# Heavy Li isotopic signatures of enriched sub-continental mantle-derived gabbroic rocks in East China: Evidence for mantle metasomatism by fluids/melts released from the down-going Paleo-Pacific slab

BIN CHEN[1], CHAO HUANG[2], YANJIAO CHEN[2]

[1]Department of Earth and Space Sciences, Southern University of Science and Technology, Shenzhen, China, chenb6@sustech.edu.cn

[2]School of Resources and Environmental Sciences, Hefei University of Technology, Hefei, China

Altered oceanic crust (AOC) shows high $\delta^7$Li due to low-temperature reaction with seawater. Dehydration of the AOC during subduction results in loss of heavy Li into deliberated fluids/melts that subsequently react with the overlying mantle-wedge peridotite. However, most arc lavas possess normal mantle $\delta^7$Li≈+3.4±1.4‰. Only a few localities of arc lavas show heavy Li signatures, and this was questioned to be caused possibly by shallow level contamination of seawater and AOC. We report heavy Li signatures for the late Mesozoic gabbroic plutons formed in a back-arc continental extensional regime related to the subduction of the Paleo-Pacific slab beneath East China, which definitely reflect the mantle source Li isotopic features.

The Late Mesozoic rock suite include gabbroic, quartz monzodioritic and granodioritic rocks, showing enriched LILEs and radiogenic Sr isotopes ($I_{Sr}$ = 0.7062–0.7112) and low $\varepsilon_{Nd}(t)$ (-7.0 to -13). Petrological and geochemical data consistently indicate that the rock suite formed via a magma mixing process between a mafic magma, derived from partial melting of a previously metasomatized sub-continental lithospheric mantle (SCLM) by subduction zone fluids/melts in the Jurassic, and a felsic magma, formed by melting of an Archean TTG-dominated lower crust. The rock suite have Li = 9-35ppm and $\delta^7$Li = +2.3 to +7.7‰, with high $\delta^7$Li in the gabbroic rocks (up to +7.7‰) and low $\delta^7$Li in the granodiorites (+2.3‰). The $\delta^7$Li values are positively correlated with the $\varepsilon_{Nd}(t)$ values and Y, and negatively with the $I_{Sr}$ ratios, $SiO_2$ and $K_2O$ of the rock suite, consistent with the magma mixing process. This indicates that the gabbroic rocks definitely possess heavy Li signatures, which is inherited from the metasomatized SCLM source. We suggest that the formation and preservation of the isotopically heavy SCLM is related to a flat subduction of the Paleo-Pacific slab beneath East China, which allowing escape of the metasomatized SCLM from being incorporated into the convecting mantle.