Tectonic Evolution of the Mórágy Granite Complex (SW Hungary): a Puzzle of the Variscan Orogeny in Central Europe

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In the frame of the Hungarian National Research Project on the final disposal of low and intermediate level radioactive waste, numerous deep and shallow boreholes exposed the Hercynian rocks in the Mórágy Hills, SE of the Mecsek Mts. More than 5000 m crystalline rock has been drilled in the Mórágy Granite Complex during this project till now. The study of this enormous quantity of fresh core material allows us to do a detailed reconstruction with the help of the ImaGeo corescanning system.

In this contribution we will deal with the ductile and brittle deformation of this complex built up mainly by metaluminous to slightly peraluminous, K-Mg-rich, microcline megacryst-bearing, medium-grained, biotite-monzogranites and quartz monzonites (Buda, 1985) that contain generally oval-shaped, variably elongated mafic enclaves (predominantly amphibole-biotite diorites, monzonites and syenites) of various size (from a few cm to several hundred metres). Feldspar-quartz rich leucocratic dykes (at least three generations) belonging to the late-stage magmatic evolution crosscut all of the previosly described rock types.

Focusing first on the ductile structures in outcrop and map scale, the complex is characterized by a ca. (E)NE-(W)SW striking, steeply dipping (generally >80°) foliation (S_1), that is overprinted in many places by a less steep (dip angle between 40-75°) foliation (S_2) transposing S_1 foliation in various degrees. Both foliations dip in the same direction, mostly to the NW, in certain zones to the SE, which might reflect a late folding event.

Sections parallel to the foliation (XY fabric plane) do not exhibit any prominent stretching lineation (occassionally a weakly-developed lineation is present), which altogether reflects basically flattening-type strain that is connected to the formation of the S_1 foliation.

Well-developed stretching lineation can be only observed on the foliation planes of the relatively rarely occurring, cm to dm scaled mylonitic shear zones that are mostly associated with the less steep S_2 foliation. The plunge of the stretching lineation in these zones slightly differs (max. 30° measured as pitch) from the dip of foliation in the most cases. Well-developed kinematic indicators show top-to-the-(S)SE (or top-to-the-N in the case of SE dipping foliation, respectively) thrusting in the XZ sections. Occasionally oblique to pure strike slip movement (both sininstral and dextral motions) were observed, which may indicate the transpressional character of the deformation. However, the age relationship between strike-slip and thrust movements is unclear yet, it requires further investigations. The mylonitic shear zones occur preferentially in fine-grained aplites/microgranites suggesting strong strain-partioning between these rheologically weaker leucocratic dykes and the surrounding host rocks at (upper-)middle crustal levels.

The brittle deformation is a much more complex, poliphase deformation. About 60,000 fractures (and their infillings) were measured and evaluated during the exploration with the help of the ImaGeo corescanning system (Maros and Palotás, 2000). Both their vertical and horizontal distribution were examined. More than 100 fracture zones were determined from field and borehole data. Six tectonic phases (1. extensional, σ_3=NNE-SSW; 2. strike-slip type stress field, σ_1=NE-SW; 3. extensional, σ_3=NNE-SSW; 4. transpressional, σ_1=NNE-SSW; 5. extensional, σ_3=SE-NW; 6. compressional, σ_1= ENE-WSW) could be determined with the help of striae. Most of them could be dated as being paleogene or miocene, based on analogues from other parts of Hungary. In the distribution of the fractures and the foliation a trend could be noticed, namely that the fractures and the foliation are organized into ENE-WSW strips. The main azimuth of both the fractures and the foliation is to the NW in the north and to the SW in the south, with a mixed zone in the middle. In the northern strip there is an additional fracture group striking NW–SE. At the end a structural model was drawn on the basis of the ductile and brittle tectonic data and a general tectonic evolution of the region was sketched out.

References

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