THE EVOLUTION OF STRUCTURAL KNOWLEDGE OF THE SOUTH CARPATHIANS REFLECTED BY OLD GEOLOGICAL MAPS (1890-1940)

STELEA Ion, GHENCIU Monica

Abstract. Following the evolution of the structural knowledge of the South Carpathians, the paper reviews the geological maps from the late 19th and the early 20th centuries. The maps prior to 1910, when Murgoci published his famous structural synthesis of the South Carpathians, are lithological maps without structural interpretations. An exception is the 1899 map of the same author, where the future path of the Getic thrust in the central South Carpathians is rigorously prefigured by a low-angle reverse fault. Highlighting the Getic Nappe stimulated the development of structural studies in the South Carpathians orogen, especially regarding the crystalline basement of the nappe and the Getic and Infragetic sedimentary formations, sometimes leading to exaggerations about the areal extent and even the existence of some Supragetic nappes. In this context, the most important study is the work of Codarcea from 1940 regarding the Severin Nappe (the Getic para-autochthonous) in the Mehedinţi Plateau.

Keywords: structural knowledge, geological maps, South Carpathians.

Rezumat. Evoluția cunoașterii structurale a Carpaților Meridionali reflectată în hărți geologice vechi (1890-1940). Urmărind evoluția cunoașterii structurale a Carpaților Meridionali, lucrarea face o trecere în revistă a hărților geologice de la sfârșitul secolului XIX și începutul secolului XX. Hărțile anterioare anului 1910, când Murgoci a publicat celebra sa sinteză structurală a Carpaților Meridionali, sunt hărți litologice fără interpretări structurale. Excepție face harta din1899 a aceluiași autor, unde viitorul traseu al șariajului getic din Carpații Meridionali centrali este riguros prefigurat printr-o falie inversă la unghi mic. Punerea în evidență a Pânzei Getice a stimulat dezvoltarea studiilor structurale în orogenul Carpaților Meridionali, privind în special fundamentul cristalin al pânzei și formațiunile sedimemtare getice și infragetice, conducând uneori la exagerări privind amploarea și chiar existența unor unor pânze supragetice. În acest context, studiul cel mai important este lucrarea lui Codarcea din 1940 privind Pânza de Severin (para-autohtonul Getic) din Platoul Mehedinți.

Cuvinte cheie: cunoaștere structurală, hărți geologice, Carpații Meridionali.

INTRODUCTION

This article reproduces and comments on 14 old geological maps, most being maps of authorship attached to works of reference for structural knowledge of the South Carpathians. The maps prior to the foundation of the Geological Institute of Romania (1906) were published under the aegis of the Geological Bureau of Romania (1882-1889), the Mines Service, and by authors themselves. The printing of the geological maps edited by the Geological Institute suffered long delays due to the two world wars and the subsequent changes of the national territory. Ready for print at the beginning of the First World War, the first general geological map of the country at the scale 1:500 000 was printed only in 1926, at the scale 1:1 500 000. Afterwards, while completed at the beginning of the Second World War, the printing of this map lasted almost a quarter of a century (1936-1959) because of the war.

According to the evolution of structural knowledge of the South Carpathians, the selected maps were grouped into five thematic categories. In chronological order, these are: 1) maps without structural interpretations (lithological maps); 2) maps illustrating the classification of crystalline terrains into metamorphic groups; 3) maps related to the Getic Nappe; 4) maps regarding the Supragetic nappes and 5) maps regarding the Severin Nappe. For some works and the attached maps there are differences of two or even more years between the year of public presentation and the year of print. To understand the comments and to respect the historical truth, these maps are ordered by year of public presentation, mentioned between brackets before the year of print. In the references, the respective works are found in chronological order of the years of print, and the years of public presentation are mentioned between brackets, after the journal number or volume.

LITHOLOGICAL MAPS

The first geological maps in Romania are lithological maps, devoid of structural interpretations. Many data are no longer topical, especially those relating to the cartographic contour and the age of the geological formations. The topographic data are often inaccurate. The patina of time gave them aesthetic values. Like any old document, these maps are valuable for the history of science and should be known and preserved.

DRĂGHICEANU (1890). Geological map of the Kingdom of Romania at a scale of 1:800 000 (Fig.1a). It is a map of authorship, the first general geological map of Romania. It was printed in Vienna in excellent graphic conditions In the explanatory note of the map, Drăghiceanu makes no reference to the map sheets printed by the Geological Bureau, fact for which the author was accused by SABBA ȘTEFĂNESCU (1891) of attributing himself the paternity of some geological data previously obtained by the Geological Bureau.

