STRUCTURAL DEVELOPMENT OUTLINE OF THE BÜKK MOUNTAINS REFLECTING RECENT REGIONAL STUDIES

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Abstract: The Bükk Mts. represents the southernmost outcrop of the paleo-mesozoic rocks in the eastern part of the Pannonian basin. Its structural interpretation is still doubtful. The authors give a model which only partly correlate with other models. (Balla, 1987; Csontos, 1988). In our opinion, the Bükk is an allochtonous imbricated nappe system, which is reversely imbricated near the surface and is thrusted over an ophiolite suture to North onto a Gemeric basement (Fig. 1, Fig. 2).

Key words: tectonics, Bükk Mts., nappe structure, reverse imbrication

In our opinion the Bükkian-Gemerian system was a united area with more or less similar sedimentation processes in the early Mesozoic. The differences in sedimentation were caused by the fact that the primitive, passive rift systems, as inner structural and facies borders, divided the area into several sub-belts. In the margins of the primitive rift belts transverse (transcurrent) faults were formed, which separated the elongated structural and facies belts. The different subsidence of the continental blocks caused pressure anomalies in the lithospheric mantle along the deep faults, which led to partial melting of the mantle, initiating intraplatform continental magmatism. The varying activity of the transverse faults, their opened or compressed status caused various differentiation and contamination in the intruding mantle-derived magmas. These processes could have produced the small basaltic veins of linear pattern, the andesitic and trachytic pyroclastites derived from labial volcanic complexes and a small amount of plagiorhyolite (quartz-porphyry).

Along the Darnó Hill - Bátor - Szarvaskő - Varbó ophiolitic geosuture, the development of the oceanic structure was aborted in a more primitive stage than that of the present Red Sea. The fact that only a few ophiolites were found proves the early abortion of the primitive rift system. In our opinion, this suture must have been situated S of its present position along the so-called Mid-Hungarian Structural Belt and its buried root complex may lying in this area even today. Its southern margin may have been the Bükkian system and the northern margin the Gemerian Unit.

Mesozoic sedimentation in the two continental margins is slightly different as the southern belt was the area of active tectonic movements, while the northern margin was only the passive collisional front opposite the compressions from South. The passive rift systems were elongated narrow trenches corresponding to the structural character of the preorogenic basement. Along their marginal normal faults, long narrow crust belts subsided. In these, sometimes several-hundred-kilometre-long belts, homogeneous or nearly homogeneous facies conditions may have been dominant allowing the fast movement of the fauna within the same facies zone. This fact permits the assumption of greater similarities between different tectonostratigraphic units within the same rift margin along the facies zones, even over several hundred kilometres, than between the two opposite rift margins. This may be the main reason for the documented genetic correlation of the Bükkian and Dinarid system and of the Gemerian and N-Alpine regions (Haas et al., 1995).

The narrow and mobile character of the subsided belts can account for frequent resedimentations. There are synsedimentation phenomena in the Jurassic series as calcareous mudflows in limestones (Bélkő), pelitic turbidites (Lökvölgy Shale Formation), Triassic olistolites in the Jurassic pelitic sediment (Bánya Hill).

Based on the primitive character of the Bükkian ophiolites we can account for continent-continent collisions since late Jurassic. The direction of the dominant compression, indicated by the fold axes of the platform and geosyncline sediments, must have been SSE-NNW.

According to the fission track data (Dunkl et al., 1994) the last age of plastic deformation was 80 million years ago. In this period the main effect of compression in this area moved towards N, and the continental basement of the northern platform margin (N of the ophiolite suture) started to become imbricated with NNW vergence. This is evidenced by the syntectonic correlative sediment series (Nekézseny Conglomerate) in the S part of the Uppony Mts. The process was catalysed by the semiplastic deformation of the S-Gemerian crust at the depth of palingenetic granitization.

Associated with the above-mentioned dominant processes, a less intensive lateral compression may have reached this region from W-SW causing the transverse folding of the still covered geosyncline series forming oblique folds, pericline structures, zigzag folds and a slight cleavage system.

Considering these factors we can structurally interpret the cooling paths of the Bükkian mass (Dunkl et al., 1994) with certain corrections (Fig. 3). After the last plastic deformations about 80 million years ago, a gradual upward shearing commenced and also the exhumation of the compressed fold system of the Bükk Mts, which lasted for 35-40 million years, started. These processes initiated the overthrusting of imbricated structures in the northern foreland. The fission track data indicate gradual covering from the early Oligocene to 20 million years ago. Considering the X-ray analysis of clay minerals in Oligocene pelitic sedimens on the surface of the elevated Bükk Mts (Csókás Formatation), the covered period seems to be shorter (between 35-25 m.y.) and less strong in its diagenetic level. Our research confirmed the latter results as we can suggest that the movement of the Bükk Mts continued in the Late Oligocene. The consequences are proved by microtectonic phenomena and by the eroded, and dissected character of the Oligocene series.

