The Mg isotopic characteristics of basalts from the South China Sea and their geodynamics implications

LIAO REN-QIANG[1,3], ZHU HONG-LI[1,2], SUN WEI-DONG[1,2,3]

[1]Center of Deep Sea Research, Institute of Oceanology, Chinese Academy of Sciences, Qingdao, China, 266071 (Correspondence: liaorenqiang@qdio.ac.cn; weidongsun@qdio.ac.cn)

[2]Larboratory for Marine Mineral Resources, Pilot National Laboratory for Marine Science and Technology, Qingdao, China, 266237

[3]University of Chinese Academy of Sciences, Beijing, China, 100049

Magnesium isotopes is a useful indicator to trace recycling of subducted materials. To better understand the influence of plate subduction and the role of recycled materials on the genesis of basalts from the South China Sea (SCS) recovered from IODP Expedition 349, here we report high-precision Mg isotopic compositions (δ^{26}Mg). Our results show that δ^{26}Mg of these basalts range from -0.31‰ to 0.00‰, most of which are systematic higher than that of the upper mantle (-0.25 ± 0.04‰). Considering the highly varied Ce/Pb (11.7 ~ 31.2) and Nb/U (35.3 ~ 53.1) ratios in the SCS basalts, the high δ^{26}Mg signatures of basalts from the SCS are most likely caused by involvement of fluids released from talc and serpentine. In comparison, Cenozoic basalts in the Leizhou-Hainan and Indochina block have much lower δ^{26}Mg values than the upper mantle, indicating contributions from subducted Mg-rich carbonates. Talc and serpentine have higher δ^{26}Mg and decompose early during subduction. Conversely, Mg-rich carbonates (i.e., dolomite and magnesite) with lower δ^{26}Mg are more stable during plate subduction and decompose at deeper depths. All these suggest that the behavior of Mg isotopes during plate subduction is strongly controlled by minerals, which have different Mg isotopic signatures and decompose at different depths during subduction. Therefore, the Mg isotopes of basalts that were influenced by subduction process, vary dramatically, depending on the depths of the corresponding subducted slab.