Xin Du, Andrew W. Rate and M. A. Mary Gee (2012) Particle size fractionation and chemical speciation of REE in a lateritic weathering profile in Western Australia. *EXPLORE 157* (December 2012)

The distribution and partitioning of rare earth elements (REEs) in intensely weathered regolith were investigated through the analysis of REE concentrations in different particle size fractions and in different chemically extractable phases from a lateritic regolith developed on meta-granitoids in Jarrahdale, Western Australia.

High concentrations of REEs were found in the silt and clay size fractions, implying hosting of REEs by secondary minerals and adsorption on clays. The sand size fraction had the lowest concentrations but the highest mass of REEs, showing the dilution effect of quartz and the importance of weathering-resistant minerals in the retention of REEs. In the ferruginous zone, Ce was predominantly hosted by gravel, suggesting that Ce was fractionated and enriched by oxidative processes, such as the precipitation of ferric minerals.

In the sequential extraction, the residual phase contained most REEs, indicating that the abundance and distribution of REEs are controlled by weathering-resistant minerals. The water soluble/adsorbed/exchangeable phase was the fraction hosting the next-highest proportion of total REEs, suggesting adsorption on clays and potential REE bioavailability. The amorphous and crystalline Fe (hydr)oxide–bound phases preferentially hosted light and mid REEs, whereas organic matter was enriched in heavy REEs. These findings inform on the use of REEs as tracers for regolith weathering and pedogenesis, especially when particle-size-sorting processes are involved.

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