Mineralogical and geochemical evidences for the evolution of red residua underlying carbonate rocks nearby the tropic of cancer, southwestern China

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The long-term chemical weathering study in the karst areas can become a key factor for the quantitative modelling of dynamics within the Critical Zones. We chose a set of representative lateritic weathering covers developing in south Guangxi of China , combining the geochemical and mineralogical data, several conclusions of this study were summarized. The mineral assemblages from various lateritic profiles are predominated by goethite, hematite, gibbsite, illite and kaolinite, and, quartz, zircon and anatase are common accessory minerals. The iron concretions are characterized by high concentration of iron and aluminum and low content of silicon and sulfur. Goethite and hematite are the primary occurrence states of iron in the lateritic soils and iron nodules. The mass balance calculation result shows that the ferruginous nodular horizon played an important role in the adsorption and enrichment of various elements. The REE were significantly fractionated, and Ce was less mobilized and separated from the other REEs at the highly enriched top of the profile. The distinct Ce positive anomalies occur in the ferruginous nodular horizon, while there are no significant Ce anomalies in mottled clay layer. The fluctuation of cerium content may be explained by a succession of periods of various weathering intensity and redox environment caused by climatic variations. Our results support that the typical tropical lateritic soils in south Guangxi developed under special conditions, especially the climate factor. The evolution model of the typical tropical lateritic profile was established, which displays geochemical behaviors of various elements generally depend on the occurrence state and stability of minerals.