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SÜLFÜR THROUGHOUT GEOLOGİCAL TIME IN BALKAN PENINSULA**

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ABSTRACT.- During investigations for a long time it has been remarked that the oldest metallogenic epochs in Balkan Peninsula include a limited number of, occurrences with sülfür as one of the chief chemical elements. Thus it could be said that in these epochs the deposits with sulphur compounds either have not been formed or in some cases there were only rare showings. So, for instance with the Grenvilian epoch, according to date knowledge, only one occurrence in Pelagonids (Nezilovo) could be associated. In the Baikalian metallogenic epoch, characterized by formation of greenschists in western Macedonian only traces of sulfide mineralizations, then one deposit of lead, zinc and copper sulfides, as well as one pyrite impregnation in the larger Popcevo - Dojran area (eastern Macedonia), exhibiting sülfür content less than 0,11% are present. In contrast to Pelagonian-Rhodopean massif, in the Green complex (Vlasina) of eastern Serbia numerous deposits and occurrences of pyrite and lead, zinc and copper sulfides are present, indicating a more remarkable sülfür yield in this district during Baikalian metallogenic epoch. Thanks to this fact it could be estimated this epoch to be much more enriched in sülfür in Balkan Peninsula, compared with the Grenvilian epoch. In the next epochs (Caledonian and Hercynian) the sülfür yield had become more and more intensive. This is especially related to the phytlitic volcanogenic-sedimentary origin formation of western Macedonian. in which fifteen deposits and occurrences of lead. zinc, copper and molybdenum sulfides have been registered, indicating numerous richer and poorer, certainly irregular pyrite impregnations. Compared with all previous epochs, the Alpine (early and late) time is characterized by great number of deposits of lead, zinc, copper, iron, arsenic, mercury sulfides and other metals, then by sulphates in sedimentary complexes, thus geochemically very sharply differing Alpine time from all previous epochs. On the basis of these facts, one could ascertain that the Cretaceous-Tertiary period could geochemically be characterized as the Sulphur Epoch. Judging by all these facts this is only the feature of Balkan Peninsula, but is probably of Global importance (phenomena).

Key words: Sülfür, epoch, sulfates, green complex, phyllitic formation, Cretaceous - Tertiary, intrusive-volcanogenic complex, Balkan Peninsula.

İNTRODUCTİON

During geological investigations lasting several years in the territories of Macedonian, Serbia, Bosnia-and-Herzegoniva, Montenegro and Turkey, as well as the visits to other regions in Balkan Peninsula, it was noticed that sulfide deposits are very rare in the oldest formations of these regions, and going throughout time they are more and more freguent so that in the Cretaceous and Tertiary time there. occur numerous smaller or larger suifide deposits of iron, copper, lead, zinc, antimony, arsenic and other metals, as well as sulphate deposits. This appearance has induced certain curiosity, resulting in some attempts this phenomenon to be deciphered. In that sense some investigations were undertaken, but these couldn't be studious and more universal because of limited financial support and other circumstances. In that way, ideas presented in this paper are based upon incomplete evidences, although sufficient, according to our opinion, the problem to be opened and some distinct observations to be presented.

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SHORT REVIEW OF GEOLOGİCAL EVO LUTİON OF BALKAN PENINSULA

In aim the phenomenon of geochemical evolution of sülfür to be perceived in the best way, it is necessary to present in brief some newer comprehensions on geotectonical evolution and some magmatic events related to certain geochemical processes.

According to knowledges to date the oldest formations in the Balkans occur in the eastern part of the Pelagonian-Rhodopean massif or in Rhodopeans, including highly metamorphosed rocks constituting the geotectonical block, which is confined, according to all features, to continental type of the earth crust. Numerous characteristics of Pelagonian-Rhodopean massif have indicated that its origin and evolution during longer span of geologic time cannot coincide with formation and evolution of the Morava massif* and other crystalline complexes in Balkan Peninsula. Just during the younger Paleozoic and in Mesozoic time the Pelagonian-Rhodopean block entered along with other geotectonical blocks, a part of the unique assemblages of Balkan Peninsula.

