The heavy noble gas (Kr, Xe) composition of the Galápagos hotspot: Insights into the origin and evolution of mantle volatiles

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Noble gases represent invaluable tracers of the sources of Earth's volatiles as well as of the interactions between Earth's reservoirs, such as the mantle and the atmosphere. For example, krypton and xenon have stable, non-radiogenic and fissiogenic isotopes that can provide a better understanding of the timing and processes associated with Earth's volatile accretion and evolution. The krypton and xenon isotopic compositions of the mantle are however very poorly known due to their low abundances and the ubiquitous atmospheric contamination of samples, rendering the analyses challenging. Atmospheric noble gases are also progressively recycled into the mantle via subduction, which overprints the initial mantle signature. As such, large uncertainties remain regarding the origin and evolution of heavy noble gases in the Earth's mantle, in particular for the plume sources for which the existing data set is very limited.

Here, we used the new protocol developed by Péron & Moreira [1] to analyze the krypton and xenon isotopic compositions of basaltic glass samples from the Galápagos hotspot, which shows among the most primitive helium and neon signatures. This new protocol consists in accumulating the heavy noble gases from step-crushing, but only for steps that show little atmospheric contamination as determined by the prior analyses of the neon isotopic ratios.

The results show a significant deviation from atmosphere for krypton isotopic ratios of the Galápagos mantle source. Our results represent the first detection of a krypton isotopic anomaly in an oceanic hotspot. The non-radiogenic xenon isotopes $^{124\text{-}126\text{-}128}$Xe present small excesses compared to atmosphere, lower than what was determined for the upper mantle [1]. The implications of these novel results for the origin and evolution of deep mantle volatiles will be discussed during this presentation.

[1] Péron & Moreira (2018) *Geochem. Persp. Let.* **9**, 21-25.