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Lithospheric delamination underneath Far East Russia

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In the back-arc environment of Far East Russia, mantle xenoliths from Sikhoti-Alin(Komku area, KO) and Primorie (Sviyaginsky area, SV), Far East Russia are fertile spinel lherzolites with traces of amphibole, phlogopite and hyalophane in some of the studied samples. Though samples from both localities are fertile there is a systematic difference in their fertility. The KO samples have mg# varying from 0.891 to 0.899 and are slightly more fertile than the SV samples that have mg# ranging from 0.898 to 0.904. LA-ICP-MS analyses on clinopyroxenes confirm this trend as the (La/Yb)N in KO samples range from 0.1to 1.0 and in SV samples from 0.15 to 1.73.

The estimated equilibration temperatures for the KO suite range from 940 °C to 1035 °C and for the SV suite from 770 to 945. The differences in the estimated equilibrium temperatures between the KO and SV suites suggest that the less fertile SV suite originated in shallower depths than the more fertile KO suite.

Pargasitic amphibole, kaersutite, and extremely Ti-rich phlogopite, up to 14 wt% TiO_2, are associated with intergranular glass indicating clearly metasomatism of undersaturated hydrous alkaline melts. Incompatible element abundances, besides Ba, Sr and Ti that are slightly enriched in the amphibole, are similar in both phases suggesting minor metasomatism due to percolation of small amounts of water-rich fluids.

The Sr and Nd cpx isotopic ratios range from 0.702599 to 0.703567 and 0.512915 to 513153, repectively and the model Nd isotope age range from 1.5 to 2.2 Ga indicating an old (Proterozoic?) partial melt event.

The lithospheric mantle beneath the studied area represents the residue after partial melting of up to 2 % of a primitive mantle and is comparable to that of Mongolia. Despite the fact that the studied area experienced several subducting episodes, the lithospheric mantle appears to be unaffected from the upwelling fluids/melts of the subducted slab(s). Since there is no indication for plume activity, and/or evidence for refertilization, it is likely that the lithospheric mantle has been delaminated as the result of tectonic events (lithospheric attenuation, inverse tectonic) associated with the subduction processes and that the studied spinel lherzolites represent upwelling asthenosphere.