Deep sedimentary calcite recycling does cause coupling Ca-Zn-Sr isotopic composition change in mantle

DETAO HE, YONGSHENG LIU*

State Key Laboratory of Geological Processes and Mineral Resources, School of Earth Sciences, China University of Geosciences, Wuhan 430074, China

Stable isotopes of metals (Ca, Mg, Zn) are used as a novel method to trace deep carbon cycling. Deep recycling of magnesite has been successfully traced by Mg and Zn isotopes. However, there is still no consensus on whether deep recycling of calcite, which is the dominant carbon-bearing phase on the subduction slab, can be traced by stable isotopes of metals. Here we report the Ca-Zn-Sr isotopic composition of the Dalihu Neogene basalt, Inner Mongolia, China. The Dalihu basalt contains abundant carbonatitic xenoliths, which originated from the deep sedimentary calcite recycling. The basalt has radioactive Sr isotopic composition range from 0.7058 to 0.7063 and shows positive correlation between $^{87}Sr/^{86}Sr$ and Sr/Nd. These observations indicate that there is sedimentary calcite in the mantle source of the Dalihu basalt. The basalt has lower $\delta^{44/40}Ca$ (0.51 to 0.70‰) but higher $\delta^{66}Zn$ values (0.35 to 0.45 ‰) value than mantle. Our study shows that deep sedimentary calcite recycling does cause coupling Ca-Zn-Sr isotopic composition change in mantle.