MAGMA GENESIS AND EVOLUTION IN THE KOLA ALKALINE-CARBONATITE PROVINCE. A PB-SR-ND ISOTOPE STUDY.

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The Kola Peninsula (NW Russia) is well known for its late Devonian (380-360Ma) ultramafic, alkaline and carbonatic magma province, that comprises more than 20 intrusions including the two giant massifs of agpaitic nepheline syenite of Khibina and Lovozero and numerous smaller annular differentiated complexes (i.e. : Kovdor, Vuorijarvi, Ê). These massifs intrude the Archean to Proterozoic crustal terranes. Whole rock Pb isotope data are reported for the first time on these intrusions. Representative samples of the Kovdor massif (carbonatites, ultramafic cumulates, ijolites-melteigites) have been analysed. Two U-rich pyrochlore-bearing carbonatites have extremely high measured 206Pb/204Pb and 207Pb/204Pb ratios (94.1 to 253.6 and to 19.6 to 28.2 respectively). Together with 5 other samples, these carbonatites plot along a linear array in the 207Pb/204Pb-206Pb/204Pb diagram. Interpreted as a secondary isochron, this array gives an age indication of 392+/-15 Ma (MSWD = 22), in agreement with the U-Pb baddeleyite age of 380+/-4 Ma. Crustal contamination or source heterogeneity are hardly detectable with such radiogenic Pb composition. Some samples of other massifs of the Kola region (Khibina, Lovozero, Sebljavr and Ozernaya Varaka) have also been analysed, they plot reasonably close to the Kovdor Pb-Pb isochron, confirming that all the complexes of the province are grossly contemporaneous. Although most rocks plot in the depleted mantle quadrant of the Sr-Nd diagram, the data show some dispersion. The Kovdor ultramafic cumulates and carbonatites have overlapping compositions (epsNd(t): +0.5 to +6 ; (87Sr/86Sr)I: 0.7031 to 0.7039) while the ijolites-melteigites tend to have lower epsNd(t) (+0.5 to -3.4) and higher (87Sr/86Sr)I (0.7035 to 0.7047) values. This dispersion can be explained either
by heterogeneities of the mantle (or mixing between different geochemical reservoirs) or by open system behaviour during complex emplacement history and hydrothermalism. Crustal contamination is difficult to ascertain by Sr and Nd isotopes because most rocks have higher Sr and REE contents than crustal materials. By contrast, Pb isotopes are more sensitive to crustal contamination. The initial 207Pb/204Pb and 206Pb/204Pb ratios (recalculated at 380Ma) define a short linear trend, that could represent a mixing line between a HIMU (or FOZO) type of reservoir (with $\mu > 10$, 87Sr/86Sr $< 0.703$ and epsNd $> 5$) and average lower crustal material ($\mu < 10$, 87Sr/86Sr $> 0.7045$ and epsNd $< -4$). These magmas have possibly undergone crustal contamination during their ascent through the thick (55km) cratonic crust of Kola.