Since the Oligocene-Miocene boundary, there were oscillations in the imbricated S-Gemerian area with small, but very intensive periods of structural movements in the Eggenburgian-Ottnangian and in the Karpathian stages with the accumulation of pebbles.

Conclusions

1. The Bükk Mts are the elevated imbricated nappe system of a Mesozoic platform margin carbonate mass with the development of a rift system which was sheared off its original basement and pushed forward in NNW direction.
2. The allochtonous series is overthrust above its former rift zone. The Bátor-Varbó ophiolite suture indicates its northern margin.
3. Its basement is built up of the imbricated and elevated, swell-like paraautochtonous S-Gemerian unit, similar to the Bükkian unit in several of its characteristics.
4. In its faulted-folded mass, first the early quasi-plastic deformations and folding, and the formation of cleavage systems had a dominant role, then the crushing deformations of the upward-moving rigid mass became determinant.
5. As the stress fields of the periodical compressions in the area have not changed significantly since the Cretaceous period, we regard the origin from SSE as an

evidenced fact. The forward movement could have reached 80-100 km. All this supports the assumption that there were not horizontal movements of several hundred km with NE direction between the lithospheric units of the Pannonian Basin.

6. The above-mentioned picture is confirmed by the tectonovolcalnic events related to the compression of the Pannonian Basin. The volcanism has dual character in close correlation with the upward shearing fronts with NE-SW strike and NW vergence, and with deep transverse faults dissecting the main fronts and reaching the lithospheric mantle. The trends of volcanism appear in the immediate foreland of the Bükk Mts just as in the covered volcanic complexes of E-Hungary.
7. There are two important structural-morphological characteristics in the area of the Bükk Mts. Folds and aerial folds with S vergence and steeply imbricated carbonate forms thrusting through the nappe-like fold systems. The former was associated with the early stage of the structural development while, the latter was formed during the later period of the structural movement resulting in the present position. Both are in good accordance with the structural development model of an imbricated nappe system with NNW vergence.

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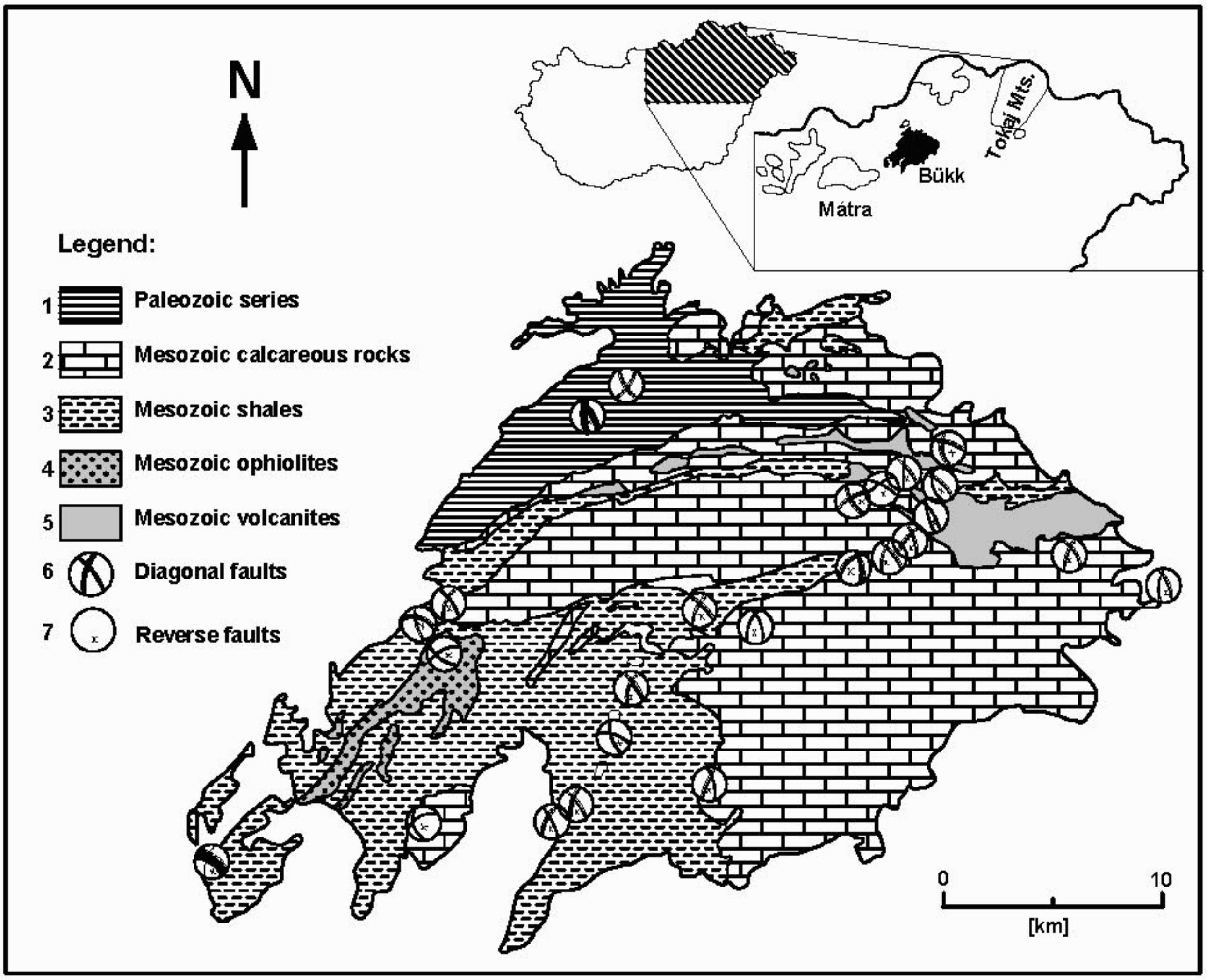
Figure 1 Distribution of microtectonic fault elements measured on the imbricated nappe, the geosuture and the northern foreland of the Bükk Mts.