According to available data the Pelagonian-Rhodopean massif originated 2.5 billion years ago, being in that time a part of the Gondwana supercontinent. From the other side, it is considered (Popovic, 1991, 1995, 1998) that the Morava massif (crystalline complexes in the Juzna Morava and Velika Morava valleys) is composed of two complexes formed in various geotectonical settings. It is under discussion, accordingly, the Gneiss complex and the Green-or Vlasina complex respectively. The Gneiss complex exhibits properties of continental type of the earth crust and initially it was a part of Bohemian or Middle European massif (Popovic, 1988), being formed 700 million or more years ago (Balogh et al., 1994), and the other, Green or Vlasina complex respectively, according to all its features is restricted to the ocean type of the earth crust. This part had originated in the area Paleoasiatic ocean (as named by Zonensain et. al., 1976), nearly in the same time as the Gneiss complex. The Vrvi Kobila structure, şeparating these two complexes, as far as concerned all facts represents a rudiment of a Collision structure, one part of it being originated between Paleoasiatic ocean and Middle European continent.

By separation of Mediterranean subcontinent from the Gondwana, and Morava massif from the Middle European continent (Popovic, 1998), and their motion in later times, they were included into the contemporaneous geotectonical mosaic of Balkan Peninsula.

Such a dynamic evolution of geotectonical blocks of the Balkans, as well as geotectonic processes, which have been developed during the younger Paleozoic, Mesozoic and Cenozoic (including the modern time as well) or after creation of the contemporaneous Balkan Peninsula respectively, have been accompanied by corresponding magmatism, which played an impressive role in geochemistry of individual elements in the same area, one of these being sulphur.

GEOCHEMİCAL EVOLUTİON OF SÜLFÜR IN BALKAN PENINSULA

Taking into consideration the independent pre-Mesozoic evolution of individual geotectonical settings of their origin, being specific for each of individual blocks in a

The Serbo-Macedonian mass is divided into Pelagonian-Rhodopean and Morava massifs (Popovic. 1991)

corresponding way, one of the features, beside other individualities, is the sülfür as a chemical element, exhibiting his own geochemical and metallogenic evolution. In the same time this is a common feature of all unified geotectonical blocks in frames of Balkan Peninsula during Mesozoic and especially Cenozoic time.

These Studies are based first of all on relatively limited and non-systematic investigations of sülfür contents, in conditions of deficiency of detailed Studies on distribution of this element throughout metallogenic epochs in Balkan Peninsula, concerning the Proterozoic complexes of Pelagonian-Rhodopean massif (Macedonia), then Drina, Ivanjica and Jadar metamorphics (western Serbia), area of southern Serbia, the Vlasina or Green complex of eastern Serbia. These facts are supported by presence of numerous sulfide and sulfate deposits originated during Mesozoic and Cenozoic epochs, in which the sülfür percentage varies mostly from 1 % to 20%.

In the oldest petrogenetic complexes in Balkan Peninsula (Pelagonian-Rhodopean massif) are not known some more important occurrences of sulfides and other sülfür compounds, thus the pre-Grenvilian epochs could be considered as depleted in this element. Just in the Grenvilian epoch in Pelagonides (Nezilovo at Mt. Babuna) some smaller sulfide occurrences are preserit, which could be assumed as the first traces of increased sülfür concentrations in the area of Balkan Peninsula. The Origin of this sülfür cannot be discussed since these investigations have not been completed, and from the other side the occurrence itself had several times undergone the hydrothermal, tectonical and all other geological transformations, which affected this part of Pelagonides throughout the geological time.

In the next, Baikalian epoch the green schists had been formed, whose protoliths are confined to the rocks originated in the area of oceanic type of the earth crust. Formations of this complex occur in the Pelagonian-Rhodopean and Morava massifs, then in western Serbia, Zagrebacka Gora and elsewhere.

