TRANSPRESSIVE PERIADRIATIC SUTURE IN SERBIA AND SE EUROPE

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Abstract: Periadriatic suture (PAS), beyond the Alps range, stretches through S Pannonia along southern side of the Slavonian mountains and Fruška Gora. Than PAS extends between eastern margin of Vardar zone and Moravicum (former "Serbo-Macedonian mass"). Over entire Pannonian and Vardarian segment PAS maintains all major properties it has in the Eastern Alps: presence of ophiolites, young tonalites and dextral transcurrence. Here, too, it represents the main zone of tectonic symmetry between the Carpatho-Balcanian and Dinaro-Hellenidic trunks of the Alpides in SE Europe.

Key words: Periadriatic suture, Eastern Alps, Pannonia, Vardar zone, Southeastern Europe.

Through the Alpides of South Europe stretches the remarkable Periadriatic suture (PAS) whose western parts have been known for more than a century (MOJSISOVICS,1879; SUESS,1885, pp. 319-322). It consists of several segments, those ones in the Eastern Alps having been especially clear so far.

In Eastern Alps PAS has two segments (Ivrea - Tonale and Pusteria - Karawanke), separated by the lateral and secondary Judikaria suture with ophiolites. Extensive literature dealing with PAS (BOEGEL,1975), shows that it represents the main zone of tectonic symmetry of the E Alps, dividing the north and southvergent structures there. Then it contains stuck bodies of ophiolites and intruding young tonalites, and also PAS is a zone with conspicuous rightward transcurrent transport. Literature offers different answers referring to the question as what happens to PAS beyond the Alps range. According to some authors it ends on the boundary between the Alps and Pannonian Basin (GOČEV, 1972, Fig.1; BALOGH, 1981, p. 25) or it curves as far as up to the Lesser Carpathians only (GLANGEAUD, 1957, Fig. 8). Just few geologists extend PAS along the Inner and Outer Dinarides boundary line (CIOCIRDEL et al. 1967, Pl. I). A big group of authors quite seriously extends this suture north-easterly, directly into the Balaton line (KOEROESSY, 1965, Fig. 2; TOLLMANN, 1968, Fig. 8; SZADECZKY-KARDOSS, 1975, pp. 73-75; HORVATH et al. 1977, Fig. 1; KOVACS, 1981, Fig. 3; BALLA, 1988, Fig. 6; MIOČ, 1997, p. 251). Some authors extend PAS almost rectilinearly into the South Transilvanian fault (ALEKSIĆ et al. 1970, p. 430; LAUBSCHER, 1971; BURCHFIEL, 1980, Fig. 9).

DIMITRIJEVIĆ & DIMITRIJEVIĆ (1971, p. 338) were among the first to suggest that PAS passes through Pannonia along the northern side of the Slavonian mountains and the Fruška Gora and extends on between Serbo-Macedonian mass and the Vardarian zone. ROYDEN et al. (1982, Fig. 6) and BIRKENMAJER (1986, Fig. 1) are of similar opinion. None of them produced any evidence, though. These are just assumptions based on the fact that in the southern parts of Pannonian Basin smaller or larger bodies of ophiolites and young granitoids occur on surface or in boreholes.

It is rather difficult to ascertain the exact position of PAS in Pannonian Basin since the terrain is covered by thick Neogene deposits. Relying, however, on the data referring to rocks from Neogene basement, obtained from boreholes (PANDŽIĆ, 1986; ČANOVIĆ et al.1988), also on aerogeomagnetic measurements (VUKAŠINOVIĆ,1972, a map in supplement; STARČEVIĆ,

1991, Fig. 1) and especially on the recent field structural investigations on the Ivanščica and the Fruška Gora (GRUBIĆ et al. 1998), we know positively that PAS lies south of these mountains, i. e. in southern Srem, southern Slavonia, northernmost parts of Mačva and Bosnian Posavina (GRUBIĆ, 1994, Fig. l). Ophiolites, Triassic and Jurassic schist lustres and diabase-chert formation, and Jurassic-Lower Cretaceous flysch in the Ivanščica and the Fruška Gora lie allochthonously overthrust northwardly (GRUBIĆ et al.,1998) and by their location make the researchers confused. PAS stretches more to the south of these formations, that is in roots of overthrust structures.

Data from deep boreholes and geophysical measurements in the Pannonian section of wider Belgrade environs show that the Vardarian zone branches here in two directions. One wing extends into Srem and the other into Banat, than it curves eastwardly towards NE and E and meets the South-Transilvanian zone. Both wings are distinctively marked by ophiolites (ČANOVIĆ et al. 1988, a map of ophiolites in boreholes in Voivodina). Apusenicum terrane is inserted between these two branches, whereby relations of the "tripple joint" type are established. It seems that such a tectonic plan prevents PAS to continue from the Srem-branch southwardly along the western border of Moravicum terrane (former "Serbo-Macedonian mass"; GRUBIĆ, 1999). Yet it continues from Sremian direction (WNW-ESE) into the Vardarian direction (N-S) west of Smederevo (GRUBIĆ, 1994, Fig.1), maintaining all its essential properties. Therefore it is obvious that the Banat-branch of ophiolites actually represents just a lateral South-Transilvanian suture which is a secondary structure as compared with PAS.

