

## ORIGIN OF SEDIMENTS TRANSPORTED FROM DIFFERENT DIRECTIONS INTO THE LAKE PANNON DURING THE LATE NEOGENE, BASED ON MINERALOGICAL COMPOSITION OF SANDS AND SANDSTONES IN THE HUNGARIAN PLAIN

THAMÓ-BOZSÓ, E.<sup>1</sup>, JUHÁSZ, GY.<sup>1</sup> & Ó. KOVÁCS, L.<sup>2</sup>

<sup>1</sup> Geological Institute of Hungary, Stefánia út 14., H-1143 Budapest, Hungary

E-mail: bozso@mafi.hu

<sup>2</sup> Hungarian Geological Survey, Stefánia út 14., H-1143 Budapest, Hungary

Sedimentological as well as seismic and sequence stratigraphic studies proved that the main sediment input came from NW and NE, subordinately from SE directions into the Lake Pannon in the area of the Hungarian Plain during the Late Miocene–Pliocene (Pannonian *s.l.*). Sediments were carried along by large fluvial and deltaic systems. To trace the origin of sediments transported from different directions we studied the available heavy mineral data of 868 sand and sandstone samples from 53 boreholes, using also statistical methods. During the interpretation the studied samples were identified in terms of depositional facies and depositional cycles, as well as lithostratigraphic units.

### Tendencies in the mineralogical composition

Different kinds of tendencies were recognized which have different backgrounds. The average amount of chlorite gradually increases from fluvial sands through delta and basin-slope sediments to the deep-basinal turbidite sandstones, as opposed to garnet, pyroxenes and amphiboles, the frequency of which gradually decreases with water depth as well as with distance from the source area. These tendencies were caused by the selective sorting of minerals during transport and sedimentation, and the changing of source rocks. The maturity of the studied sands and sandstones mostly depends on the distance from their source areas. There are characteristic vertical changes in the mineralogical composition of the sedimentary succession. These changes are connected to depositional cycles rather than vertical facies changes. The closer the source area the stronger the changes are. The most considerable changes are connected to tectonically controlled 3<sup>rd</sup> order sequence boundaries, especially in those cases when they mean considerable hiatus. In the NE area, close to the sediment source, even the 4<sup>th</sup> order cycles bare well visible changes of the mineralogical composition.

### Mineralogical composition of sediments derived from different directions

Sands, which came from NE into the Hungarian Plain, deposited as chlorite-rich turbidite, basin-slope and delta sediments, while on the marginal areas the basin-slope, delta and fluvial sands are immature and they have high biotite, amphibole, magnetite, garnet and pyroxene contents. Sedi-

ments that came from NW and were deposited in the delta front and delta plain environments on the Danube–Tisza interfluvium, have chlorite, garnet and/or epidote-rich compositions, and there are fluvial sands with a high garnet content, too. Far from the source areas they became chlorite-rich sands, and were deposited as turbidite and basin slope sediments. Delta and fluvial sands in the Jászság subbasin, originating from NW and N directions, have chlorite, garnet, biotite, and sporadically magnetite-rich compositions. Sediments, transported from SE into the south-eastern part of the Hungarian Plain are subordinate. Here the basin slope sands are characterised by pyroxene-amphibole-garnet-chlorite compositions, the delta sediments are rich in chlorite, and the fluvial sands have varying compositions, with dominating amphibole, epidote, garnet, chlorite or magnetite.

### Origin of sediments

Based on the results of cluster and discriminant analyses, we could deduce transport directions far from the source areas; e.g. sands coming from NW reached the middle and southern parts of the Hungarian Plain. The results of correlation analysis indicate the selective sorting and the origin of some minerals, too (garnets are dominantly from metamorphic rocks, pyroxenes and amphiboles from magmatic or volcanic rocks). The occurrence of source rock indicator minerals shows that detritus of low grade metamorphic rocks of the Carpathians and/or recycling the older sedimentary rocks, first of all flysch sediments of the surrounding areas, spread almost in the whole study area. Minerals that originated from medium and high grade metamorphic rocks are most abundant in the sediments of the fluvial sands of the Jászság subbasin and the Danube–Tisza interfluvium. They derived from NW, from the Western Carpathians, Alps and Bohemian Massif. The sedimentary rocks on the SE and E parts of the Hungarian Plain with varying compositions and subordinate metamorphic mineral contents came from the Apuseni Mountains. Minerals from the Inner Carpathian volcanites are most frequent in the North-Transtisza region, but occur in the southern part of the Transtisza region, too.

This research was funded by the Hungarian National Scientific Research Fund (OTKA T-035168).