In greenschists of western Macedonia, as a part of Pelagonian-Rhodopean massif, trending form Sar Planina, across Kicevo, Demir Hisar and Pelister, Continuing further to Greece, some low order, until recently not investigated sulfide mineralization have been registered. In contrast to them, in the district occurring between Strumica and Dorjan in eastern Macedonia occur much larger concentrations of iron, lead, zinc and copper sulfides. This has particularly been manifested by the lead-zinc deposits near Dojran, with indicated ore reserves of about 25 million tons averaging 3.8% lead-and-zinc and 0.1% copper. The chief minerals in this deposit are pyrite, galena, sphalerite, chalcopyrite, arsenopyrite, marcasite, enargite, pyrrhotite and others. Although the lead-zinc and copper contents are low, it is stili to be ascertained, according to frequency of all sulfides, including the pyrite impregnations in concentrations of 0.3% covering a large area of greenschists, that in the mean sülfür content in these schists is higher than the mean value in basic magmatic rocks (0.03% after Vinograd ov, 1962). The investigations in the district between Strumica and Dojran (Popovic, 1993) exhibited the sülfür content (according to 100 analyzed samples) in greenschist from 0.042% to 0.11%, evidently speaking about sülfür increase from about 1.5 to 4 times (averaging about 2 times) compared with basic magmatic rocks.

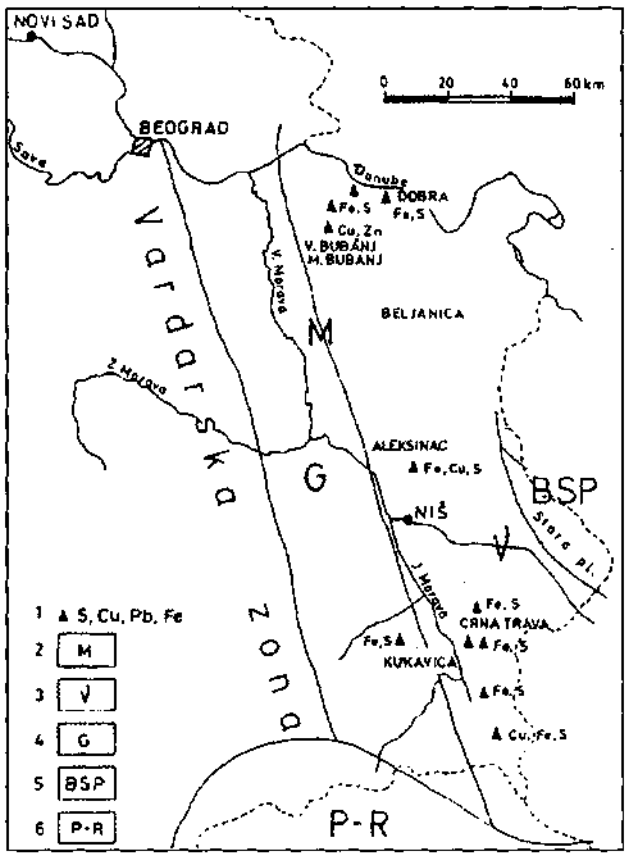

Fig. 1- Distribution of sulfide occurrences in Green complex (Baikalian) of the east Serbia.
1. Sulfides of Cu, Pb, Zn occurrences, 2. Morava massif, 3. Green complex, 4. gneiss complex, 5. block Stara Planina, 6. Pelagonian-Rhodopian massif.

In contrast to Pelgonian-Rhodopean massif, where in greenschists took place relatively limited concentrations of sülfür compounds in the same rocks of the Vlasina complex or the Morava massif respectively, which extends from Carpathians in Romania. Continuing across eastern and SE Serbia, to NE Macedonia and further throughout Bulgaria. The sulfide mineralizations are widespread in the whole area. They were formed during Baikalian tectono-magmatic cycle in the area of oceanic type of the earth crust. These are most commonly poor or rich sulfide impregnations as well as smaller or iarger suifide ore deposits in which the pyrite is predominant, accompanied by chalcopyrite. sphalerite, galena and others. The most important sulfide occurrences and deposits appear near Golubac, at Veliki Bubanj and Mali Bubanj nearby Petrovac na Mlavi, then occurrences near Aleksinac and at Bukovik and Rozanj, in the iarger area of the Crna Trava and Blagodat (Ljubata) district, near Trgoviste etc. (Fig. 1). Considering the length and width of the greenschist zone with sulfide impregnations and higher concentrations in form of deposits, and according to investigations to date (drilling), extending more than 200 m depth, the sülfür mean content in greenschist could be estimated at about 0.08%, which is about 3 times

higher than the average (clarke) content in basic magmatic rocks after Vinogradov (1962). Taking this information into consideration, including also the mentioned sulfide deposits only in the area of eastern Serbia, it could be concluded that this tract of land is very promising for discovery of lead, zinc, copper and most probably gold deposits, the last ones otherwise coinciding with the Green complex of this region.

