EGU2020-3985
https://doi.org/10.5194/egusphere-egu2020-3985
EGU General Assembly 2020

Genesis of ca. 850-835 Ma high-Mg# diorites in the western Yangtze Block, South China: Implications for mantle metasomatism under the subduction process

Yu Zhu and shaocong Lai
Northwest University, Department of Geology, Xi'an, China (354839918@qq.com)

High-Mg$^{\#}$ (molar 100 × Mg/(Mg + Fe)) diorites can provide significant insights on the mantle metasomatism under the subduction zone. Here we investigate the genesis of Neoproterozoic high-Mg$^{\#}$ diorites in the western Yangtze Block to constrain mantle metasomatism during the subduction process. Zircon U-Pb dating results display new weighted mean $^{206}Pb/^{238}U$ ages of 850.1 ± 1.7 Ma, 840.9 ± 2.4 Ma, and 836.6 ± 1.9 Ma for these high-Mg$^{\#}$ diorites. They are metaluminous and calc-alkaline rocks, and characterized by moderate SiO_2 (57.08–61.12 wt.%), high MgO (3.36–4.30 wt.%) and Mg$^{\#}$ values (56–60). The relatively low initial $^{87}Sr/^{86}Sr$ ratios (0.703406 to 0.704157), highly positive whole-rock εNd(t) (+3.26 to +4.26) and zircon εHf(t) values (+8.43 to +13.6) imply that they were predominantly sourced from depleted lithospheric mantle. These high-Mg$^{\#}$ diorites also show the enrichment of large ion lithophile elements (LILEs, e.g., Rb, Ba, K, and Sr) and depletion of high field strength elements (HFSEs, e.g., Nb, Ta, Zr, and Hf), resembling typical arc magma affinity. The highly variable Rb/Y, Th/Ce, Th/Sm, and Th/Yb ratios indicate the significant incorporation of subduction-related fluids and sediment-derived melts into primary mantle source. We therefore propose that the ca. 850–835 Ma high-Mg$^{\#}$ diorites in this study were formed by the partial melting of metasomatized mantle source influenced by subduction fluids and sediment melts. Our new data, in conjunction with numerous studies of metasomatized mantle magmatism from the western Yangtze Block, suggest that Neoproterozoic mantle sources were progressively metasomatized by the subduction-related compositions from slab fluids, sediment melts, to oceanic slab melts during persistent subduction process.