Structural Model of the Bersek and Kecskekő Hills in the North--Eastern Gerecse (A Three-Dimensional Visualization)

Gáspár ALBERT

Geological Institute of Hungary, Stefánia rd. 14. H-1143 Budapest, Hungary

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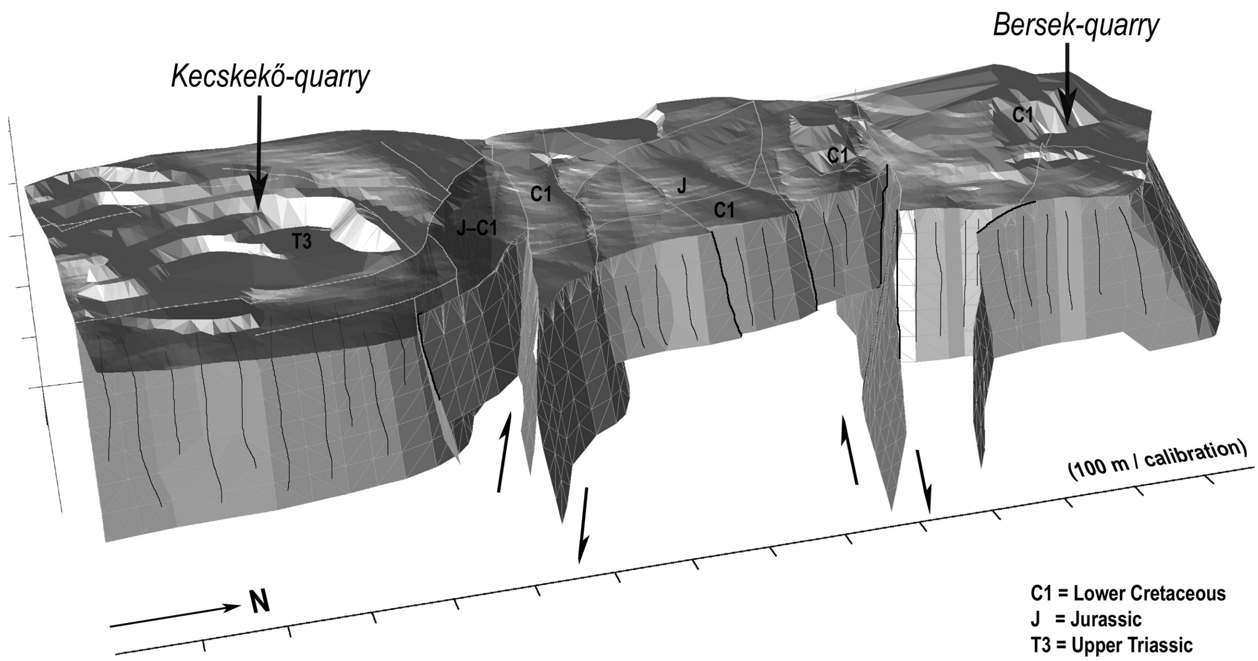
The North-eastern peaks of the Gerecse Mountain are bruised by several quarries operated for the building industry. The Kecskekő limestone quarry and the Bersek marl quarry are the biggest of these. A geological mapping was carried out last June in order to explore the 500 m wide zone of a planned conveyor, which may connect the two quarries with a remote cement-factory site (Albert and Selmeczi 2004, Budai ed. 2004). Although it wasn't required for the construction of the cross-section, an experimental 3D model had been set up for the territory. It was experimental, because the modelling of the structural elements followed a surface modelling method, which resulted in a complex multi-layered structure (fig. 1). Application of this method made the fragmented thrust-surfaces docile, which meant that their shape-lines were stored in a background database, and visualized only if a graphic query was executed in the modelling environ. Further applications exploited the semi-automatic cross-section creating ability of the modelling software. In spite of these capabilities, continuous human intervention was necessary during the development, to avoid serious misinterpretations of the initial data. This modelling project has:

- solved the problem of the "patchwork" tectonics on old geological maps;
- corrected the hypsometric errors of the earlier preteriary-basement contour maps;
- applied a new method for structural modelling.

The structural elements were classified upon their likelihood, and they were sorted in three groups (observed, determined, supposed). As a first step of the modelling process, all of them were projected on a terrain model surface. To create vertical extension for the fault-lines, the projected vertexes were cloned along a 3D vector which was calculated from measured direction/dip data. These arrays contained the input coordinates of the primary fault-surface models, which were refined later.

A borehole database of the region (Gyalog and Tullner 2004) was provided for the model of the basement surface. Although several errors were detected on them, the old geological maps of the region were useful as initial information. During the modelling process, these improper data were corrected.