ȘTEFĂNESCU (1890). Geological map of Romania at a scale of 1:175 000. It is the first project of the general geological map of Romania, put into practice by members of the Geological Bureau and collaborators, under the coordination of Gregoriu Ștefănescu (Fig. 1b). The map was to be integrated into the first international geological map of Europe, at a scale of 1:1 500 000, agreed at the Second International Geological Congress (Bologna, 1881) and printed in Berlin between 1881-1913. From SABBA ȘTEFĂNESCU (1891) we have the information that 27 sheets from this geological map, covering the provinces Muntenia and Oltenia (sheet 32 from the map of Europe), were already printed in 1890. The geology of the provinces Dobrogea and Moldova was drawn up on the map of Europe (sheet 33) according to the data of the Geological Institute. Curiously, sheet 33 renders the Flysch Marginal Nappe in the East Carpathians, as the only tectonic unit depicted on the first edition of the international geological map of Europe.

POPOVICI-HAȚEG (1900). Geological map of Romania at a scale of 1:300 000 (Fig.1c). Romanian Mines and Quarries Service. It is the first geological mural map of the country, drawn up on the basis of the existing geological data at that time. It is not well-known because it was printed in a single copy and was not multiplied due to lack of funds. It was exhibited at the Universal Exhibition in Paris (1900), and presented at the 8th International Geological Congress, held in Paris in the same year. It is the first map on which the relief is rendered, using fine hatches in dark sepia.

METAMORPHIC GROUPS

At the end of the 19th century, the crystalline basement of the South Carpathians, considered to be of Archaic age, was attributed by the Hungarian geologists to three metamorphic groups, based on the degree of crystallinity and schistosity. Without going into details, which differ from one author to another, the rocks with high crystallinity of granitic gneisses type were included in the group I (lower or oldest), the rocks with a similar degree of crystallinity of mica schist type in the group II and the weakly crystalline schists of various petrographic types in the group III.

MRAZEC (1897) classifies the metamorphic rocks of the South Carpathians into two groups, also taking into account the stratigraphic criterion. Laying discordant on the crystalline basement, the Palaeozoic schists likely to represent the group III are not subject to classification. Also, igneous rocks do not fall into the classification, except for the granitic gneisses included in the group I (lower) along with other petrographic types with a high degree of crystallinity. The group II (upper) includes all the rocks with low degree of crystallinity, which due to their stratigraphic position could not be attributed to either the group I or to the known Palaeozoic terrains, with reference to the Schela Formation. In his work, the author also evokes the remark of MURGOCI (1895, publ. 1898) regarding the fact that the spatial relationships between the two groups are not always concordant.

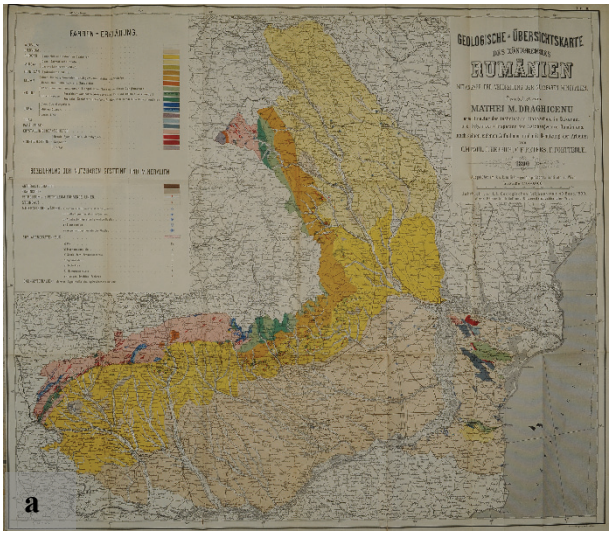
At the 9th International Congress of Geology in Vienna, MRAZEC (1903) presented a new classification, in two metamorphic groups different from those previously separated. The first group consists of high-grade metamorphic rocks, predominantly mica schists, and the second group consists of phyllite rocks, predominantly chlorite schists. Spatial relationships as well as the nature of the boundary between the two groups are considered unclear by Mrazec, which is why the author includes them in a single Pre-Mesozoic metamorphic series. The meta-sedimentary formations and the associated basic rocks are attributed to a Mesozoic metamorphic series. The granites and the granitic gneisses are not included in the classification.