Along the Vardarian zone eastern margin, i. e. between this zone and Moravicum (GRUBIĆ, 1999), there is a transcurrent dislocation the presence of which was indicated to a long time ago (BRUNN, 1959). It stretches all the way up to Halkidiki and, what is very important, it has properties of a dextral fault (GRUBIĆ, 1966, p. 478; van BEMMELEN, 1969), thus being, preliminary, included within the PAS (DIMITRIJEVIĆ et al., 1973, p. 338; ROYDEN, 1988).

Over the entire Pannonian and Vardarian segment, PAS maintains all major properties it has in the E Alps: presence of ophiolites, young tonalites and dextral transcurrence. It is also of a great relevance that here, too, it represents the main zone of tectonic symmetry between the Carpatho-Balkanian and Dinaro-Hellenidic trunks of the Alpides. Here as well sutures of second order branch from it sidewardly: Judikaria, Zagreb-Zemplin, South-Transilvanian and Metohian sutures with ophiolites, along which the dextral transcurrent movements also took place. Hence it is beyond any dubt that where Pannonian Basin and the Vardarian zone are concerned, it is the mater of an extention of the authentic PAS.

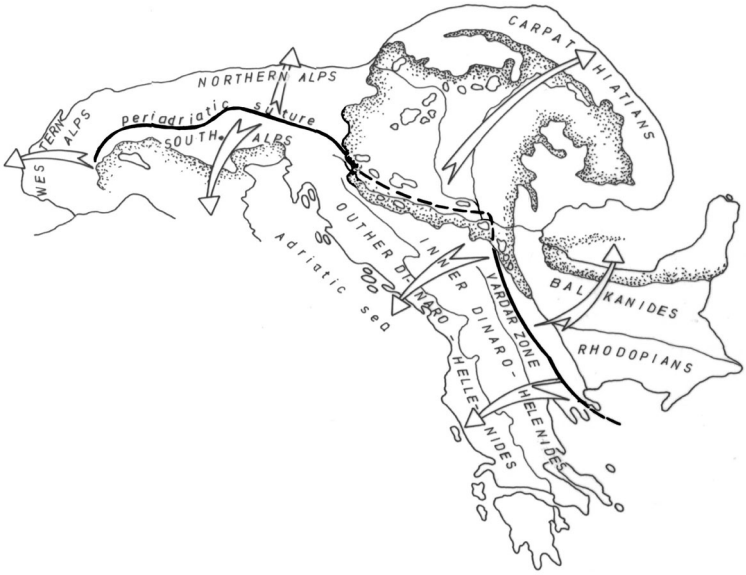

Fig.1. Position of Periadriatic suture in the Alpides of SE Europe.

PAS was formed in the place of former Vardar, Voivodina and Ivrea troughs with oceanic crust. The trough of Voivodina, however, did not exist north of the Slavonia - Srem mountains during the Cimmerian time as it was believed (GRUBIĆ, 1980, Figs.13 and 15) but lied south of them. In the Upper Jurassic and Lowermost Cretaceous these troughs were closing: partially by being consumed (Ivrea), but usually their contents were obducted (Voivodina and Vardar troughs). This closing was uncomplete, ununiform and did not occur simultaneosly over the entire area and resulted from a collision between the African Plate and Adria with neighboring sialic blocks on one side and mosaic of islands of the Austro-Alpine and Carpathian, Pannonian and Balkanian terranes on the other side. On that occasion, ophiolites, Triassic and Jurassic schistes lustres and diabase-chert formation were squeezed out from troughs and in a form of obducted nappes thrust over south-Pannonian parts of the Carpatho-Balkanian and Dinaro-Hellenidic elements.

From the Mid-Lower Cretaceous, remaining parts of oceanic bottom underwent a phase of a transpressive ocean-floor closing which lasted throughout the entire Upper Cretaceous and a part of the Tertiary. In this period Adria, with neighboring sialic blocks, kept sliding in intervals from SSE towards NNW alongside the Austro-Alpine and Carpatho-Balkanian terranes with sialic crust (CHANEL et al. 1976, Figs. 7, 8 and 9), pressing and pushing them laterally towards N and NE across the system of external troughs with oceanic crust (Strandža, Transilvania and Meliata range, and Kotel, Kraina, Severin, Vah and Penin range). In this way, first, the huge Austro-Alpine and Carpatho-Balkanian Mid-Upper Cretaceous nappes were formed. Later, on, in the Tertiary, these nappes got longitudinally splitted, refolded and secondarly imbricate structured, particularly so the Carpatho-Balkanides s.l. (GRUBIĆ, 1981). in same time with these events younger external Alpine and Carpathian nappes were formed.

Through this transpressive process, PAS with specific structural and other accompanying features was definitely installed. The most remarkable among these is general symmetrical position of PAS between Carpatho-Balkanian and Dinaro-Hellenidic tectonic trunks of the Alpides in SE Europe.

It is very interesting that during the whole Quaternary tectonical stress between eastern margin of Vardarian zone and Moravicum were in accord with the dextral transcurence of PAS. It is especially clearly observed in the wider Kopaonik area where even recent faults in the orienation NE-SW are generated (I. ĐOKOVIĆ et. al. 1995, Fig.1).

After GRUBIĆ (1992, Fig. 1, and p. 90) PAS is connected to the noted North-Anadolian fault in Turkey and via it to the main fault of Zagros in Iran. These two systems of faults also are with rightward transcurrent movements, but they are younger and do not represent zones of main symmetri either in Anadolides or in the Iranides. This means that these big faults only towards the end of the Paleogene joined right away the already existing system of PAS.

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