# EVOLUTION OF THE VIENNA BASIN AT NORTHEASTERN CORNER OF THE EASTERN ALPS

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Vienna basin is regarded usually as classical example of a pull apart basin (Royden) in many textbook of structural geology. Even though some authors see difficulties connected with this oversimplified evaluation (Fodor, Wessely), overwhelming majority of recent interpretations repete pull apart story defined by Royden in 1983.

I present here an evidence based on deep (14 s) and shallow (5 - 6 s) seismic profiles and geologic studies from numerous boreholes and surface that there were, in fact, three distinct periods of the development of the Vienna basin during Neogene.

The first one occurred during late Eggenburgian,
Ottnangian and Karpatian (20 - 16.5 Ma) of the Paratethyan scale. Piggy back basin development via transtension in the area of the shallow low-angle Alpine and steep high-angle Carpathian thrust boundary was present. Transtension lead to unusually rapid subsidence and sedimentation during counterclockwise rotation of the Carpathian subplate. Western Bulhary strike-slip fault is well evidenced. There is, however, no sign about its eastern counterpart. Transtension probably occurred via reactivation of previous subhorizontal Alpine thrust faults in the Limestone Alps. Only minor subsidence and sedimentation took place in Flysch belt. This first piggy back basin might be regarded as special example of a pull apart basin.

Second period brought the majority of sedimentation and also recent shape of the Vienna basin. It started in mid-Badenian (15.5 Ma) after short about 1 million years long time of docking and compression phase after transtension and end of thrusting. Several half graben were developed along high angle 50° major normal faults as Steinberg, Schrattenberg, Kuty and others. Pure extension was a leading tectonic regime and no strike-slip faulting was evidenced. Recent rhomboschsm shape of the basin is result of pure extension which ended at Pontian (7 - 6 Ma).

Following late Miocene, Pliocene and Quaternary development of the basin was mostly dominated by uplift and erosion. Sarmatian (12 Ma) marine sediments has been sometimes elevated to a height of 400 m above sea level. Minor pull apart sedimentation has occured along the Mur - Muerz - Leitha - Male Karpaty fault.

Deep seismic and geologic studies of the Vienna basin and surrounding Alps and Carpathians result, however, in surprising conclusions valid for the whole Eastern Alps. The Alpine - Carpathian boundary was present along N - S trending passive margin of the Krosno - Tarcau ocean (which was subducted later between 20 - 10 Ma) also during the Oligocene and early Miocene. This boundary was subsequently shifted to the North without significant movement to the East. Late Jurassic black shales beneath the Vienna basin different from platform sediments beneath the Alps document the time of opening of the latest Carpathian ocean. Oligocene and early Miocene shallow thin-skinned thrusting of the Eastern Alps over the European platform was accompanied by Oligocene steep continental and early Miocene oceanic subduction of the Carpathians. At least 15 km thick pile of the Carpathian flysch and few km or nearly non existent Alpine flysch document large scale offscraping in the Carpathians and subduction or tectonic erosion of flysch and Helveticum in the Alps. Corollary of these observations is simple: Large scale Oligocene and Miocene escape movement of the East Alps to the East is excluded. Simple 2D sandbox modelling and structural studies of the East Alps are contra - evidenced by 3D seismic studies at the Alpine - Carpathian boundary. Other model for post - Eocene development of the East Alps has to be found.