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Neogene evolution of the Slovenj Gradec Basin, Northern Slovenia (preliminary results)

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The Slovenj Gradec basin is situated along the west side of the Labot fault, adjacent to the Pohorje Mountains massif in northern Slovenia. This Neogene basin is tectonically bounded toward the older Paleozoic and Mesozoic formations. The most pronounced are the Labot fault to the east-northeast and the Periadriatic dextral shear fault zone to the south.

Miocene sedimentary rocks of the wider Slovenj Gradec area were not considered as a part of Pannonian basin. More recent investigations, comprising radiometric dating, paleomagnetism and structural parameters (Márton et al. 2006, Trajanova et al. 2008, Fodor et al. 2008), indicate that sediments of the wider Slovenj Gradec area correspond to the Miocene Pannonian basin formations. Calcareous nannoplankton assemblages found in the borehole MD-1 (Ćorić, Trajanova & Lapanje, 2011) support marine environment of the deposition and correlate well with the findings in the Styrian and Mura-Zala basins (Jelen et al. 2008).

Structural elements of the basin show three main evolutionary phases. Its initial stage is most probably influenced by the east-west extension connected to development of the Labot fault. It was accompanied with marginal normal faulting. This was probably lower Miocene (Ottnangian to Karpatian) D1 syntransgressional phase with synchronous rapid infilling of coarse material from the southern, western and northwestern basin's margins.

Oblique north-easterly directed D2 compressive phase affected the south and south-eastern parts of the basin, while northwest-southeast extensional regime dominated in the area adjacent to the Labot fault. The western and southern margins of the basin were uplifted and erosion took place. Simultaneously, the connection to the Pannonian basin was cut off by the left rotating eastern parts of the Austroalpine units (Pohorje and Kozjak Mountains) (Márton et al. 2008) and tilting of Pohorje along the Labot fault. As deduced from the cooling history of the Pohorje batholith, where the strongest tectonic activity took place at around 16,5 Ma and terminated in Badenian at around 15 Ma (Trajanova et al. 2008), this could be the time of the D2 deformations. Smaller collapse basin formed near the Labot fault, south of Slovenj Gradec. After detachment, the collapse basin was syntectonically rapidly filling up by Pliocene-Quaternary stream and alluvial fan sediments.

The third deformational phase D3 is characterized by N-S compression, which reactivated most of the normal faults at the Slovenj Gradec basin margins in a reverse sense. At the same time, Pliocene infill of the collapse basin was slightly folded. This phase formed the final morphology of the area and is probably still active.