The Caledonian and Hercynian metallogenic epochs in Macedonia or in Pelagonian-Rhodopean massif respectively are characterized by relatively higher sulfide concentrations, most commonly represented by pyrite, galena, sphalerite, chalcopyrite, molybdenite, and lesser arsenopyrite, pyrrhotite, marcasite, antimonite and others, bearing in mind that higher concentrations could be consıdered as ore deposits and occurrences. In western Macedonia following occurrences and deposits of sulfide mineralizations are known: molybdenurn - Strelci (near Kicevo) and Vrutok (near Gostivar), copper, zinc and iron at Berikovo, copper at Padaliste, lead and zinc near Kolari, copper near Judovo, lead and zinc at Openica, as well as numerous pyrite concentrations in the Phyllite compiex of volcanic-sedimentary Origin. On the basis of distribution and local sampling, it could be estimated that the average sülfür content varies in the pyhllitic formation complex from 0.014% to 0.37% (according to only 50 analyses of rocks of this formation), thus evidentfy indicating the increased content of this element, denoting that both Caledonian and Hercynian epochs are markedly enriched in sülfür, compared with previous epochs. especially in amount of sulfide deposits and occurrences (about 15). Similar features as in mentioned two epochs are in other parts of Balkan Peninsula. aithough in some districts the sulfide concentrations in the Phyllitoid complex are lower than in western Macedonia (as for instance in the Drina river region, Polimlje, SE Bosnia, eastern Serbia ete.), but essentially not changing the impression on the sülfür content in general.

The Alpine (early and later) time has been defined, after Haq and Eysinga (1987), as early, middle and Late one, including the whole Mesozoic and Cenozoic era. When considered the distribution of intrusive-volcanic complex accompanied by sulfide ore deposits and occurrences, in such cases in the Balkans have existed vast areas occupied by these complexes (Fig. 2). In addition of widespread anhydrite and gypsum sedimentary deposits in Dinarids and in other areas of the Balkans it could be comprised that during the Mesozoic and Cenozoic took place remarkable sülfür enrichment. Considering only sulfide ore deposits one could say that 90% of Pb, Zn, Cu, Mo etc. deposits in Balkan Peninsula originated in that period. In lack of other investigations (on sülfür contents and distribution) this is the most important criterion for estimation of the sulfur yield throughout Mesozoic and Cenozoic time in the Balkan Peninsula. If compared with older epochs an evident difference is remarkable, not only in freguency of deposits, but in the total reserves of Pb, Zn, Cu and other sulfides as well. If the pyrite impregnations in rocks are added, locally being the genuine pyrite ore deposits with reserves of several million tons, considering gypsum and anhydrite in Sediments, relatively simple and real estimations are achievable, but it should be noticed that during Alpine time the sülfür yield was not Uniform. Namely, in the Mesozoic the largest sülfür concentrations are related to anhydrite and gypsum, lesser to sulfide deposite. From the other side. at the end of Mesozoic and Cenozoic epochs extremely great number of the Fe. Pb, Zn, Cu and other metals took place. Taking into account the roughly calculated ore reserves of all sulfides in the area of the former SFR Yugoslavia, quantities are greater

than 2 billion tons. The calculated sulfur grade has exhibited more than 5%, from that amount minimum 0.5% sulfur is restricted to disseminations in dacite-andesitic rocks, thus indicating the huge sülfür quantities. Similar situation is in the other Balkan areas, particularly in Rumania and Bulgaria. However, it should not be neglected that during these times the active subaerial volcanoes had emitted also great amounts of sulfur, as it could be compared with contemporaneous volcanoes. Some of these volcanoes have extruded, for extample, 50 tons of sülfür per year or more, and the others extruded during a single day 100 tons of sulfur or more, as emanations. The best illustration for it is the Mount St. Helena volcano, which emitted from June, 6-22, 1980 between 950 and 1300 tons SO_2, including periodical 15 minutes paroxysms emitting 40 tons SO_2 or recalculated at 3800 tons SO_2 per 24 hours (Lipman, Donald, 1980).

