A POSSIBLE GEOTECTONIC INTERPRETATION OF THE SOUTH APUSENI MOUNTAINS (ROMANIA)

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Abstract: After a long debate concerning the nature (type) of the Mesozoic magmatites from the South Apuseni Mountains - the existence of exclusive island arc volcanism (IAV) products versus ophiolites (O) followed by IAV products, the second theory imposed. There still remained a lot of uncertainties regarding the spatial extension and relations between these products and the Mesozoic sedimentary deposits, complicated by the nappe structure of the area. A composed structure formed by narrow, prolonged slides of Laramian mélange suture, deciphered by a detailed Remote Sensing and geophysical interpretation covering all the area, is proposed.

Key words: ophiolites, volcanic arc island rocks, Mesozoic sedimentary deposits, suture mélange, slides structure, South Apuseni Mountains.

Introduction

The South Apuseni Mountain (SAM), covering an area of about 3,300 km^2, are composed by J – K_1 N-type MORB sequences of ultramafic-mafic isotropic cumulates of gabbros and diorites / sheeted dykes / pillow lava forming an ophiolitic complex (Saccani et al., 2001) and volcanic island arc rocks (Savu, 1995; Savu et al., 1988; Savu et al., 1991; Savu et al., 1992a; Savu et al., 1992b; Savu et al., 1992c; Cioflica G. et al., 2001; Saccani et al., 2001) of J_3 and K_1 age. The geologic setting of SAM is completed by a variety of J - K sedimentary deposits which compose, together with the Mesozoic magmatic suites, the so considered *nappe structure*. Different interpretations of this *nappe structure* have been advanced, the most comprehensive belonging to Sandulescu (1984). Balintoni and Berza (2001) consider this *nappe system* of Laramian age.

The present structure of SAM is accomplished by Laramian magmatics (banatites), by Miocene sedimentary deposits and Sarmatian-Quaternary calc-alkaline / alkaline volcanics.

The arguments for a nappe structure are: stratigraphycal discordances mapped in different outcropping locations, different composition of ophiolites (namely the presence of spilitic rocks in certain nappe units - Sandulescu (1984), the presence of olistolithes and the prevalence of specific rocks like ophiolites and flysch-rocks (Sandulescu, 1984).

A lot of unclear issues still persist on *nappe postulate* because:

- There is no detailed mapping to discriminate O, IAV the Mesozoic sedimentary deposits (generally covered with soil and vegetation);
- No detailed photogeological mapping was performed till now;
- Widespread ophiolitic tectonic breccias occurring within Capalnas-Techereu Nappe has been considered cartographically as "pyroclasics" (Borcos, M. et al., 1981)
- Breccias-type of the limestone olistolithes is entirely ignored;
- The olistolith elongation of few kilometers, despite the narrow width, of hundreds of meters, is also ignored;
- The obvious recurrence of some discordant stratigraphic successions (*Fenes area - Dambau*) are interpreted as successive faulting;
- The presence of crystalline rocks in the Capalnas-Techereu unit (mainly ophiolitic) still remains exotic, unaccountable in a unitary remnant of ocean floor crust.

The *nappe units* of SAM surround the North Apuseni Mountains (Internal Dacides) by their southern and eastern sides: Grosi unit, Cris unit, Bucium unit, Capalnas-Techereu unit, Curechiu-Stanija unit, Fenes unit, Trascau (Bedeleu) unit, Fundoaia unit, Boyes unit, Cabesti unit, Bejani unit.

The photogeological interpretation reveals the development of some long, imbricate slides on the entire Transilvanides area (fig. 3). The slides are formed exclusively of Mesozoic rocks. Successive slides of ophiolites, limestone and flysch rocks, as well as successive ophiolitic and island arc volcanic rocks may develop. Only the thickness of the limestone slides may exceed 200-300 m. Within the ophiolitic slides, the typical succession of an ophiolitic complex (peridotite/gabbro/sheeted dikes/pillow lava) cannot be

distinguished, though the specific ophiolitic types have been randomly described all over the Apusenide area. However, the basaltic pillow-lavas prevail, though frequently transformed into tectonic breccias. Both the carbonatic and the carbonatic - ophiolitic "olistolithes" develop linearly as continuous or discontinuous slides, being certainly the result of a tectonic process, not of the development of olistostrome or wildflysch.

