# Abundance of rare earth elements in soils of upper montane and sub-montane forests in Sri Lanka

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**Abstract:** Soils in untouched forest regions are considered less-polluted from anthropogenic activities. Hence, they can be considered as a soil environment that represents natural background element levels. Exploring the distribution and abundance of rare earth elements (REEs) in soil is essential to understand their role in nature. This study aimed to compare distribution of REEs in soils of upper montane forests (UMFs) and sub-montane forests (SMFs) in Sri Lanka. Seventeen near-surface (0–25 cm) soil samples were collected systematically from one hectare sized permanent sampling plots (PSPs) at Horton Plains and Enasalwatta (2 PSPs). Microwave digestion was carried out and REEs were quantified by using ICP-MS in addition to determining the clay content of studied soils. Total REEs (∑REE) content in Ensalwatta site 1 and 2, and Horton Plains were 169, 110 and 62 mg/kg, respectively, whereas the mean content of REEs varied in the order of Ce>La>Nd>Pr>Gd>Sm>Dy>Er>Tb>Ho>Eu>Lu>Tm. In both forests soils, higher content of light REEs was noted compared to heavy REEs that is mostly similar to the order of the crustal abundancy. The upper continental crust–normalized REEs distribution patterns in soils of UMFs and SMFs were different indicating different soil formation processes although the underlain rocks are mostly similar in all PSPs. The average clay content was determined using the hydrometer method which showed 16.5, 14.5 and 13.5% for Ensalwatta site 1 and 2, and Horton Plains, respectively. Higher content of REEs in Enasalwatta site is probably due to its enriched clay content. It is well-known that clay minerals can incorporate REEs in their structure. In conclusion, the soil genesis of UMFs and SMFs are different and REEs distribution may be a result of clay minerals that adsorb REEs in soils.

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