

IAS POSTGRADUATE GRANT SCHEME

Scientific Report from Raucksiné Varga Andrea

Petrology and geochemistry of the Palaeozoic (Upper Carboniferous-Permian) siliciclastic sediments from southern Transdanubia, Hungary

Transdanubia (Tisza Megaunit) is located in southwestern Hungary. In this territory, the Upper Carboniferous and Permian siliciclastic formations are relatively subordinate in areal extent, but they have a great thickness. The purpose of my PhD project is to examine the petrographic, mineralogical and geochemical characteristics of the Palaeozoic siliciclastic succession from southern Transdanubia. As a result of recent stratigraphical research, these Palaeozoic sediments can be divided into six lithostratigraphical units: (1) Turony Formation, (2) Téseny Sandstone Formation, (3) Korpád Sandstone Formation, (4) Cserdi Formation, (5) Boda Aleurolite Formation, and (6) Kővágószőlős Sandstone Formation.

Siliciclastic rocks studied in this part of my PhD project belong to the Turony Formation (TF, Upper Devonian? – Lower Permian?), Téseny Sandstone Formation (TSF, Upper Carboniferous), and Korpád Sandstone Formation (KSF, Lower Permian). Rocks of these formations do not crop out in Hungary, but are known from numerous boreholes in southern Transdanubia. Eight sandstone samples from borehole Diósvizsló Dv-3 (TSF) were selected for geochemistry, and fourteen sandstone and mudrock samples from borehole Turony Tu-1 (7 for TF and 7 for KSF) were selected for mineralogy (X-ray powder diffraction analysis). Major and trace element abundances of sandstones were established by X-ray fluorescence analysis using a Philips PW 2404 instrument in the laboratory of the University of Veszprém (Department of Earth and Environmental Sciences). XRD analysis was carried out at the University of Veszprém (Department of Earth and Environmental Sciences) using a Philips PW 1710 instrument. Random specimens were used to determine the bulk mineralogical composition. Clay fraction (<2 µm) was separated by sedimentation after acetic acidic dissolution of easily soluble carbonates and ultrasonic deflocculation. XRD analysis of phyllosilicates was performed on oriented specimens using the smear on glass method. Two X-ray diagrams were carried out on each sample of the clay fraction: one under natural conditions, another after saturation with ethylene glycol.

Data of XRF major and trace element analyses show similar element composition of all samples from borehole Dv-3 indicating constancy of provenance. SiO₂ content in Téseny sandstones ranges dominantly from 71 to 82 wt%. Al₂O₃ content of the sandstones is widely

considered uniform, with concentrations lying in a narrow range from 11 to 15 wt%. A plot of major elements, normalised to upper continental crust (UCC) values, indicate significant relative depletion of CaO and Na₂O, and slight depletion of TiO₂, Al₂O₃, Fe₂O_{3tot}, MnO, MgO, and P₂O₅ for nearly all samples studied during this investigation. Concentrations of SiO₂ and K₂O are similar to those of the UCC. Accordingly, in comparison with the UCC, all the sandstones studied are depleted in Sr, too. Low contents of Na₂O, CaO and Sr in the Upper Carboniferous sandstones indicate moderate degree of weathering of source area. Additionally, these low values would also reflect the absence of neutral and basic plagioclases. Geochemical signatures of the samples studied in the borehole Dv-3 are typical of continentally-derived sediments.

Dominant minerals of the claystones of TF are quartz, plagioclase and illite±muscovite. Hematite, chlorite and carbonates are present in minor amounts. On the other hand, the sandstone and mudrock samples of the KSF are composed dominantly of quartz, plagioclase (albite), illite±muscovite and hematite. Chlorite, kaolinite and carbonates (calcite and dolomite) are present in minor amounts.

These preliminary results of mineralogy and geochemistry of the studied sedimentary rocks and further detailed petrological and geochemical work have made important contributions to interpretations of Palaeozoic plate tectonic setting and provenance of the Tisza Megaunit.

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