The examined area is located on the structural border of the Gerecse Mountain and the Dorog Basin. Its structural evolution is characterised by the orogenetic events, which affected the whole Transdanubian Range. Marks of the eo-, meso-, and mainly the neoalpine structural phase could be observed. Analysis of this tectonic pattern suggests that the last main phase (probably in the Pannonian substage) produced pull-apart structures, driven by ENE-WSW extension. In regional scale it produced large scale



■ **Fig. 1.** Shallow-buried pre-tertiary surface and sub terrain fault-structure of the Kecskekő and Bersek-hills (no vertical distortion).

normal faults at the eastern edge of the Gerecse Mountain and partly renewed neoalpine faults, producing southwest-dipping half-graben structures in the Dorog-basin. It is supposed that old faults may have renewed during the Quaternary, enhancing the morphological imprints of older structures.

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The Anatomy of Strike-Slip Gas-Bearing Structure of Ryszkowa Wola (Carpathian Foreland Basin, SW Poland) as Revealed by 3D Seismics: a Product of Late Sarmatian-Pliocene(?) Episode of E–W Directed Tectonic Compression

Pawel ALEKSANDROWSKI[1], Piotr KRZYWIEC[2], Barbara RYZNER-SIUPIK[3], Bartosz PAPIERNIK[4], Janusz SIUPIK[3], Krzysztof MASTALERZ[5], Anna WYSOCKA[6], Jacek KASIŃSKI[2], Piotr NESCIERUK[7], Antoni WÓJCIK[7] and Tomasz MALATA[7]

[1] Inst.Geological Sciences, Wroclaw University, Cybulskiego 30, 50-205 Wroclaw, Poland
[2] Polish Geological Institute, ul. Rakowiecka 4, 00-975 Warsaw, Poland
[3] Polish Oil & Gas Company; ul. Lubicz 25, 31-503 Krakow, Poland
[4] Academy of Mining & Metallurgy, al. Mickiewicza 30, 30-059 Krakow, Poland
[5] Explora Consulting, ul. Grottgera 5, 51-630 Wroclaw, Poland
[6] Warsaw University, Faculty of Geology, ul. Zwirki i Wigury 93, 02-089 Warszawa, Poland
[7] Polish Geological Institute, Carpathian Branch, ul Skrzatów 1, 31-560 Kraków, Poland

The Miocene Carpathian foreland basin in Poland (CFB) has developed in front of the Outer Carpathian fold-and-thrust belt, at the junction of the East European craton and the Palaeozoic platform. Numerous gas fields occur in the Miocene, Upper Badenian through Sarmatian, deposits of the sedimentary infill of the eastern part of the CFB. The gas-bearing Miocene succession is characterised by a shallowing-upward trend of sedimentation and consists of offshore hemipelagic, turbiditic and deltaic and nearshore-to-estuarine facies associations. The foredeep basin formation was largely controlled by the structure of its Neoproterozoic-Early Cambrian basement, especially by NW-SE trending faults inherited form Palaeozoic through Mesozoic tectonic history of SW Poland. Several NW-SE-elongated, narrow basement pop-up structures developed in the northeasternmost part of the CFB, one of them being the Ryszkowa Wola block. The uplift of the latter basement block involved Miocene reactivation of the older fault zones. The uplift of this pop-up structure in the basement brought about the formation of a narrow, NW-SE elongated Ryszkowa Wola horst (RWH) above it, in the Miocene strata. A complex system of right-stepping, en-echelon, mainly normal, faults of predominantly E-W trend, branching off from the NW-SE-striking boundary faults of the RWH, has developed around and above the horst, leading to compartmentalisation of the Miocene succession into numerous, mutually displaced and rotated fault blocks. The above interpretation of the deep-seated Ryszkowa Wola gas-bearing structure, based on 3D seismic data from the Sieniawa-Rudka area, was supported by field investigations in land surface outcrops in a clay pit at the village of Wylewa near Sieniawa, located directly above the RWH. In Late Miocene (Sarmatian to Pliocene?) times, the Sarmatian Krakowiec clay underwent intense tectonic deformation there, producing tight folds of NNW-SSE to N-S axes, strike-slip and dip-slip faults of various sizes, tectonic joint systema and a pencil cleavage localised in fold hinges and steep limbs. Such an association of deformation structures is easily interpretable in terms of a sinistral transpression conditions with the horizontal maximum compression axis directed ±E-W and a sinistral strike-slip displacement in the basement on NW-SE striking faults. The same sinistral kinematics can be inferred from the en-echelon fault arrays recognised around the RWH from the 3D seismics. An important implication of the structural features at Wylewa and Rudka seem to be an inference about a hitherto unknown epi-