NOBLE GAS INSIGHTS INTO THE DEGASSING HISTORY OF EARTH'S MANTLE RESERVOIRS

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The noble gas isotopic composition of the mantle can provide unique insights into the origin and evolution of volatile elements on Earth. With nine isotopes, xenon has been proposed as a powerful tool for discriminating between sources of volcanism originating from the deep mantle source sampled at ocean island basalts (OIB) and convecting upper mantle (MORB). The Central European Volcanic Province, which includes which includes the Massif Central and the Eifel regions, exhibits geochemical features characteristic of both OIB and MORB. Its magmatic origin is therefore still up for debate with both mantle plume upwelling [1] and melting of upper mantle material [2] being advocated as possible drivers of volcanism under Europe.

In this study, we use the Giggenbach sampling method to concentrate magmatic noble gases from the Eifel volcanic area (Germany) into glass bottles and carry out high-precision analyses of Ne, Ar and Xe isotopes. Our data indicate that the mantle beneath the Eifel volcanic area, and by extension the Central European Volcanic Province, resembles the convective upper mantle reservoir with an additional source of ^{238}U-derived Xe that we attribute to the influence of a subducted HIMU component. Comparing the geochemical signature of the MORB reservoir as sampled by popping rocks [3] with that of Eifel gas (this study) indicates that high Pu-Xe/(Pu+U)Xe may not be indicative of the degassing state of the mantle and therefore should no longer be considered as being characteristic of a deep mantle origin. This ultimately leads us to revisit the differences in noble gas isotope and elemental composition between upper and lower mantle sources.

[1] Caracausi et al., 2016. *Nature*, *533*(7601), 82. [2] Moreira et al., 2018. *GPL*, *6*, 28-32. [3] Péron and Moreira, 2018. *GPL*, 9, 21.