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# Investigating the nature of the East Pacific Rise mantle source with heavy noble gas isotopes

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The noble gases (He, Ne, Ar, Kr, and Xe) are a versatile toolset for studying the nature and history of geochemical reservoirs in the Earth's interior. Noble gases trace the paths of volatile compounds (e.g., water and carbon dioxide) essential to planetary habitability and geodynamics; simultaneously, their inert and atmophile nature greatly simplify their chemical behavior in Earth systems. Contributions to the noble gas composition of a mantle reservoir include volatiles delivered during Earth's accretion, ingrowth through radioactive decay, and ingassing of atmospheric noble gases via subduction. Therefore, leveraged together, the noble gases can shed light on the origins of volatiles in a mantle reservoir, preservation of ancient mantle heterogeneities, and ongoing modification of a reservoir through degassing, subduction, and radiogenic ingrowth. Despite the power of the full suite of noble gases in mantle studies, heavy noble gas isotopic data of oceanic basalts are often limited by extensive syn- to post-eruptive atmospheric contamination[1-2].

This study presents He, Ne, Ar, and Xe elemental and isotopic data from mid-ocean ridge basalt (MORB) glasses dredged from 22 - 29°S along the East Pacific Rise in order to investigate the nature, formation, and volatile transport history of the MORB source reservoir sampled by a mid-ocean ridge in the Pacific Ocean Basin. To assess the extent of geochemical heterogeneity in the global MORB source, we compare these data with other well-studied ridge segments, such as the Southwest Indian[3-4], North Atlantic[5-6], and Equatorial Atlantic[7] Ridges. Expanding the global MORB noble gas dataset is essential both to improve our understanding of the average composition of the Earth's upper mantle and to assess whether MORB-source heterogeneities reflect the incorporation of material from other, discrete reservoirs—such as a plume or the sub-continental lithospheric mantle—or intrinsic differences within the Earth's upper mantle.

[1]Mukhopadhyay & Parai (2019), *AREPS*. [2]Mukhopadhyay (2012), *Nature*. [3]Parai *et al*. (2012), *EPSL*. [4]Parai & Mukhopadhyay (2015), *G*$^3$. [5]Peron & Moreira (2018), *GPL*. [6]Parai & Mukhopadhyay (2021), *GCA*. [7]Tucker *et al*. (2012), *EPSL*.