Quaternary tectonic activity along foreland preexisting dislocation – some evidence from the Kleszczów Graben (south–central Poland)

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The late Alpine Kleszczów Graben is locted in the southern part of Łódź Upland and constitutes the easternmost structure of the tectonic depressions system which extends on the epi-Variscan platform, north of the West Carpathian Front. It may be assumed that Cenozoic development of Kleszczów Graben was strongly influenced by reactivation along pre-existing NE–SW, NW–SE and WNW–ESE dislocations in the Permo–Mesozoic subsurface. The exact timing, kinematics and origin of the Tertiary–Quaternary movements in this area are still being discussed.

Presented field studies in the "Bełchatów" open cast mine involved the analysis of large number of clastic dikes and related structures, which are located just above unexposed, NW–SE trending, preexisting faults in Mesozoic bedrocks. The clastic dikes were observed within vertical open fractures and normal faults in gently folded clayey-sandy sediments (the Upper Miocene–Pliocene?) and strike parallel to their host faults. The largest were traced at a distance of over 1 km. The vertical extent can be estimated at 70–80 m and majority of the structures show a tendency to die out in the uppermost part of the underlaying coaly sediments of the Middle Miocene. In general, clastic dikes were divided into four main genetic groups: infilling by collapse, slow gravitational transport, intrusion of liquified sands, squeezing-in of ductile material. The type of infilling within individual fissures can change along the strike, and more commonly, with depth. Particularly significant is the occurence of composite dikes consisting of lateral sequence of different infillings originated as a result of multistage opening and infilling of fractures. Thus, opening of fissures, particularly the more advanced ones, seems to have been a relatively, long-lasting process with distinct succesive stages. In the case of uconsolidated deposits both processes took place: opening of fissures and their filling must have developed contemporaneously. Analysis of dike sediments indicates that they formed in the Quaternary. Restriction of the analysed structures to the wide zone of anticlinal crest, parallel to the fold axis, indicates that they could have formed as a result of tensile stress related to the folding. The commonly observed termination of fissures downwards at the Upper Miocene–Middle Miocene contact, can be explained by tensile stress drop towards the neutral surface in folds. The fold deformations which developed simultaneously with opening of the fractures was generated by movements along NW–SW striking pre-existing dislocations.

Quantifying finite deformation in mountain belts – the Andes and the Jura mountains

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With better coverage of fold and thrust belts with high quality, "balanced" cross sections, we begin to have dense, and seemingly reliable data on the displacement of the crust over long time intervals – normally as long as the process of orogenesis itself. More thought than ever is being put into drawing cross sections based on simple enough principles. Fewer people so far have made the move into combining cross-section data and restoring things in "map" view. The principles of how to do this are, however, well-established and date from the same time as the development of balanced section techniques.

Any map view restoration will give finite displacements for a region of the earth's crust. These displacements have a meaning. We can use them in calculating finite strains predicted as a consequence of any structural model.

The regional strain pattern can then be used in a number of ways. For instance:

1. Comparing field measurements of strain to trajectories of finite strain.
2. Drawing contour maps of the maxima of extension and contraction across a region. This should help in determining how reasonable the structural model is.
3. In clarifying what are the likely relationships between regional transport directions and the micro and macro-structural features we can determine from rock samples.

In summary, strain calculations in plan view give us a "2D" impression of effects out of the plane of the cross-sections we draw.

To demonstrate these techniques more thoroughly, the Andes and Jura mountains are used as two examples at quite different scales, but with many similar features

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Magnetic fabric indication of Rhenohercynian deformations in the Silesian Zone of the NE Bohemian Massif

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In the Lower Carboniferous flysch rocks of the Rhenohercynian Zone in the NE Bohemian Massif, the magnetic fabric ranges from virtually sedimentary to strongly deformational in origin. The ductile deformation, indicated by magnetic fabric, gradually increases from the east to the west, being associated with the development of the spaced cleavage and slaty cleavage passing into metamorphic schistosity at the boundary with the Silesian Zone. In the crystalline rocks of the Silesian Zone, the magnetic fabric shows signs of multiple origin. In some metamorphic rocks, the magnetic foliation is parallel to the metamorphic schistosity, probably indicating that the magnetic fabric originated during metamorphic processes in which the recrystallization in an anisotropic stress field was the most important. In addition, in many metamorphic rocks, the magnetic foliation deviates from the metamorphic schistosity, sometimes very strongly. The magnetic fabric of these rocks was evidently affected by ductile deformations, much younger than the metamorphism of the rocks.

The orientations of the magnetic fabric elements are very similar in the sedimentary rocks of the Rhenohercynian Zone and in those metamorphic rocks of the Silesian Zone, which show the post-metamorphic deformational magnetic fabrics. This implies at least one strong deformation phase that affected both the Rhenohercynian and Silesian rocks. A hypothesis can be thrown out that the stresses responsible for creation of the structure of the Rhenohercynian propagated also into the Silesian Zone.

The origin and evolution the seismic belts of northeast Russia

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Two large seismic belts traverse Yakutia: the Baikal–Stanovoy (BSB) to the south and the Cherskiy (CSB) to the northeast. These extensive epicentral belts mark the Eurasian–North American–Amur lithospheric plate boundaries in northeast Asia. In the Late Cenozoic the boundaries represented fault systems of specific kinematics and different morphology and growth dynamics. The BSB marks the Eurasian–Amur boundary stretching from Lake Baikal to the Sea of Okhotsk. The crust experiences tension in the western BSB (the Baikal rift) and compression in its eastern part (the Stanovaya folded area). Therefore, normal faults common in the western part grade eastward, from the mid-section of the Olekma river, into dextral sublatitudinal strike-slip faults and associated thrusts.

In southern Yakutia, compression has led to a specific mountain relief, e.g., the Jugjur–Stanovaya folded area and continuous Predstanovoy