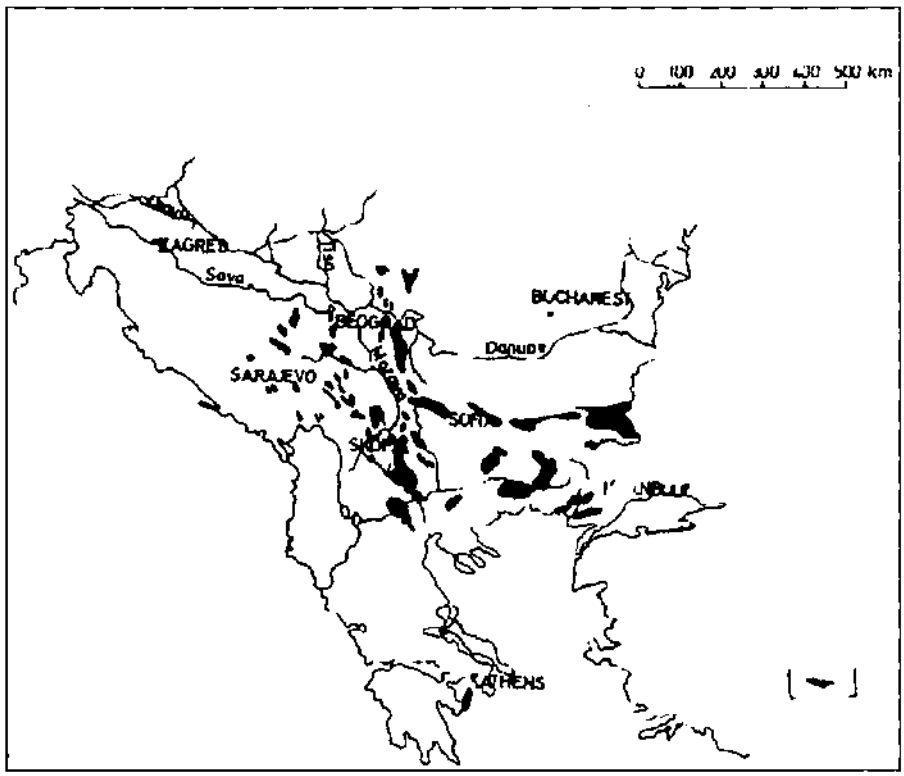

Fig. 2- Simplified map of distribution Mesozoic-Cenozoic volcanites on the Balkan Peninsula. 1. Mesozoic-Cenozoic volcanites.

All the presented data are in favour of the fact that in the intrusive-volcanic complex of Balkan Peninsula during Alpine epoch intensive enrichment in sulfur took place. According to roughly estimated sulfur amounts in rocks (complexes) it has averaged about 1 %. Such a content of this element is 30 times higher, compared with the mean (clarke) values in similar or same magmatic rocks (Vinogradov, 1962), and 10-15 times higher in relation to the older metallogenic epochs. These are features distinguishing the Mesozoic-Cenozoic time as an extraordinary geochemical appearance.

ORİGİN OF SULFUR IN THE BALKAN PENINSULA DURING THE ALPİNE TIME

If compared number of sulfide ore deposits and disseminated sulfides of iron, copper, lead, zinc, arsenic, and others, as well as various sulfates originated in sedimentary complexes in the Balkans during Mesozoic and Cenozoic periods with the same or similar complexes of Paleozoic or older time, enormous differences are evident. This is particularly characteristically for the period of the latest Mesozoic and Tertiary or better to say the whole Cenozoic time. In that way the Upper Cretaceous, Paleogene, Neogene, and Quaternary times should be defined as the Sülfür Epoch in the Balkan Peninsula. But this phenomenon has opened numerous problems, among them the most important being origin of sülfür. This is not all an Uniform and unilateral problem, especially bearing in mind limited amounts of direct geochemical and other informations and that this phenomenon was not to date in focus of corresponding Studies.