The slides design of the Mesozoic rocks is quite significant and it is slightly disturbed by the Banatitic volcanism (Laramian), the Neogen volcanism or by the Neogen sedimentary deposits. It subsequently develops along major E-W direction on the South segment of the Apusenides (the Capalnas –Techereu area, the Ampoi basin) and along SW-NE direction in the eastern segment (Trascau Mts), following the major suture line of the continental blocks of the Internal Dacides/ Median Dacides.

Geophysical data

Both regional shaded relief aero-magnetic (fig. 1) and gravity (fig. 2) images succeed to reveal the whole outcropping area of the ophiolitic complex of the SAM.

Moreover, the magnetic contrast and the gravity mass contrast between ophiolites and its lithological background, allow their regional outlining both to NE (beneath the Transilvanian basin) and to SW (beneath the Pannonian basin) to be defined.

Within the alignments of regional maximum gravity, associated mainly to the ophiolitic piles, the subsequent detailed measurements (upon the Valisoara – Luncoiul de Jos area) have revealed a succession of gravity maximum and minimum relative parallel to the main direction (WSW - ENE) of the ophiolites. The relative gravity minimum may be associated either to the presence of island arc volcanics, or to sedimentary rocks. This alternation is better reflected by the horizontal gravity gradient (fig. 4), which suggests a possible suture structure.

Conclusion

The entire area between the Internal Dacides and Median Dacides represents a suture mélange formed by slides of oceanic crust (equally composed by ophiolites and sedimentary rocks), which randomly solders to the continental margins at north and at south. The design of the majority of the *nappes* forehead, represented cartographically, may constitute a structural local reality, but the real

nature of the *nappes*, as a whole, represents in fact, a recurrence in an uncountable number of such phases.

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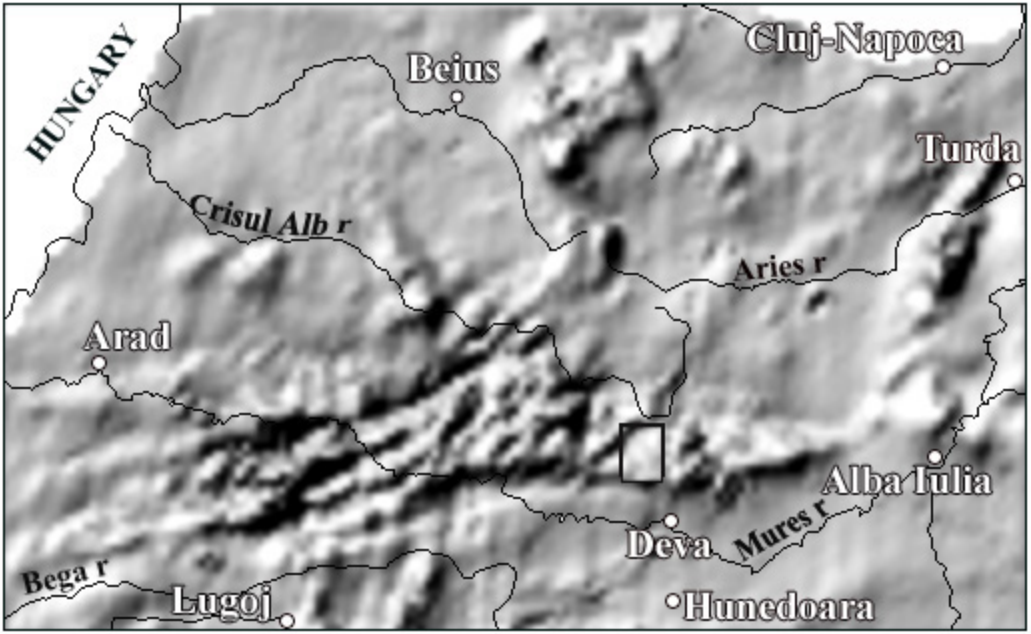

Figure 1 Regional aeromagnetic anomaly map (Lambertian reflection) of South Apuseni Mountains and the surrounding areas

