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The role of the Érmellék-Berettyó-Körös depression in the river course development of the Great Hungarian Plain

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During the Pleistocene, due to the regional subsidence of the central part of the Pannonian Basin, the ancestors of the Danube and Tisza rivers and its tributaries have been filling up the basin in an overall aggradational style, resulting in the formation of the Great Hungarian Plain (GHP).

The aim of our study was to investigate the control of the Érmellék-Berettyó-Körös line on river course development of the GHP through the detailed study of the Körös-Berettyó rivers, which form a major eastern tributary system of the Tisza. The modern Berettyó-, Sebes-, Fekete- and Fehér-Körös rivers display a transverse fan-shaped pattern, orientated approximately east-west, draining the Apuseni Mountains in Romania, and confluencing with the axial Tisza river in the central part of the Pannonian Basin.

We have identified various ancient channel planforms on the Hungarian lowland area of the Körös-Berettyó system, based on a detailed analyses of airborne photographs covering about 4000 km^2. The reconstruction of the most important morphological features (channels, levees, terraces, marshes) showed, that the area can be subdivided into three roughly E-W striking sub-parallel zones which are found at slightly different morphological levels: (1) on the north, roughly along the Érmellék-Berettyó depression, large, well developed meanders are found at an average height of 87 m asl, (2) the central part is characterised by a dense pattern of small-scale former meanders, resembling to an anabranching river at the lowest topographic position at 85-86 m asl, (3) on the south, a braided pattern can be seen at the highest morphological level at 88-89 m asl.

In order to study the origin of the various planforms we have drilled altogether 8 full-

cored boreholes with an average depth of 7 m in each zones in the autumn of 2004. Together with some other samples from nearby sand and clay pits, we have performed a detailed sedimentological analysis of the sediments, including heavy mineral studies to unravel source areas, as well as OSL and ^{14}C dating. Some preliminary results are summarised herein.

There is a striking difference in the lithological logs of the boreholes. Two boreholes, drilled in the braided zone expose 4 m thick fine-medium grained, well sorted sands, underlain by silt and clay. Another two boreholes in the zone of the large meanders expose similar fine-medium grained sand in a depth interval between 3 and 7 m, overlain by silt and clay. Four boreholes in the anastomosing zone mostly expose clay and silt, some fine-grained sand interbeddings are found at various depths.

OSL dating so far shows, that on the area of the large meanders the sands are about 25 ± 1 and 40 ± 2 ka old at a depth of 1,7 and 4,0 m below the recent surface. On the area of braided pattern morphology sands are older as they are about 39 ± 3 and 50 ± 4 ka old at 0,6 and 1,1 m below the surface.

According to our hypothetical model, the first stage of river development was characterised by a braided pattern as shown by its highest topographical position and oldest OSL age. Then the next stage of river development occurred at a lower topographic level, characterised by a meandering river style, i.e. this meandering river was flowing on the subsided former braided plain. Sands from the meandering zone show a younger OSL age. In the boreholes they are found at a depth of 3-7 m and are probably identical with the nearsurface sands of the braided zone. The next stage of development occurred at a further lowered level and led to the formation of the present lowest part of the alluvial plain, which formed a minor depression between the former braided and meandering zones. This was occupied by a river system of an anabranching pattern, which was probably flowing on the subsided former meandering plain, underlain by the oldest braided plain remnant. Borehole logs in the anabranching zone expose thick clay sequences with some sand interbeddings at various depth, which can be identical with the meandering and/or braided sands. This deepest zone had a very low gradient and could have represented a very similar pattern to the historical times with swampy environment. The question if the change from braided to meandering and to anabranching was caused by climate change and/or by tectonics still needs further investigation.

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