If this complicated problem would be open to be solved, especially in frames of actual knowledge, it is necessary to start from Alpine geotectonical events in Balkan Peninsula. In that regard the most important problem to be analyzed is the so called Tertiary tectonomagmatic activation. The authors of this concept (Grubic, 1974b; Jankovic and Petrovic, 1974), although being seriously occupied by problem of geotectonical events and related metallogenic manifestations characterising the mentioned activation, have not been occupied neither by the problem of sulfur origin nor by its enormous yield and deposition in the intrusive-volcanic complexes of that period. However, the concept of origin-of. large intrusive-volcanic complexes in the process of tectonic-magmatic activation in the Balkans has indirectly suggested the assumption that this process resulted from subduction of the ophiolitic belt and Inner Dinarids below the continent (in this case these are the Morava and Pelagonian-Rhodopean massifs or Serbo-Macedonian mass, after Grubic (1974b), Jankovic and Petkovic (1974). Such an unilateral explanation is hard to be accepted if considered only one segment (Inner Dinarids and ophiolites of the Vardar zone), because a simple explanation is that the tract of subduction is not remarkable compared with the span of time of its activity.

In fact, the numerous sulfur emanations and pyritizations (Vranje Spa, Sijarina Spa etc.) speak that ophiolites and Inner Dinarids, sometimes being active segments of subduction of the earth crust, ended this activity, but that the sülfür yield has continued. This fact is of primordial importance for these tracts. If to these considerations is added the fact that sülfür in the area Carpatho-Balcanids is also abundant, but not being related to the same geological processes of tectono-magrnatic activation, an-other problem has been opened: of what kind and which mechanisms were producing sulfur in that area; And then appears a common problem of the total sulfur yield. This problem or huge guantity of the sülfür introduced during Alpine time is not restricted only to Balkan Peninsula but has continued from one side to the Aegea, Asia Minör and further to the east and, and from the other side, across the Carpathians to middle Europe as well.

The conception of the authors for the Tertiary tectono-magmatic activation unclearly has defined the causes and direct factors of the tectono-magmatic activation. Only Karamata (1983), Grubic (1974) and partly Auboin, Blanchet (1981) have been more concrete in that sense, especially Karamata

(Fig. 3), who has analyzed, throughout geochemical features, the direct relation of ophiolitic complexes with Tertiary dacite-andesitic volcanites in the tract of Tertiary tectono-magmatic activation. Namely, he has observed, from one side, the Inner Dinarids including so called Drina-Ivanjica block and ophiolites of the Vardar zone, being subducted as a whole, and from the other side, the Outer Dinarids, which also had parallel entered into the process, leading to distinct magmatic processes, being reflected to the earth surface: either at the border of Morava massif or inside the Pelagonian-Rhodopean massive or the Serbo-Macedonian mass respectively, and in frames of the Drina-Ivanjica block and Vardar zone or the ophiolitic zone respectively. This model is acceptable if it would be taken into consideration that subduction of the mentioned blocks is a conseguence of another subduction, much more widespread, being stili active in the present days. Thsi is subduction of the Mediterranean bottom or African continent respectively, which also contains high sulfates concentrations, beneath the Europe, i.e. Balkan Peninsula in our case.

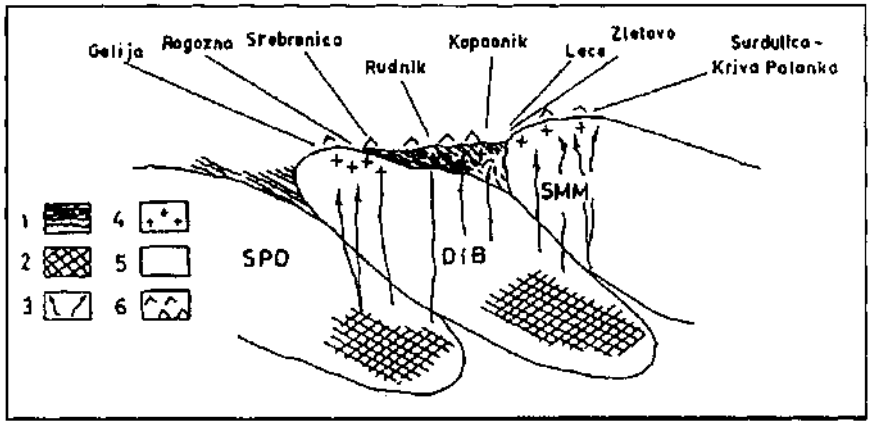

Fig. 3- Geotectonic setting of Tertiary magmatic rocks and distribution of ore deposits (Karamata, 1983).
SPD - Outer Dinarides, DIB - Drina-Ivanjica block, SMM - Serbo-Macedonian mass.
1. Ophiolitic melange, 2. zone of origin of Tertiary magmas, 3. rise direction of Tertiary magmas, 4. intruzive rocks, 5. continental crust, 6. volcanic rocks.

