

## **Late Miocene to Quaternary evolution of the alluvial landscape in the northern Danube Basin: interplay of sediment supply and forming of accommodation space**

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The Danube Basin represents northernmost subbasin of the Pannonian Basin System, which was formed by several distinct subsidence phases during the Neogene. The last major period of accumulation of up to 4500 m thick column of deposits is associated with filling of Lake Pannon depocenters during the late Miocene. The deposition in the Danube Basin occurred dominantly in alluvial environment after ca. 9.0 Ma, when the high sediment supply from the Eastern Alps and Western Carpathians led to regression of the water body (Kováč et al., 2011; Magyar et al., 2013; Šujan et al., 2016). This large portion of the alluvial strata was studied using an extensive dataset of several thousand boreholes, with the aim to recognize a detailed interplay between the rate of sediment supply and the forming of accommodation space.

A dominant part of the deposits is represented by the Volkovce Fm. accumulated by meandering to anastomosing rivers between ca. 6.0 and 10.0 Ma. The formation is generally highly fine grained, with floodplain facies content in the range 70-90% and low frequency of sandy channel bodies. Exceptions appear locally on the basin margins, where rivers from the Western Carpathians entered the basin (NE margin) or where low rate of forming of accommodation space led to stacking of the meandering channel belts (foothills of the Transdanubian Mountain Range).

The Volkovce Fm. is overlain discordantly by the Kolárovo Fm., which was deposited in an environment of braided rivers in the until now poorly constrained time span 2.6 to 4.1 Ma. The formation consists dominantly of gravelly and sandy channel facies, which resulted from decrease of subsidence rate and increase of sediment supply. This change was associated with a compression phase of the Pliocene basin inversion, characterized by synchronous uplift of basin margins together with subsidence of the basin central depression (Horváth & Cloetingh, 1996). This led to forming of erosional surface below the Kolárovo Fm. dominated by an incised valley in the northern part of the basin. The paleo-Váh river is the most favourable candidate for this incision. At least five phases of the high frequency cycles were recognized in the fill of the canyon. Each cycle is composed of gravelly low accommodation rate system tract with dominance of sandy-gravelly channel facies, followed by high accommodation rate system tract with channel belt - floodplain facies ratio ca. 1:2. The cycles are preceded by incisions driven by minor base level fall episodes, which are marked by concave bases. The content of coarse layers

in the Kolárovo Fm. decreases towards the basin centre, where the incised valley opens towards the Gabčíkovo depression.

The last phase of evolution of alluvial systems is characterized by dominance of high sediment supply of the paleo-Danube river during the Quaternary and forming of up to 300 m thick gravelly succession. The apex of the large fluvial distributary system is situated in the Devín Gate between Malé Karpaty Mts. and Hundsheim Hills, on NW margin of the basin. The high sediment supply led to overwhelming of the tributaries and their orientation sub-parallel to the major stream on the basin margins. This phase is connected with (1) low subsidence of the central depression (possibly induced by compaction of underlying sequences), (2) by stagnation or very low uplift of the basin margins and (3) by uplift of marginal mountains mediated by fault activity and forming of river terrace staircases. Low accommodation rate probably resulted in amalgamation of gravelly channel belts across the basin.

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