Figure 2 Simplified structural map of the Bükkian region

Figure 3 Structural development of the Bükk Mountains during the Oligo-Miocene period, on the basis of correlative stratigraphic data of the northeastern foreland



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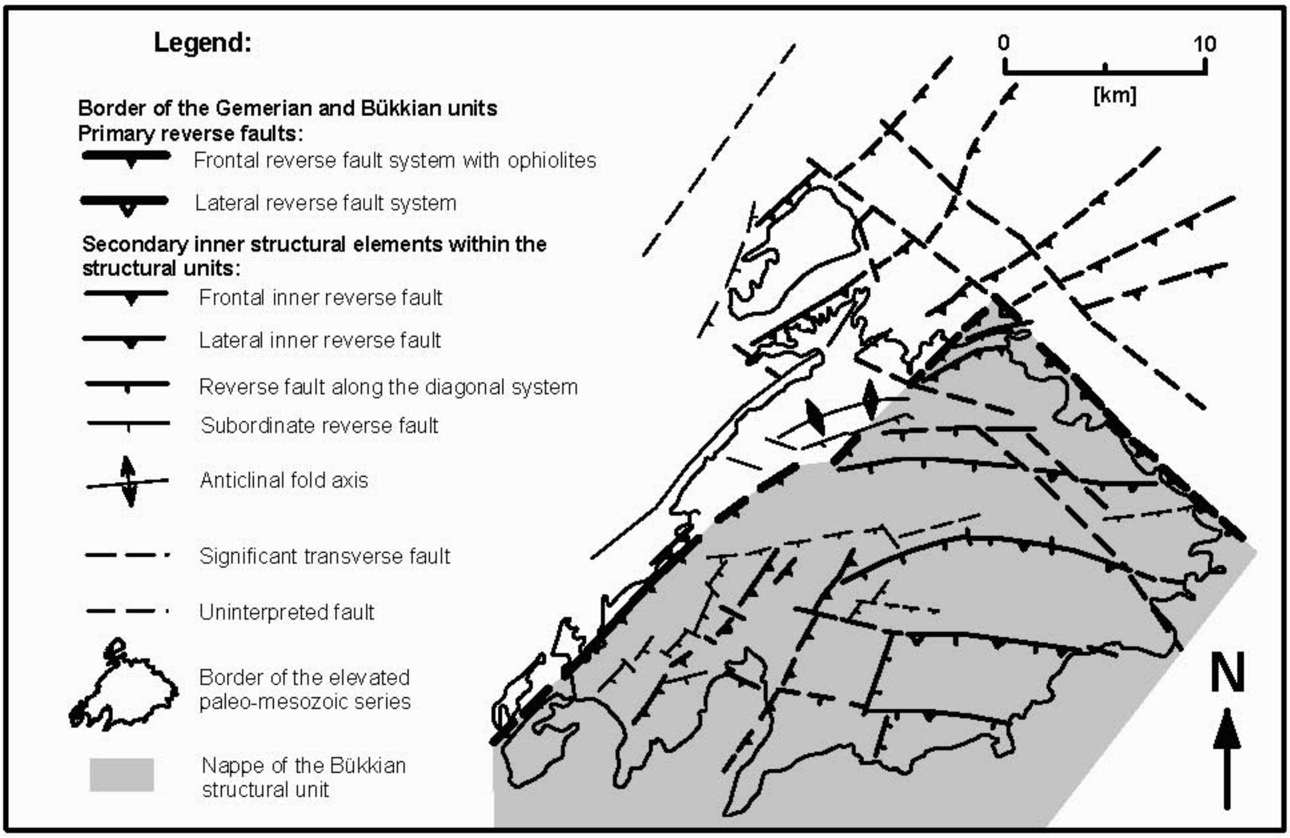

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