Stepwise crushing data on light noble gases in Guli massif peridotite and carbonatites

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Guli massif (Maymecha-Kotuy magmatic province, Eastern Siberia) is the largest alkaline-ultramafic complex in the world [1]. Our previous study [2] based on relationships between C, N and Ar concentrations as well as on differences in C and Ar isotopic compositions in fluid inclusions of the early and late carbonatites has shown an open system behavior of the fluid phase: At the late stages of Guli massif carbonatite formation an additional CO_2 source with heavier carbon and atmosphere-like Ar have contributed to the system. But the type of primary source (i.e. shallow or deep mantle) remained unclear. To better understand the fluid phase sources of Guli carbonatites and associated ultramafic rocks we have studied He and Ne isotopic composition in carbonatites (85-134Cal, 85-126Cal) and pyroxenite (85-151Px) samples extracting gases by stepwise crushing.

The $^4He/^3He$ ratios in crushing steps vary from typical for subcontinental lithospheric mantle (SCLM, ~120000 [3] [4]) to more radiogenic values (up to 300000). The ratios depend on primary ^3He concentrations: the higher the ^3He content the lower the $^4He/^3He$ ratios, which approach the SCLM values. The neon isotopic composition also supports the SCLM as primary source for the fluid phase: The data points of the very first crushing steps of Guli85-134Cal and 85-126Cal samples plot close to the SCLM mixing line [4] [5]. With progressive crushing one can observe an increase of the nucleogenic component in the neon budget, which is most probably the result of addition of *in situ* nucleogenic neon that is extracted with increasing number of strokes while primordial neon is decreasing.

Thus, He and Ne isotope compositions reveal the SCLM as the most plausible primary source of Guli massive carbonatites and earlier ultramafic rocks.

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