

bably contemporaneous with sinistral reactivation of some thrusts in the Western Outer Carpathians, induced by eastward-directed extrusion of crustal blocks in the Carpathian internides. In the second event, both W-E and NW-SE- oriented joints and WNW-striking normal faults were formed. The latter most probably originated due to reactivation of the Early Palaeocene WNW- and NW- striking normal faults in the basement. In the third event, both NE-SW and NW-SE- oriented joints and NE-striking normal faults were formed as a result of reactivation of the SW- and WSW-striking

faults in the basement. Therefore, normal faults detected in the Outer Carpathians and Carpathian Foredeep appear to be a result of not a single collapse event but of different successive events. This extensional episode lasted at least to the late Pleistocene.

We also provide evidence for the recent, N- to NNE-directed, tectonic compressive stress, typical for that segment of the Carpathian arc. This stress resulted in the formation of an orthogonal system of joints striking N-S and W-E, produced during the (4) event.

## Pattern of the Mesoscopic Thrust Faults in the Eastern Part of the Silesian Nappe (Polish Western Outer Carpathians)

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Polish Western Outer Carpathians are a stack of nappes composed of Lower Cretaceous to Lower Miocene flysch sediments. One of the biggest nappe is the Silesian nappe. The outcrop of this nappe forms the bend convex to the North. The eastern part of this nappe, located to the southeast of the Wisłoka River, is the object of the research. In the Polish Outer Carpathians the folding and thrusting were connected with the two shortening events, which were characterized by different orientation of horizontal compression: 1) NNW- (N), and 2) NE- (NNE) directed ones. During the first event the thrusting has in-sequence character and the deformational front migrated approximately from the south to the north. The regional folds were formed during this event. During the next event, the previous thrust faults and related folds were overprinted and refolded. The regional fold axes in the Silesian nappe are approximately parallel to the frontal thrust of this nappe. In the eastern part of the Silesian nappe the regional fold axes and the strikes of the regional thrust faults are directed WNW-ESE and NW-SE.

The tectonic structures were investigated in 34 outcrops. The studied mesoscopic thrust faults were divided into two groups formed in: 1) horizontal strata and 2) tilted strata. Numerous thrust faults of (1) group were tilted, together with the host strata during folding. Such faults were backtilted at the beginning of the structural analysis. There were measured 572 thrust faults, 255 faults of (1) group and 317 faults of (2) group.

The thrust fault planes dip mostly about 25°. The dip angles of the (1) group faults are clustering around the value 25°. The dip of the (2) group fault planes is characterized by bigger changes and ranging between 15 and 70°. The strike of thrust faults usually varies between N 60°E and N140°E, showing single prevailing orientations N 125°E in the both groups of thrust faults. Other fault planes of the (2) group are striking WNW-ESE, W-E

and more rarely ENE-WSW. The orientation of the strikes of the (1) group fault planes are mostly clustering around the direction N 125°E. The direction of thrusting varies mostly from N-S to NE-SW. The dominant direction of thrusting along the (1) group faults is NNE-SSW and along the (2) group faults is NE-SW. The differences of the thrust fault strikes and the thrusting direction between the (1) and (2) group of thrust faults are visible but not significant. According to crosscutting relationship older thrust faults are commonly these faults striking WNW-ESE and younger are these faults striking ESE-WNW. The reconstructed orientation of the horizontal compression is N 18°E for the older thrust faults of the (1) group and N208°E for the younger thrust faults of the (2) group.

The dominant age relationship of the thrust faults could be caused by clockwise rotation of the horizontal compression. Numerous thrust faults of (1) group vary in strike orientation with the host strata, this fact may suggest that the rotation of the horizontal compression took place locally before folding. There is also second explanation of such thrust faulting: the NE-oriented, stable horizontal compression and counterclockwise rotation of host strata.

In the eastern part of the Silesian nappe the differences between the orientations of the older thrust faults of the (1) group and the younger ones of the (2) group are smaller comparing such differences, which are observed in the central part of this nappe. Therefore in the eastern part of the Silesian nappe the total amount of the rotation was smaller. When we are taking into consideration that the host strata rotated counterclockwise, then the bending of the whole Silesian nappe could cause the clockwise rotation of the eastern part of the Silesian nappe. Such clockwise rotation of the eastern part of this nappe could decrease the effect of counterclockwise rotation of the whole nappe.