In such circumstances one could suppose that formerly deposited sulfur (in form of gypsum and anhydrite) in Dinarids could be the chief source of sulfur that area. So called tectonomagmatic activation is not autochtonous in this case, but had resulted from a complex spacious and longtherm process having lasted from jurassic time (Auboin, Blanchet, 1981, Fig. 4).

The subducting evidently commenced with ophiolites of the Vardar zone and metamorphites of Inner Dinarids below the Morava massif (in the southern part of the Balkans, beneath the eastern segment of the Pelagonian-Rhodopeans or Rhodopean massive in this case), accompanied by another subduction related to the western ophiolitic zone and Outer Dinarids beneath Inner Dinarids (as

reported by Karamata, 1983), and further in the district of Hellenic trench initiated by subduction of the Tethyan ocean bottom or remains of the oceanic crust and African continent beneath the Europe or Balkan Peninsula in such a case (Underhill, 1989). All these very intricated processes had initiated a vigorous magmatism, partly reflected as so called Tertiary tectono-magmatic activation (Grubic, 1974b; Jankovic and Petkovic, 1974), accompanied by corresponding geochemical masifestations. One could say, neglecting other phenomena, which otherwise follow all geodynamic processes of such complexity, and retaining only at so called Tertiary tectono-magmatic activation or at the magmatism introducing large sulfur amounts into Balkan Peninsula, that the zone of Tertiary intrusive-volcanic complex stretches across the Balkans in the northwest-southeast direction, cutting all older structures and the Vardar zone as well, as formerly reported by numerous authors. This zone strikes in length of several hundred kilometres and probably across the Aegean sea continues to Asia Minor, thus measuring more than 2000 km in total length.

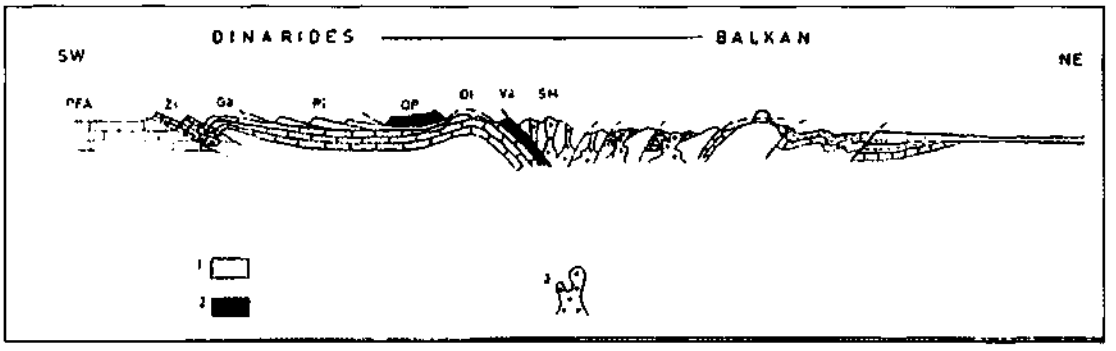

Fig. 4- Cross section of the Dinarides and Balkan Alpine chains (Aubouin, Blanchet, 1981).
1. Prealpine continental basement, 2. Alpine oceanic crust (ophiolites), 3. Alpine granodiorites (Jurassic-Cretaceous-Tertiary).

Differing from the zone of tectono-magmatic activation, in Rumania, eastern Serbia and Bulgaria the Carpatho-Balkanids are present, also characterized by abundant intruzive-volcanic complexes with the outstanding sülfür enrichment. We don't enter now in their origin since various opinions have existed. Some authors such as Grubic (1974a) have proceeded from rifting, the others, Bogdanov (1977) for instance, have taken into account the subdictioh of Moesian plate bellow the Balkans, the third ones - Vukasinovic, Antonovic (1989) have considered impacts as a cause etc. The fact is that in this belt also occur extremely spacious intrusive-volcanic complexes, with high concentrations of (iron, copper, lead, zinc etc.) sulfides, lesser sulfates. This region evidently has similar, not only petrogenic but also geochemical characteristics of sulfur, as the trans-Balkan intrusive-volcanic complexes (the zone of Tertiary tectono-magmatic activation).

