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SOME COMMENTS ON THE STRUCTURE OF THE APUSENI MOUNTAINS, ROMANIA

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The Apuseni Mountains represent a part of the Mesozoic Preapulian Craton. During the Tertiary time, they made up a passive portion of the composite Tisia-Getia terrane. From the bottom to the top the Apuseni Mountains consists in the following units: the Bihor Autochtonous, the Codru Nappe System, the Biharia Nappe System and the Western Transylvanides as the uppermost units in this nappe stack. The Bihor Autochtonous consist of pre-Alpine metamorphic basement and a Permo-Mesozoic cover. In the frame of the Codru Nappe System, only the second tectonic unit (starting from the base), has metamorphics in its constitution, all the other components of this nappe system being built up from unmetamorphosed Permian and Mesozoic formations.

The Codru sediments which were deposited on a continental platform and the Codru Nappe System are known only in the western part of the Apuseni Mountains Southward, the Codru Nappe System is covered by the Biharia Nappe System, developed mostly in the eastern and southern part of the Apuseni Mountains. Though, there were found some tectonic klippes in the Meses Mountains and Valea Draganului, proving that the Muntele Mare and Vladeasa Massifs have been tectonically covered by these units in the past.

The lowermost tectonic unit in the Biharia Nappe System supports on its crystalline basement an unmetamorphosed Permo-Mesozoic sequence. The median units of this system, namely the Biharia Nappe and its satellites, consists either in metamorphosed Permian formations, or in a Pre-Alpine basement supporting Permian and Triassic metamorphosed sequences. The uppermost unit in the Biharia Nappe System is represented by the Baia de Aries Nappe. It is constituted by a pre-Alpine crystalline without a Permo-Mesozoic cover.

The Transylvanides thrusts over the Baia de Aries crystalline. They are composed mainly from Mesozoic sediments, but not older than the middle Jurassic, ophiolites and island arc volcanics. Initially, the Transylvanides formations has a rift affinity, yet their basin evolved during the Early Cretaceous toward a foreland retro-arc basin type. The absence of the Permo-Mesozoic sediments on the Baia de Aries crystalline suggests that this unit represented a shoulder of the Transylvanides rift.

The first crustal shortening was happened during the Early Cretaceous emplacing the Austrian Transylvanides. It finished during the Late Aptian-Early Albian.

The second crustal shortening acted during the Turonian and generated the Codru and Biharia Nappe systems. The third crustal shortening ended during the Latest Cretaceous and re-sheared the Austrian Transylvanides, generating the Laramian Transylvanides.

The primary relations between the Codru and Biharia Nappe Systems components are not well understood. Sandulescu (1984) suggested the idea that the Permo-Mesozoic formations of the Codru nappes could be taken out from the basements of Biharia nappes. This assertion cannot be accepted because:

a. the Garda Nappe, the lowermost Biharide, preserves its own Permo-Mesozoic cover;
b. the Biharia Nappe and its satellites possess metamorphosed Permian and Triassic formations;

The tectonic units of the Apuseni Mountains have been sheared antithetically, that is their overthrusts are perpendicular to the subduction plane. In other words, the Preapulian craton played the upper plate role as the western part of South America today.

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The final direction of the Codru Nappe System displacement was done from SW towards NE. The Biharia Nappe System moved finally from SE toward NW. From structural point of view, the Apuseni Mountains cannot be correlated with the East and South Carpathians. The tectonic units of the East and South Carpathians show a synthetical character, these units being emplaced in relation with the gradual closure of the External Carpathians Flysch Basin. Also, for the East and South Carpathians, the pre-Gosau (intra Turonian) tectogenesis is missing. We can highlight two key aspects of the Apuseni Mountains structure, namely: the alpine metamorphism of the Biharia Nappe System Permo-Mesozoic components and the 90° difference between the displacement direction of the Codru and Biharia Nappe systems, respectively.

The Laramian Transylvanides represent out-of-sequence thrusts and overthrusts. During the emplacement of the Apuseni Mountains tectonic units the rotational displacement has been outstanding. The Transylvanides and the Biharia Nappe System disappears gradually towards NE, the tectonic transport diminishes in the same direction and the Codru Nappe System is completely missing in this part of the Apuseni Mountains.

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