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Sedimentation of Late Pannonian clastic deposits in main and marginal basins

(Sava depression vs. Bjelovar subdepression)

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The Sava depression and the Bjelovar subdepression belong to the SW margin of the Pannonian Basin System. This area was a part of the Central Paratethys during Late Pannonian period. Geotectonically the Bjelovar subdepression represents a submarine slope between the Sava and Drava depressions.

In the Sava depression analyzed Late Pannonian deposits include several lithostratigraphic members: Iva and Okoli sandstones (or their lateral equivalent Zagreb member), as well as the Lipovac marlstone. Sandstone members are proved as economical hydrocarbon reservoirs. Generally, entire Late Pannonian sequence is lithologically represented by alterations of marls, silts and sandstones. Total thickness of these sediments in the deepest part reaches up to 800 meters, and along depression margins from 100-200 meters. Deposits are compound of 5 facies:

- Facies of thick layered to massive sandstones (F_1) sedimented in channels in the Donja Jelenska subdepression;
- Facies of thin sandstone layers (F_2) – channel banks deposited distally from the

Donja Jelenska subdepression;

- Facies of laminated sandstones, silts and marls (F_3) – deposited laterally from F_2. This is the most distal facies of sandstones;
- Facies of massive marls (F_4) – basin sediments deposited during calm periods. In the period of turbiditic activities these deposits accumulated around sandstone bodies.

Among **the Bjelovar depression** deposits two lithostratigraphic members were analyzed: Zagreb member and Okoli sandstones, which are lateral equivalents. The thickness of the Late Pannonian deposits varies from 50 meters along the S and SE margins to more than 350 meters along the E margin. The oldest Late Pannonian deposits (Lipovac marlstone) were eroded in the central, uplifted part of the subdepression.

Generally, detritus is characterized by a single source, as proven both by sedimentological and physical properties as well as by geometry of sandstone body and fossil content. This clastic material was dispersed through the S, elongated and relative narrow Sava depression and in the N, smaller Bjelovar subdepression of rhomboidal shape. Sedimentation occurred in water mostly up to 300 meters deep and strongly influenced by submarine paleorelief directly forming the shape of particular sandstone members (bodies). Also, sandstones have been deposited through relatively short and strong tectonically initiated events. In the meantime, continuous deposition of fine-grained, pelitic detritus was active over entire basin plain.

Medium- and coarse-grained material, according by mineralogical analyzes, was transported from the NW (later from the N) to the SE. The main stream, influenced by Moslavačka gora Mt., was separated by two independent turbiditic flows. Detailed analysis of sandstone body geometries indicates sediment flow directions, variability in thickness of sandstone bodies and cyclic progradation of turbiditic fans.