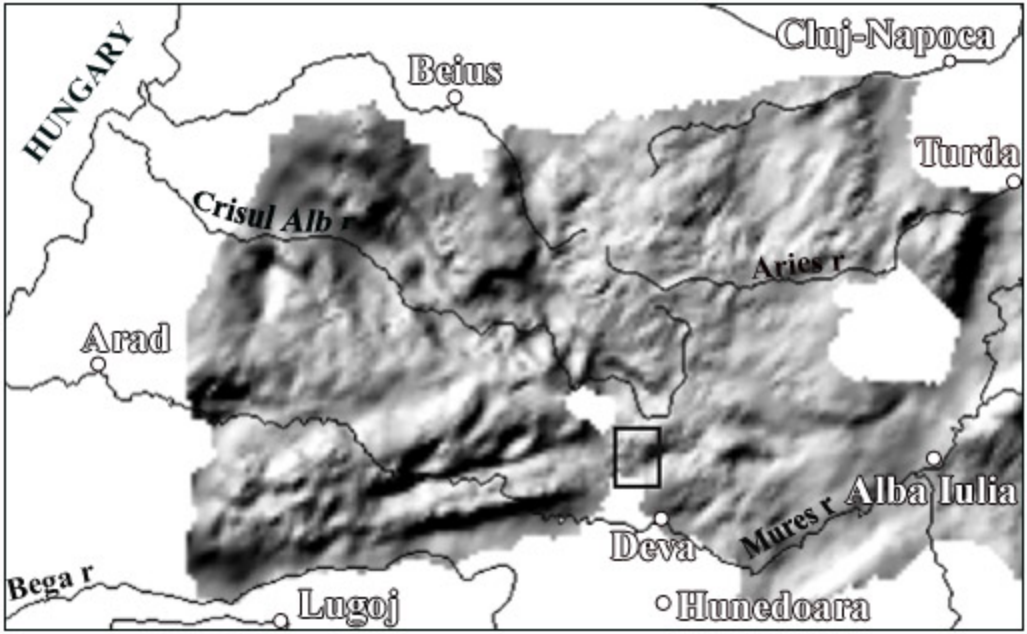

Figure 2 Regional gravity anomaly map (Lambertian reflection) of South Apuseni Mountains and the surrounding areas

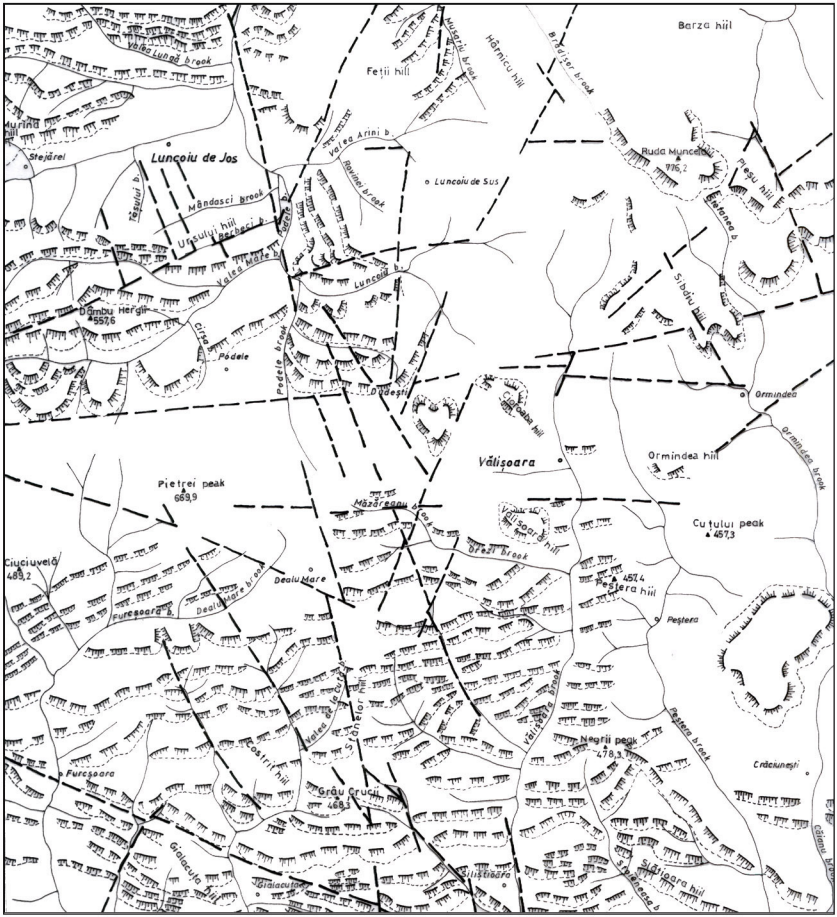

Figure 3 Photogeological map of Luncoiu-Valisoara area