



Caesium as a geochemical tool to investigate continental crustal contaminations within LIPs

R. Meyer (1), J. Hertogen (1), R.B. Pedersen (2), G. Nicoll (3), V. Troll (3), L. Viereck-Götte (4), M. Abratis (4)

(1) Afd. Geologie, Katholieke Universiteit Leuven, Belgium (2) Department of Earth Science, University of Bergen, Norway, (3) Dept. of Geology, School of Natural Science, Trinity College Dublin, Ireland, (4) Institut für Geowissenschaften, Friedrich-Schiller-Universität Jena, Germany (Romain.Meyer@student.kuleuven.be)

The contribution of the continental crust to either the production of melt or to the contamination of mantle melts during Large Igneous Province (LIP) magmatic episodes is still a matter of debate. Divergent opinions originate mainly from the difficulties in distinguishing trace element and isotopic characteristics of crustal contamination from those acquired by involvement of the non-convective lithospheric mantle, either as melt source or as a contaminant.

The identification of crustal and lithospheric source contributions requires careful geochemical and isotopic study. However, most of the observed disparity from traditional geochemical tools are often ambiguous and can be a reflection of intrinsic variations of deep-mantle sources (mantle plumes), contamination from the non-convective mantle and/or continental crust. Even the strongest isotopic mantle plume "fingerprint", that of high He ratios, is currently being challenged as proof of a deep mantle source. As a result, a better geochemical characterization of LIP magmas is needed to ultimately clarify which of these observed variations is due to crustal contamination.

To this end, this study has used Caesium, along with traditional geochemical tools (e.g. radiogenic isotopes), to investigate the potential influence of continental crustal contamination / assimilation processes on LIP magmas. Cs with its [Xe] 6s¹ electron configuration and its single outer orbital electron makes it extremely ionic. It is also the most "lithophile" of all elements and shows the greatest relative increase: with fractionation, with decreasing degrees of melt and with alkalinity. As a result, the Cs

partition coefficients are very low for most rock forming minerals ($\ll 1$), except for biotite (> 1). The Cs concentrations in the C1 Chondrites (0.188 ppm), the Primordial Mantle (0.018 ppm), and the Lower Continental Crust (0.3 ppm) are very low, while the Upper Continental Crust contains much larger values typically ~ 5 ppm Cs. Due to its very low concentrations, it is only with the recent introduction of low blank sample dissolution methods and ICP-MS that reliable, high-precision Cs data has become available. In geodynamic earth models Cs will always be enriched in the continental crust and depleted in all possible geochemical reservoirs within the earth's interior. During subduction Cs will mainly escape the subducting slab during dehydration processes. As a result, Cs concentrations in magmas illustrate unanimous continental crust / mantle melt interactions. In addition, if the enriched classical geochemical signatures correlate with the Cs data, this enriched geochemistry has to be related to the continental crust, rather than a deep mantle source. New Cs data from onshore and offshore areas within the North Atlantic Igneous Province (Isle of Rum and the Vøring Plateau) will be presented to test these ideas.

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