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Structural development of the Orava-Nowy Targ Intramontane Basin (Western Carpathians): Progress report

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The Orava-Nowy Targ Basin (ONT): (1) straddles across junction of major tectonic units of the Western Carpathians and, (2) is located at the NE termination of the Mür-Žilina Fault Zone of prominent historical seismic activity which was the NW boundary of the block shifted eastward due to lateral extrusion of the Eastern Alps. The NE segment of the fault zone was the locus of sinistral strike-slip movement during Neogene and Quaternary times. The activity of the Mür-Žilina Fault Zone has been essential for structural development of the Western Carpathians and Carpathian Foredeep during these times. It follows that the ONT is one of the key-areas for unraveling the neotectonic evolution of the Western Carpathians. The basin is filled by poorly indurated terrestrial and fresh water sequence, up to 1300 m thick. The age of the sequence is considered to be Miocene or Miocene to Pliocene in age.

We studied minor tectonic structures affecting the ONT Neogene sequence. The study comprised: (i) several sets of minor strike-slip, reverse and normal faults, single set of joints and deformation bands cutting claystone/mudstone strata, (ii) two sets (I, II) of joints cutting clasts in conglomerates and, (iii) strata orientations. The results of structural analysis were supplemented by results of new vitrinite reflectance analysis and results of our paleomagnetic studies. Our interpretation of whole data is following. (i) The deposition of the whole Neogene sequence took place in compressional stress setting with NNW-SSE oriented σ_1 (present day orientation). During the deposisition the claystone/siltstone strata were cut by strike-slip and reverse faults, whereas, clasts in conglomerates were affected by joints of the set I. (ii) The maximum heating of the Neogene sequence took place after cessation of deposition. The heating resulted in bedding-parallel thermal stratification of the sequence. This thermal structure shows that upper part of the sequence, some 800 m thick, was subsequently eroded. (iii) The thermally stratified sequence was submitted to folding. During the folding, the claystone/siltstone strata were cut by joints and strike-slip faults, as well as, locally by normal faults. The folding resulted in formation of a large-scale syncline. (iv) The folded sequence underwent CCW rotation of about 20^o which resulted in apparent CW stress field rotation from NNW-SSE σ_1 orientation up to NNE-SSW σ_1 orientation. (v) The rotation completed, the claystone/siltstone strata was still affected by jointing, strike-slip and (locally) normal faulting, whereas, clast in conglomerate were cut by joints of the set II. (vi) There followed a stage of normal-faulting largely due to NNW-SSE to NW-SE oriented extension.

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