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Behaviour of chemical elements in brown soils on complex nephelinite saprolites (Cameroon): impact of hydrothermal versus weathering processes.

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The progressive weathering the 0.65 Ma nephelinites of Mont Etinde (South Western Cameroon) in a humid tropical setting has resulted in the formation of a weathering blanket of 150 cm thick. The profile type is constituted of three horizons Ah/Bw/C. A major differentiation of the chemical and mineralogical signature is related to the complexity of the saprolites: some of them were affected by tardi-magmatic hydrothermal fluids. The weathering of fresh nephelinite leads to a paragenese of halloysite, hematite, traces of goethite and crandallite. The weathering of hydrothermalised nephelinite leads to the formation of halloysite-gibbsite-traces of hematite and goethite. Bulk geochemistry analysis (ICP-AES, ICP-MS) and microgeochemistry analysis on selected minerals (EDS and WDS microprobe) were performed on the different horizons of the two reference profiles. The results show that the primary minerals in the rocks experienced differential weathering rates with the rare earth elements rich primary minerals surviving in the saprolite and the Bw horizons The weathering

of the primary minerals is expressed by the leaching of alkaline and alkaline-earth elements, except for barium and rubidium (in the hydrothermalised nephelinite soil). The order of mobility is influenced by hydrothermal processes: Na>K>Rb>Ca>Cs>Sr in fresh nephelinite soil, Na>K>Sr>Ca>Mg in hydrothermalised nephelinite soil. Rb/Sr and Sr/Mg can be used respectively as indicators of the kinetic of the weathering on fresh nephelinite and on hydrothermalised nephelinite. The enrichments in barium are related to variable concentrations in the nephelinites, to the formation of crandallites and the leaching of surface horizons. The metallic elements are richer in the hydrothermalised nephelinite soil than in the fresh nephelinite soil. Primary minerals as magnetite and perovskite have been affected by hydrothermalism and became more sensible to weathering. The accumulation of metals is observed in secondary minerals (hematite, goethite, halloysite) and coatings. It is showed that hydrothermal alteration leads to an enrichment of light and intermediate rare earth elements (La, Ce, Nd, Sm, Eu, Dy). The enrichment in Cr and Pb in the surface horizons is discussed related to the organic matter activity, the dissolution of magnetites, and the impact of hydrothermal processes as well as an entropic pollution for lead.