The Magnesium isotopes of the northern margin of the Tarim Large Igneous Province

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Tarim Large Igenous Province (TLIP) is a newly recognized large igneous province in Asia, which is characterized by a relatively long duration (300-270Ma), complex igneous units [1] and predominant alkaline rocks [2, 3, 4, 5], which is interpreted to be generated by the low degree partial melting (<10%) of the mantle sources [6, 7, 8, 9]. However, such interpretation is inconsistent with the huge volume of basaltic rocks that consitute the large igneous province. Therefore, the critical topics are how the enormous amounts of the basaltic rocks in TLIP were produced and what the nature of the mantle sources are. To understand the nature of the mantle sources, we conducted the magnesium (Mg) isotopes study on the flood basalts, mafic-ultramafic layered intrusions and mafic dykes along the northern margin of the TLIP. The δ^{26}Mg values range of the flood basalt are from -0.33 to -0.45‰, while the layered intrusions and basic dykes have δ^{26}Mg values of -0.31~-0.42‰ and -0.28~-0.31‰, respectively. These δ^{26}Mg values are lower than the average value of the normal mantle (-0.25‰) [10, 11]. As the Mg isotope fractionation caused by the magmatic evolution process is limited (less than 0.07‰) [10], the light Mg isotopic compositions reflect the natue of the mantle sources, indicating the involvement of the recycled sedimentay carbonates in the mantle sources [12, 13, 14]. Our results reveal a carbonated mantle source for the basaltic rocks of the TLIP. A plate subduction-mantle plume-lithosphere interaction model is proposed in our study to interpret the generation of the massive alkaline basalts in the TLIP.

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