For geochemical Studies of the sülfür excess during the Cretaceous-Tertiary period, a partial assistance may offer the tests of the sülfür isotopic composition, as reported by Putnik (1981) in the zone of Diabase-Chert Formation in western Serbia, then by Alek-

sandrov (1992), Efremov (1993) and Serafimovski (1993) for districts of the Lece massif and in deposits of NE Macedonia, as well as former Studies by Drovenik et al. (1975) in sulfide deposits of NE Serbia. Their interpretations of the sülfür isotopic composition are rather Uniform, although with some reserves. Certainly, numerous measurements of ^{34}S have varied around values linked to magmatogenic sulfur, which most of authors have related to the upper mantle. However, when the cited results presented by them are observed, it is to be noticed that most of these could not be connected with the mentioned concept. They actually have not an obvious explanation for the isotope values higher than +7 $\%_0$ and lesser than -7$\%_0$. So for example for the Markov Karnen in NE Serbia Drovenik et al. (1974/75) have cited the ^{34}S values starting from -20$\%_0$., which is evidently characterized for enrichment in the light sülfür isotope. Similar results have been obtained for the ore deposits of NE Macedonia as well. Such appearances would be rather interpreted as a consequence of various Origin of the primitive sülfür. One could, namely, suppose that one part of sülfür has originated from the upper mantle, but for the other part would be rather assumed to originate from the former Sediments entering during subduction in the zone of magma generation, as well as from lovver parts of the continental crust, affected by partial melting. Such a ^{34}S fractionation from the melt created in the mentioned manner depended on physical-chemical conditions, pH value, transport length, thermodynamical and other terms.

it has been considered that such factors would improve the fractionation of heavy isotopes, but in the case of light isotopes the ımproving would be partial. But results reported by the mentioned authors could not be simplified as they did. Intricated processes, which took place in the tract of formation of the magma melt and the yield of sülfür from sedimentary rocks during subduction, introducjng it into the magmatic melt, show much more complicated processes of the sülfür isotope fractionation. In that manner, sülfür from the upper mantle, then from the subducted Sediments and from lovver parts of the earth crust represent the reaj primitive sources of sülfür. All these processes have together conditioned the high heterogenity of the sülfür isotopic composition in individual sulfide ore deposits in Balkan Peninsula. This phenomenon has especially been focused by Drovenik et al. (1974/75) in an attempt to find out a satisfactory solution considering the horizontal zonality around the magmatic body, while other authors have mostly neglected this phenomenon. It is possible that Sediments in Dinarids or from another geotectonic block, then the bottom of Mediterranean sea, and African plate would not be the primary source at least of one part of sülfür in sulfide deposits and impregnations occurring in the zone of tectono-magmatic activation? Wen the Carpatho-Balkan arc in question, it is hard to favour either the subduction process, although Bogdanov (1977) postulated this way, or other planetary geotectonical process, as reported by Grubic (1974a) and Vukasinovic, Antonovic (1989). In all such cases the Sediments or continental crust in this district respectively occur as primordial source of one part of sülfür, entering into composition of sulfide deposits in Carpatho-Balkanids.

If duration of the subduction process, then the phase of magmatic melt, introduction of sülfür into Cretaceous-Tertiary intrusive-volcanic complexes, and certainly continuation of its yield till the present days would be taken into consideration, it is evident that this is included in a relatively longterm process, having lasted for about 140 million years.

If this period would be better focused one should get to the judgement that this geochemical feature of the Balkan Peninsula is not of a local importance. Contrary, it could be said that in guestion is a global phenomenon, which in the best way reflects distribution of the Cretaceous-Tertiary sulfide deposits around the Pacific, in Mediterranean regions and ın districts with contemporaneous active volcanoes. This is related to the so called circumpacific fire belt, then to the middle- southern and SW Pacific, middle America, Mediterranean, southern and SE Asia, Malaya archipelago, middle oceanic rifts (in Atlantic, Indian ocean etc.). All together it has led to an unigue conclusion that the Cretaceous-Tertiary period could be announced as the Epoch of Sülfür from the geochemical point of view, not only for Balkan Peninsula but in larger sense as well, representing a global geochemical epoch.

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