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Zinc isotope evidence for carbonated asthenosphere-lithosphere interaction beneath eastern China

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The limited Zn isotope fractionation during magmatic processes and the remarkable Zn isotope difference between igneous rocks and sedimentary carbonates make Zn isotopes a novel tool for identifying recycled carbonates in magma sources. In this regards, alkaline basalts with ages of <110 Ma from eastern China have been found to have anomalously heavier Zn isotopic compositions ($\delta^{66}Zn_{JMC3\text{-}0749L}$ = 0.30‰ to 0.63‰)[1] than global oceanic basalts ($\delta^{66}Zn$ = 0.28 ± 0.05‰)[2], indicating the presence of a large-scale carbonated mantle beneath eastern China. Nevertheless, the origin of the large $\delta^{66}Zn$ variation is still poorly constrained.

We present new Zn isotope data for Cenozoic alkaline basalts from Shandong and Wudalianchi, eastern China. The results show that all the studied basalts are more enriched in heavy Zn isotopes relative to oceanic basalts. In particular, the strongly alkaline basalts are systematically heavier than the weakly alkaline basalts and $\delta^{66}Zn$ values are in good correlation with proxies sensitive to both degrees of melting and source characteristics (e.g., La/Yb, Nb/Y, Zn/Fe, Ti/Ti*). The Zn-Sr-Nd isotope mixing models rule out the possibility of different degrees of melting in controlling the large isotope variation but suggest mixing of two isotopically different mantle end-members, i.e., carbonated DM or EMI mantle source and normal SCLM. Therefore, our study demonstrates that carbonated asthenosphere-lithosphere interaction plays an important role in the genesis of Cenozoic alkaline basalts from eastern China.

[1] Liu et al. (2016) *Earth. Planet. Sci. Lett.* **444**, 169-178.
[2] Wang et al. (2017) *Geochim. Cosmochim. Acta* **198,** 151-167