

## WEATHERING RATES AND CLAY MINERAL ASSEMBLAGES IN SOILS OF DIFFERENT CHRONOSEQUENCES DEVELOPED ON MARLS AND CALCAREOUS SANDSTONE FLYSCH DEPOSITS IN ISTRIA, CROATIA

MIKO, S.,<sup>1</sup> HASAN, O.,<sup>1</sup> MILEUSNIĆ, M.,<sup>2</sup> PEH, Z.,<sup>1</sup> MESIĆ, S.<sup>1</sup>

<sup>1</sup> Institute of Geology [Institut za geologiju], Sachsova 2, Zagreb, 10000, Croatia

<sup>2</sup> Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb [Rudarsko-geološko-naftni fakultet, Sveučilište u Zagrebu], Pierottijeva 6, Zagreb, 10000, Croatia

E-mail: smiko@igi.hr

Chronosequences of soils developed from Eocene flysch, in two small catchments (Argila and Bazuja rivers) in Istria, were studied with respect to their soil mineralogy and chemistry. The catchments are a part of accumulation-denudation type of morphostructure characterised by rapid denudation processes developed on Eocene flysch deposits. The flysch bedrocks are turbidite deposits of alternating marls and arenites. The calcarenites contain quartz, feldspar, mica grains and lithoclasts of both carbonate and silicate rocks (chert, quartzite and schists). The chronosequences of soils developed on these deposits contain quartz, muscovite and illitic material, calcite in the deeper part of the profiles, feldspars, and the clay minerals dominantly represented by expandable clays (probably smectite) and by small amount of kaolinite. Chemical weathering was evaluated with the aid of bulk chemistry analysis focused on major elements, zirconium and rare earth elements (REE) at 32 sites and the mobility of elements was characterised with the mass transfer coefficient (eluvial-illuvial coefficient, EIC) assuming Zr as the conservative component and the saprolite-rock boundary samples as the least weathered. Due to agricultural land-use practice in the Argila catchment the physical processes significantly contribute to amount fine

carbonate-rich rock debris within the soil profiles, which resulted in a mass transfer  $\approx 0$  or slight accumulation for all major elements and REE in the 0–5 cm horizons and the 5–20 cm horizons. In the same horizons of the forest soils of the Bazuja catchment losses of over 30% of Mg and Ca were determined while Al and K loss ranged from 23 to 28%. The calculated mass loss of REE was 17% in the topsoil horizons 14% in the deeper horizons. Chemical weathering in the soil horizons and weathering rinds of corresponding calcarenite rocks shows enrichment of REE as well as fractionation of REE occurs indicating a higher mobility of light REE than of heavy REE. Changes in long-term weathering rates were evaluated through comparison of molar ratios of major elements in recent stream sediments, overbank sediment profiles in swallow-hole zones and soil profiles. The elemental ratios and REE show that sediments deposited in the floodplain, swallow-hole areas after storm events are mainly derived from less weathered material and plot close to the calcarenite-marl composition. The effect that natural reforestation and abandoning of arable lands has a critical effect on chemical weathering rates in these catchments causing a loss of Ca and Mg from the top 50 cm of the soil profiles and increasing the overall acidification.