# The La-Ce isotope systematics in Gough Island lavas: new constraints on the origin of the EM1 component

M. BOYET[1], R. DOUCELANCE[1], C. ISRAEL[1], P. BONNAND[1], D. AUCLAIR[1], K. SUCHORSKI[1], C. BOSQ[1]

[1] Laboratoire Magmas et Volcans, CNRS UMR 6524, Université Clermont Auvergne, F-63000 Clermont-Ferrand, France.

Hotspot lavas show a large diversity of isotope compositions resulting from the recycling of surface material into the convective mantle. Amongst the mantle end-members, EM-1 (enriched mantle) is widely debated and scenarios involving either old pelagic sediments subducted into the deep mantle or subcontinental lithospheric material incorporated at shallow depths are commonly evoked. The aim of the present study is to combine the measurement of Rare Earth Elements (REE) and of several isotope systems ($^{147}$Sm-$^{143}$Nd, $^{176}$Lu-$^{176}$Hf, $^{138}$La-$^{138}$Ce) in order to better understand the origin of the EM1 component. The use of the $^{138}$La-$^{138}$Ce isotope systematics ($T_{1/2}$ = 292.5 Ga; *Tanimizu*, Phys. Rev 2000) is particularly well adapted since a reservoir carrier of a negative cerium anomaly is characterized by fractionated La/Ce ratios and thus will develop radiogenic $^{138}$Ce/$^{142}$Ce ratios with time.

We selected 12 lavas from Gough Island (South Atlantic Ocean). Negative cerium anomalies (Ce/Ce*<0) measured in these samples were attributed to the participation of 0.5% of a recycled sediment component [*Class and le Roex*, EPSL 2008]. We measured limited ranges for $\varepsilon^{143}$Nd (-1.03 and -1.99), $\varepsilon^{176}$Hf (-3.1 and -1.5) and $\varepsilon^{138}$Ce (0.1 and -0.4) values: Ce/Ce* do not correlate with isotope ratios. Cerium isotope compositions measured in Gough island lavas allow us to exclude the contribution of old sedimentary material carrying a negative cerium anomaly in the mantle source. Modeling a primitive mantle source contaminated by a pelagic component does not reproduced our measurements.

Our isotope results suggest that the incorporation of subcontinental lithospheric material (proportion between 15 and 30%) at shallow depths during the plume ascent is a more suitable model to explain the isotope composition of Gough Island lavas. Subcontinental lithosphere sampled via kimberlites and lamproites has isotopic compositions that plot generally below the εHf-εNd mantle array, a signature that is also seen in Gough lavas.