Ce-Nd isotopic composition of the continental crust : first measurements of lower crust samples

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The continental crust (CC) is the main reservoir of light rare earth elements (LREE) in the silicate Earth. Its bulk chemical composition is established as accounting for 70% of the total LREE budget [1]. The isotopic composition of the lower crust is not as well constrained as that of the upper crust. It has been shown that crustal samples from both upper and lower crust plot along the εHf-εNd mantle array [2]. However, current Ce-Nd budget equations of the silicate reservoirs predict that (1) the bulk CC is distinct from the εCe-εNd mantle array; (2) the lower crust has negative εCe, in order to balance with the upper crust located on the mantle array [3, 4].

In this study, we combine the analysis of ^{138}La-^{138}Ce, ^{147}Sm-^{143}Nd and ^{176}Lu-^{176}Hf isotope systems to study a depth profile of the crust in three different locations : modern xenoliths from Beaunit (French Massif Central) and uplifted crust from the Southern Ivrea-Verbano zone (Italy) ; and 1.8 to 2.7 Ga xenoliths from Udachnaya (Siberian craton). The selected samples covers a wide range of compositions from mafic to felsic. Cerium isotopes were measured by TIMS using the procedure described in Bonnand et al., 2019 [5]. Nd and Hf isotope ratios were measured by TIMS and MC-ICP-MS, respectively. Preliminary results obtained on the youngest samples show an alignment in the Ce-Nd isotopic space, covering the main part of the mantle array. Measurements of Siberian samples are in progress. Our new results will better constrain the Ce-Nd isotopic composition of the bulk CC. From these results, we can shed some light on the local variability of the crust and discuss the models of crust formation.

[1] Rudnick and Gao (2014) ToG **3**, 1-51 ; [2] Vervoort et al. (2000) EPSL **181**, 115-129 ; [3] Israel et al. (2020) EPSL **530**, 115941 ; [4] Willig and Stracke (2019) EPSL **509**, 55-65 ; [5] Bonnand et al. (2019) JAAS 34, 504-516.