



## **Cations in expandable clay minerals: a snapshot of past soil solution chemistry**

**T. Grygar** (1), J. Kadlec (2), A. Zígova (2)

(1) Institute of Inorganic Chemistry ASCR, Rez, Czech Republic, (2) Institute of Geology, v.v.i ASCR, Prague, Czech Republic

Expandable clay minerals (ECM) are able to record the information about Mg/Ca relative activity in the soil solution where they were originally formed unless this information has not been rewritten by solutions with a high concentration of these elements. The Mg/Ca ratio hence reflects the parent rock composition and pedogenic processes. But while, for example, the elemental ratios of Ca, Mg, and other elements in carbonates is used to diagnostic purposes in geochemistry, the ratio of interlayer exchangeable cations in ECM has yet only rarely been utilized in analysis of soil and sediment sections. This is rather surprising if one assumes that ECM are very common components of almost all soils, pedosediments, and lacustrine and river flood sediments derived from soils in their catchment areas. The analysis of the ion-exchangeable cations in ECM is a very fast and reliable method with small sample consumption if the Cu-trien method is used. The Cu-trien method was introduced a decade ago (Meier and Kahr, 1999) and then validated to characterization of ECM specimens and raw bentonites, and in the recent few years it has also been used to the analysis of soils and sediments (Grygar et al., 2007). The method produces the cation exchange capacity mostly or exclusively attributed to ECM, i.e., a proxy of the total ECM content that is otherwise obtained by much more laborious ways. As "a side product" of that analysis, the composition of the interlayer cations in ECM is obtained, which, together with the proxy of ECM, can be very useful in the evaluation of soil and sediment profiles. We tested the robustness of the Cu-trien method with reference specimens of ECM. We compared the results of the Cu-trien method with the traditional pedologic analyses of total cation-exchange capacity of soils in a case study of the Late

Pleistocene-Holocene profiles of paleosoils, pedosediments, and loess from Litovel, Northern Moravia, Czech Republic. We successfully used the Cu-trien method to a stratigraphic correlation of flood-plain soil sequences in the Morava River basin in a study of the river activity during the last millennium: Mg/Ca ratio and total content of ECM reflected two main distinct lithological units in the sediments, one having been deposited before and the second after the half of the last millennium.

Meier, L.P., Kahr, G., 1999. Determination of the cation exchange capacity (CEC) of clay minerals using the complexes of copper(II) ion with triethylenetetramine and tetraethylenepentamine. *Clays Clay Miner.* 47, 386-388

Grygar, T., Bláhová, A., Hradil, D., Bezdička, P., Kadlec, J., Schnabl, P., Swann, G., Oberhänsli, H., 2007. Lake Baikal climatic record between 310 and 50 ky BP: Interplay between diatoms, watershed weathering and orbital forcing, *Palaeo Palaeo Palaeo* 250, 50-67