

Mobility and fractionation of REEs during deep weathering of geochemically contrasting granites in a tropical setting, Malaysia.

ABSTRACT

In this study we describe the mobility and fractionation of REEs in two deep (up to 30 m) tropical weathering profiles developed on two granites from the Kuala Lumpur pluton, Malaysia, sampled at Cheras and Rawang. On the basis of Na₂O and K₂O both are S-type granites, but Rawang has higher CaO, MgO and FeO than Cheras and lower SiO₂. With respect to Al-saturation Rawang is I-type and Cheras is S-type. We compared the two profiles in terms of total REEs, magnitude and changes in Ce and Eu anomalies, REE mobility and LREE/HREE fractionation. Rawang profiles have higher REE contents, display lower mobility for most except the heaviest REEs and show higher LREE/HREE fractionation than those from Cheras. These differences can be linked to differences in primary mineralogy and degree of weathering, the latter controlling the type and volume of secondary minerals. Specifically, bowl-shaped parent-rock-normalised patterns in the Cheras saprolites appear to be a result of apatite dissolution. Moreover, moderate weathering evident in lower Mineralogical Indices of Alteration (MIA) at Cheras has conserved parent rock REE patterns and fractionation factors in the saprolites. By contrast, more intense weathering observed in Rawang profiles has produced abundant kaolinite group minerals that have preferentially retained LREE, which consequently display high LREE/HREE fractionation. This study provides important insights into the factors controlling REE mobility during tropical weathering, and its potential as an indicator of weathering intensity.

Keyword: Weathering