



Pedostratigraphy of pre-Quaternary/Quaternary red paleosols from Central Europe based on geochemical and clay mineralogical proxies

János Kovács (1,2), Gábor Újvári (3), Klemens Seelos (4), György Varga (5), Franz Ottner (6), Georgina Lukoczki (1,2)

(1) Department of Geology, University of Pécs, Pécs, Hungary (jones@gamma.ttk.pte.hu), (2) Environmental Analytical & Geoanalytical Laboratory, Szentágothai Research Centre, University of Pécs, Pécs, Hungary, (3) Geodetic and Geophysical Institute, Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences, Sopron, Hungary, (4) Institute for Geosciences, Johannes Gutenberg-University, Mainz, Germany, (5) Geographical Institute, Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences, Budapest, Hungary, (6) Institute of Applied Geology, BOKU, Vienna, Austria

Geochemical and mineralogical studies of paleosols provide essential information for paleoclimatic and paleoenvironmental interpretation of continental deposits and can present a high-resolution proxy for paleoclimate. Consequently, paleosols can help to interpret the history of sediment deposition and the autogenic and allogenic processes that influenced a sedimentary basin. Paleosols are also helpful in stratigraphic studies, including sequence stratigraphic analyses. They are used for stratigraphic correlations at the local and basinal scale, and some workers have calculated sediment accumulation rates based on the degree of paleosol development. The horizons of paleosols are widely used as key horizons for the stratigraphic subdivision of continental sedimentary series.

The reliability of usage of paleopedologic data has increased, especially with the development of methods of absolute and relative dating: radiocarbon, luminescent, paleomagnetic, amino acid, and paleontological (palynological and paleofaunistic) with geochemical and clay mineralogical data. The use of paleosols as components of the stratigraphic record has increased, especially after paleosols morphotypical features of different ages were studied. Paleosols in various sediment sections were once compound units of soil covers of different ages.

Results from geochemical climofunctions applied to Upper Pliocene–Lower Pleistocene red clays and paleosols located in East-Central Europe (Austria, Slovakia, Hungary, Serbia and Romania) together with other geochemical data, clay mineralogy and fossil record, indicate that there were three major periods of their development.

1. The older type red clay/paleosol (age \sim 4.2–3.2 Ma) is red kaolinitic clay containing typically disordered kaolinite, mixed-layer smectite/kaolinite, smectite and little gibbsite. It was formed in the local subaerial weathering crust in warm, humid, subtropical or monsoon climate.
2. The younger type (age \sim 3.2–2.5 Ma) contains red (or "reddish") clay beds. It contains relatively fresh material (illite, chlorite), the weathering products are predominantly smectite and goethite formed under warm and drier climate in environmental conditions of savannah and steppe or forest steppe.
3. The basal red paleosol layer of the loess-paleosol series (age \sim 1.0–0.5 Ma) contain similar material as the 2nd type. The slightly but significantly lesser degree of weathering (more illite and chlorite, less smectite) indicates cooling of the climate.

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