Goldschmidt 2021 Abstract
https://doi.org/10.7185/gold2021.7229

Tracking deep carbon cycling by using zinc isotopes - *Shen-su Sun Foundation Medal Lecture*

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Carbonate sediments represent the major form of recycled carbon to the mantle via subduction. Carbon isotopes can easily distinguish organic carbon from inorganic carbon, but degassing-induced isotope fractionation of carbon during magma eruption [1] makes it difficult to track recycled carbonates in the sources of mantle-derived lavas. Marine carbonates (δ^{66}Zn=0.99±0.25‰, [2-4]) are isotopically heavier by up to ~0.8‰ than the mantle (δ^{66}Zn=0.18±0.05‰, [5-7]). Therefore, zinc isotopes may be promising tools of tracking subducted carbonates in the mantle.

A large-scale heavy Zn isotopic anomaly was observed for Cenozoic basalts from Eastern China, which is spatially consistent with the sub-horizontally stagnated paleo-Pacific slab in the mantle transition zone (MTZ) [8-9]. This coupling suggests that carbonates can be deeply subducted into the MTZ. Similarly heavy Zn isotopic compositions and the spatial coupling of heavy δ^{66}Zn with the stagnated Neo-Tethyan oceanic slab were also observed in Cenozoic basalts from southwest China and central Myanmar in SE Tibet [10-11]. Thus, oceanic subduction has the potential to transport surface carbon into the MTZ (410-660 km) globally, at timescales that significantly exceed those of arc-trench cycle.

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