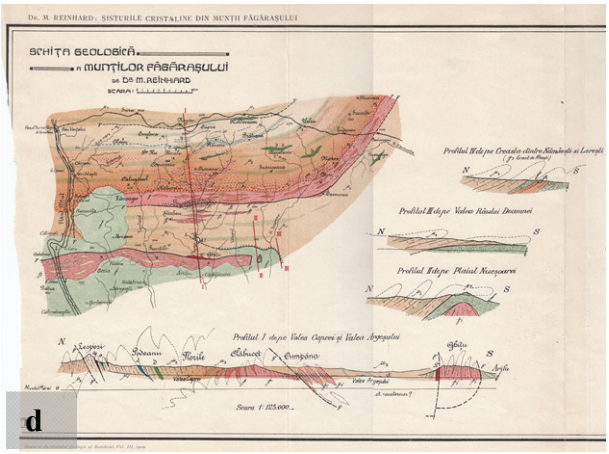
REINHARDT (1909, publ. 1911). Geological sketch of the Făgăraș Mountains, graphic scale 1:330 000. Like MRAZEC (1903), Reinhardt attributes the crystalline schists from the Făgăraș and Iezer Mountains to the first group. As the phyllite rocks on the northern slope of the Făgăraș Mountains gradually pass to the micaceous ones on the southern slope (Fig. 1d), they are not separated, the second group being included in the first one. In turn, the micaceous rocks on the southern slope gradually pass to the Cumpăna gneisses, tectonically delimited by the micaceous rocks of the Iezer Mountains. The field observations of the author come to invalidate the classification of crystalline terrains into metamorphic groups.

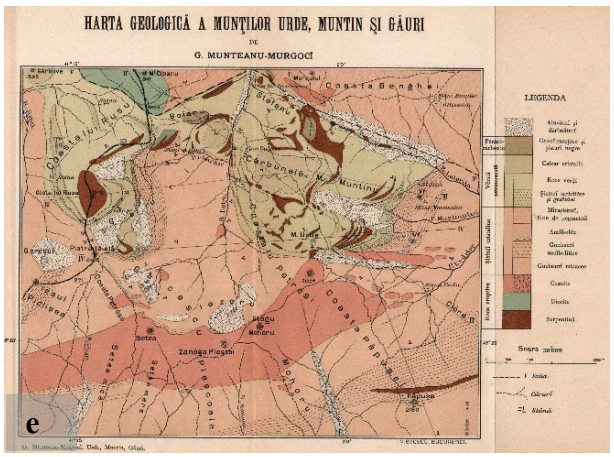
The Cozia-Lotru fault first appears on Reinhardt's map, on the northern limit of the Cozia gneisses. Both types of gneisses, Cozia and Cumpăna, are considered magmatic bodies responsible for the higher metamorphic degree of the crystalline basement on the southern slope of the Făgăraș Massif. In the basins of the Vâlsan and Doamnei rivers, the metamorphic group I appears thrusted over the sedimentary formations, considered by the author as Cretaceous-Paleogene flysch. For MURGOCI (1910), these formations represent the post-tectonic cover of the Getic Nappe.

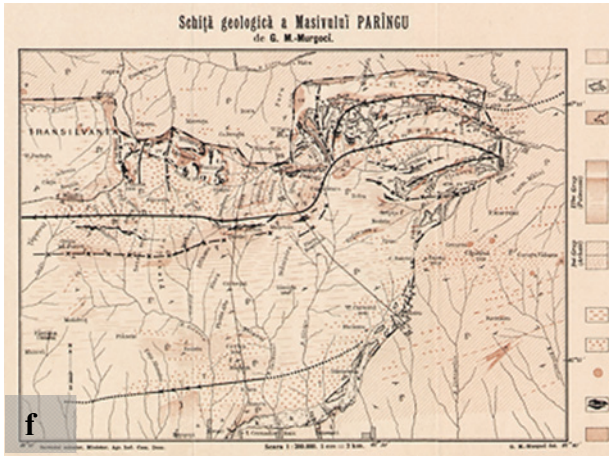
THE GETIC NAPPE

The elaboration of the revolutionary tectonic concept of the Getic Nappe lasted more than ten years. MURGOCI (1895, publ. 1898) had noticed the discordant (tectonic) relationship between the lower metamorphic group and the upper group in the Parâng Mountains, later identified in the Sebeș and Căpățâna Mountains (MURGOCI, 1899). At the end of the 19th century, the tectonic plane between the two groups was mapped in the central South Carpathians. The Getic Nappe was announced by the author through a series of three presentations held at the French Academy in 1905, two years after the thrust theory developed by the French geologist was admitted to the International Geological Congress in Vienna. Five years later, at the 11th International Congress of Geology in Stockholm, the cartographic image of the nappe also appeared.









