WSW/ENE oriented, with maximal development on 300-400 m width and 1-2 km length within an entity with frequent sequences of discordance is revealed. This image closely fits to the structural model of the frontal Nappes of the Botiza Unit as outlined in the area of maximum outcropping and is extended upon the entire Botiza and Wildflysch Units (conformable to the main entity of the nappe units upon which sporadic outcropping and consistent Upper Miocen sedimentary cover are observed). The development of the crystalline rocks assigned to the Internal Dacides Units vs. Tisia-Dacia as well as of the Cretaceous, Paleogene and Upper Miocene deposits and mostly of the Badenian-Pannonian volcanics have defined a crustal puzzle difficult to decipher, which favored different cartographic and structural interpretations. Based on the photogeologic image, the tectonic interpretation evidenced the major fractures in OGM area: 1. *NE Gutai Fault*, 2. *Dragos Voda-Bogdan Voda Fault*, 3. *Suior-Baia Sprie Fault* (the last two ones being frequently taken one for another), all sinistral strike-slips. We designed also the corresponding sintetic/antitetic faults, as well as other minor faults with considerable structural effects.

The statistic analyses of all fractural alignments quantified by discordant measurable segments (considered proportionally with the value of the fractural amplitude) led to the vectorial representation of the major fractures and their associated syntetic/antitetic secondary faults (1., 2., 3.) advancing the cinematic model (translational and rotational) of the analyzed tectonic block (OGM). The model indicates northeastward movement and counterclockwise rotation (45^0-60^0) as compensation (retreating) effect of the convergence generated by the oblique collision of the major tectonic plates (East European Plate/African Plate). This cinematic hypothesis (collision at open angle to WSW) seems to infirm the closing sense of the oceanic basin, illustrated by the migration of the foreland basin depocenter in front of the Carpathian arc from W to SE and can be explained only by a specific oblique collision of this tectonic area. The reconciliatory advanced solution of the two interpretative scenarios regarding the Miocene kinematics of the area is a NE peninsula part of the Tisia-Dacia block or of a distinct crustal entity with its own kinematics (Zemplin), at northern joint of the Alcapa / Tisia-Dacia Units. A detailed evaluation of each fractural entity including compressive/distenssive associated assembles (pull apart, positive flower structure, double compressive bands, bypass bends, distenssive and compressive bends etc.) has been performed.

Post-subduction Pliocene-Quaternary magmatism in the south-east part of the Carpathian-Pannonian Region: tectonic significance

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The SE part of the Carpathian-Pannonian region records the cessation of convergence between the European platform/Moesia and the Tisza-Dacia microplate. Pliocene-Quaternary magmatic activity in this area, in close proximity to the 'Vrancea zone', changed from normal calc-alkaline type to much more diverse magma compositions at approximately 3 Ma, suggesting a significant change in geodynamic processes. We review the tectonic setting, timing, petrology and geochemistry of the post-collisional volcanism to constrain the role of orogenic processes such as subduction and collision on melt production and migration. The calc-alkaline volcanism (5.3-3.9 Ma) marks the end of normal subduction-related magmatism along the post-collisional Călimani-Gurghiu-Harghita volcanic chain in front of the European convergent plate margin. In South Harghita magma compositions changed at 3 Ma to adakite-like calc-alkaline and continued until recent times (< 0.03 Ma) interrupted at 1.6-1.2 Ma by generation of Na and K alkalic magmas, signifying changes in the source and melting mechanism. We attribute the changes in magma composition in front of the Moesian platform

Ψηφιακή Βιβλιοθήκη Θεόφραστος - Τμήμα Γεωλογίας. Α.Π.Θ.

to two main geodynamic events: (1) slab-pull and steepening with opening of a tear window (adakite-like calc-alkaline magmas) and (2) renewed contraction associated with deep mantle processes such as slab steepening during post-collisional times (Na and K alkalic magmas). Contemporaneous post-collisional volcanism at the eastern edge of the Pannonian Basin at 2.6-1.3 Ma was dominated by Na alkalic and ultrapotassic magmas, suggesting a close relationship with thermal asthenospheric doming and strain partitioning related to the Adriatic indentation. Similar timing, magma chamber processes and volume for K-alkalic (shoshonitic) magmas in the South Apuseni Mountains (1.6 Ma) and South Harghita area at a distance of ca. 200 km imply a regional connection with inversion tectonics.

Hierarchical mapping of landforms from Digital Elevation Models (DEMs)

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Digital Elevation Models (DEMs) are used for the extraction of land-surface parameters and objects through geomorphometric analysis. Landforms are examples of objects that can be extracted or mapped through wall-to-wall classifications and further used in any application where discrete representations of land surface might serve as variable of interest. In a somehow counter-intuitive manner, most of landform classification systems work through the classification of cells, which could be further clustered to define the borders of objects. This approach is limited in several aspects, including the scattered aspect of classification in the so-called 'salt-and-pepper effect', tying the scale of analysis by the raster resolution, difficulties in including topological relationships in classification and also in developing hierarchies of landforms.

This work aims at investigating methods of producing hierarchical mapping of landforms from DEMs. In our approach, homogeneous objects are produced first through image segmentation of DEMs and their derivatives, which are further used as building-blocks in classification/mapping of landforms. Image segmentation is coupled with multi-scale pattern analysis so that the objects are delineated at characteristic scales in a data-driven fashion. Thus, land-surface parameters as derived from DEMs are segmented into relatively homogeneous areas with eCognition Developer® at a range of scales. At each scale level, local variance (LV) is calculated as the mean value of standard deviation of segments. The values so obtained are plotted against scale levels. High values of LV and its rate of change (ROC-LV) indicate scale levels where objects are associated in patterns of land-surface parameters satisfying the condition of maximizing internal homogeneity while maximizing external heterogeneity. The whole procedure has been implemented as an algorithm called Estimation of Scale Parameters (ESP). This procedure produces homogeneous spatial entities with boundaries such that coarser scale entities have precise boundaries within which finer scales entities nest perfectly. This is a condition for developing hierarchical classifications of landform elements.

We are currently investigating two methods of developing such hierarchies:

1. Breaking down complexity through segmentation and successive partitions by nested means. The initially segmented DEM at the scale corresponding to the maximum value of LV is classified in two areas separated by the mean value of elevation. Each area is extracted as independent layer on which segmentations are performed again at the scale indicated by the maximum value of LV and then partitioned at the mean value of another land-surface parameter. This procedure is iterated to produce the third level of the hierarchy. This method is being applied at macro-scale to classify the physiographic units of Africa, as well as at micro-scale to classify landform elements in a flat Dutch landscape for archaeological purposes. Both applications have produced encouraging preliminary results.

Ψηφιακή Βιβλιοθήκη Θεόφραστος - Τμήμα Γεωλογίας. Α.Π.Θ.