CALCRETE- AND BROWN COAL-BEARING EOCENE FLUVIAL SEQUENCE FROM SOUTHERN TRANSDANUBIA – A UNIQUE CONTINENTAL BASIN FROM S HUNGARY

A. VARGA[1], B. RAUCSIK[2], B. WÉBER[3] and Gy. SZAKMÁNY[1]

[1] *Eötvös Loránd University, Dept. of Petrology and Geochemistry, H-1117 Budapest, Pázmány P. sétány 1/C*
[2] *University of Veszprém, Dept. of Earth and Environmental Sciences, H-8201 Veszprém, Egyetem u. 10.*
[3] *Mecsek Ore Environment, H-7633 Pécs, Esztergár Lajos u. 19.*

Abstract: The Upper Eocene continental sequence (S Transdanubia, Hungary) is comprised of variegated claystones, clayey siltstones, marls, litharenitic sandstones, clast-supported conglomerates and breccias, and contains thin brown coal seams and palaeosol beds. Petrographic composition of the clastic sediments suggests that the grains are derived directly from rocks of the crystalline basement, and in the upper part of the succession, they are also derived from Mesozoic carbonate rocks.

Key words: petrography, provenance, X-ray diffraction, Eocene, S Hungary

Transdanubia is located in the western part of the Pannonian Basin filled up with a thick clastic sedimentary cover Neogene to Quaternary in age. Its basement is made up by Palaeozoic to Early Tertiary formations (Haas et al. 1999). Epicontinental Palaeogene successions are very frequent in the northern part of the Transdanubia (Pelso Megaunit). On the other hand, there are only isolated occurrences of the Palaeogene sedimentary rocks from Southern Transdanubia (Tisza Megaunit).

The sedimentary rocks studied belong to the Upper Eocene continental sequence called Szentlőrinc Formation. Lithologically, it is made up of variegated clays, grey clays, marls, siltstones, sandstones, conglomerates, and contains thin brown coal seams. The fluvial–lacustrine nature of these clastic sediments is evident from the sedimentary organization of channel facies and interbedded floodplain facies (Wéber 1982, 1985). Rocks of this formation are not exposed in Hungary. The Upper Eocene sequence was uncovered in significant thickness (150 to 400 m) by boreholes Szentlőrinc XII, Szigetvár I–III and Becefa–1 in Southern Transdanubia. Its basement is composed of Palaeozoic mica-schists (borehole Szentlőrinc XII) or Upper Jurassic limestones – Middle Cretaceous marls (boreholes Szigetvár I–III) (Wéber 1982, 1985). Rarely, redeposited calcrete and conglomerate pebbles of this

formation also occur in the Western Mecsek Mountains from the Miocene conglomerate called Szászvár Formation (Varga 2002).

In this work, the mineralogical and petrographic composition of the Upper Eocene sequence has been investigated to determine the provenance and sedimentary environment of these rocks. A large number of thin sections were analysed using petrographic microscope (Eötvös L. University, Dept. of Petrology and Geochemistry). This study was supplemented by X-ray diffraction (XRD) methods. XRD analysis was made at the University of Veszprém (Dept. of Earth and Environmental Sciences) using a Philips PW 1710 instrument.

According to our petrographic results, the Szentlőrinc Formation is comprised of variegated (red, grey, greenish-grey) claystones, clayey siltstones, marls, medium- to coarse-grained sandstones, clast-supported conglomerates and breccias, and contains thin brown coal seams and palaeosol beds.

Dominant minerals of the claystones and siltstones are quartz, feldspars, muscovite±illite, hematite and goethite. Minor amounts of calcite, dolomite, chlorite, smectite and 7 Å-phase were detected. These rocks sometimes include root traces, calcite nodules and siderite concretions. Locally, they are modified by intensive burrowing activity. The claystones can be interpreted as suspended fine sediments deposited on a floodplain. The presence of scattered carbonate nodules and intensive colour mottling indicates palaeosol development. Claystones include interbedded fine sandstones to siltstones which can be interpreted as being deposited during the major floods, recording sedimentation in crevasse splays.

Lithologically, the sandstones and gravelly sandstones (channel facies) of borehole Szentlőrinc XII are immature litharenites. In its lower part, the grains are highly non-spherical and angular. These sandstones are composed of polycrystalline quartz grains and metamorphic fragments (quartz-plagioclase-muscovite-biotite-schist). Moreover, there are some detrital micas and accessories such as tourmaline, zircon and titanite. Based on X-ray diffraction measurements, dominant minerals of the sandstones are quartz, feldspars and muscovite±illite. Minor amounts of pyrite, goethite, calcite, dolomite, kaolinite, chlorite, smectite and illite/smectite mixed-layer were detected. This composition suggests that the grains are derived directly from rocks of crystalline basement. This succession shows upward increase in acidic volcanic clasts and K-feldspar grains. On the other hand, composition of the sandstones from boreholes near the town of Szigetvár is similar to that described above for the borehole Szentlőrinc XII, but these sandstones contain a lot of

limestone and dolomite fragments, too. All the samples studied have hematite and calcite cements.

Clast-supported, massive variegated conglomerate beds (fan deposits) are very frequent in the boreholes near the town of Szigetvár. Their clast lithologies can be grouped in two main classes: cover and crystalline basement. The cover class includes Triassic and Jurassic sedimentary rocks (limestones and dolomites), whereas the crystalline basement class includes Palaeozoic metamorphic and magmatic rocks. This succession shows upward increase in limestone and dolomite pebbles. Samples studied have medium- to coarse-grained sandstone matrix with carbonate clasts, poly- and monocrystalline quartz grains and metamorphic rock fragments.

Two pieces of redeposited Eocene calcrete gravels were found in the Miocene conglomerate sequence (Szászvár Formation). Based on evidence from spore and pollen remains (Varga et al. 2002), local geology (Wéber 1982, 1985) and ancient analogy (Gierlowski-Kordesch et al. 1991), the reworked calcrete seems to be related to the continental sequence of Szentlőrinc Formation. These pale brown coloured calcrete gravels consist of poorly sorted, micrite coated grains with core of rock fragments. The diagnostic features identified are rhizoliths (rhizocretion, root cast and root petrifaction), alveolar textures, in situ Microcodium grains, peloids, coated grains and pedogenic voids. Based on the micromorphological results, the calcrete studied belongs to the beta calcretes. Biofabric of this calcrete reflects an extensive vegetation cover and a relatively high degree of biological activity. The results of investigation on the macroscopic features of the redeposited calcrete breccia and microfacies of its extraclasts suggest that this calcrete developed on alluvial fan sediments containing fragments of Mecsek-type Lower Jurassic rocks.

Micromorphological and mineralogical compositions of the calcrete pebbles (i.e. dominance of calcite, quartz, illite±muscovite and illite/smectite) suggest semi-arid/subhumid climate during calcrete pedogenesis. Based on the observations of expandability of illite/smectite mixed-layer phases, only a moderate degree of burial of the Eocene succession studied (up to 80 ºC of heating) can be proposed.

The recycled Eocene conglomerate pebble from the Szászvár Formation is composed of mainly Triassic limestone and dolomite clasts and Jurassic bioclastic limestone and marl fragments. Sample studied has medium- to coarse-grained sandstone matrix with carbonate clasts and poly- and monocrystalline quartz fragments. There are some detrital micas and accessories such as zircon and tourmaline. Based on its petrographic composition, the redeposited conglomerate

cobble seems to be related to the Eocene continental sequence of boreholes near the town of Szigetvár.

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