.91-7.55 wt.% CaO and 0.04-0.15 wt.% TiO_2 . Both spinel and spinel-garnet lherzolites have more radiogenic $^{187}\text{Os}/^{188}\text{Os}$ ratios (0.11931-0.17627), enriched P-PGEs. The higher Al_2O_3 and Os content and depleted IPGE character of these lherzolites suggest that they were not juvenile mantle accreted by Siberian mantle plume but the refertilized ancient mantle. Therefore, our result suggest that the cratonic mantle beneath the Obnazhennaya has not been replaced by juvenile mantle during the Siberian mantle plume.