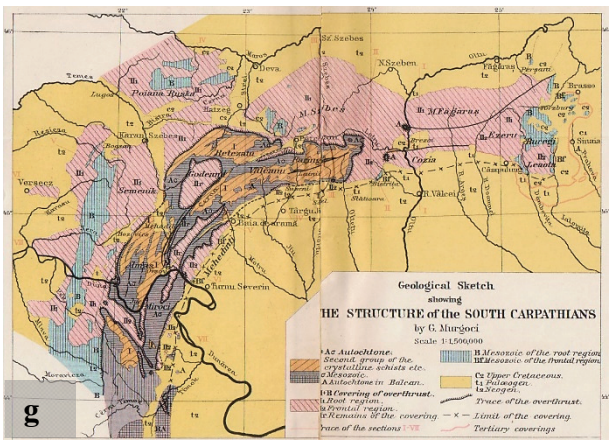


Figure 1. a) Geological map of Romania, 1:800 000 (DRĂGHICEANU, 1890); b) Geological map of Romania, scale1:175 000, Turnu Severin sheet (Geological Bureau, 1890); c) Extract from the geological map of Romania, scale 1:300 000 (POPOVICI-HAŢEG, 1900); d) Geological sketch of the Făgăraş Montains, scale 1:330 000; e) Geological map of the Urde, Muntin and Găuri Mountains, scale 1:50 000 (MURGOCI, 1895); f) Geological map of the Parâng Massif, 1:200 000 (MURGOCI, 1899); g) Geological sketch showing the structure of the South Carpathians, scale 1:500 000 (MURGOCI, 1910).

MURGOCI (1895, publ. 1898). Geological map of the Urde, Muntin and Găuri Mountains, scale 1:50 000. It is a cartographic document with detailed geology at that time, and structurally significant. This map depicts, for the first time, a fault on the future path of the Getic thrust plane in the Parâng Mountains area (Fig. 1e).

MURGOCI (1899). Geological sketch of the Parâng Massif, scale 1:200 000. It is a map with a very detailed toponymy and hydrographic network compared to the map scale, reduced after the Austrian topographic maps to the scale 1:75 000. The lithology is rendered with fine hashes in light sepia while the tectonic and structural lines are rendered with thick black lines (Fig. 1f). The contrast is striking and structurally suggestive. In fact, we see a tectonic sketch on which the Getic thrust plane in the central South Carpathians is rigorously prefigured by a low-angle reverse fault with unfolded hanging-wall (Getic Crystalline) and folded foot-wall (Danubian Crystalline). Eleven years later, Murgoci will consider that the Getic Crystalline is also folded, in order to justify the overfolding mechanism of the Getic Nappe emplacement.

MURGOCI (1910). Tectonic sketch showing the structure of the South Carpathians, scale 1:1 500 000. On this map (Fig. 1g) Murgoci draws the erosion contour of the Getic Nappe, with its klippes and the autochthonous window. The overfolded nappe is thrusted on the Sinaia Schists (Sinaia Beds), representing the upper term of both allochthonous and autochthonous sedimentary covers, which the author considered to be identical. Insufficiently dated paleontologically, the age of the Sinaia Schists was largely attributed to the Lower Cretaceous (Neocomian and Barremian). Consequently, the age of the first overfolding phase was considered the Mesocretacic (Post-Barremian and prior to Cenomanian transgression). The Getic Nappe was correlated by Murgoci with the Bukovinian Nappe in the East Carpathians, also thrusted over Sinaia Schists.

The long overfolding process started on the inner border of the Carpathians (the nappe root) advancing to the outer border (the frontal part of the nappe) where it affected newer sedimentary formations, leading even to the formation of a Miocene nappe in the Făgăraș Mountains area according to POPESCU-VOITEȘTI (1909, publ. 1911). In this context, Murgoci considered that the second overfolding phase took place at the end of the Lower Miocene, post-saliferous formation. The overfolding cause is seen to be the underthrusting movement exerted by the peri-Carpathian platforms on the orogenic area. This movement began during the Palaeozoic and has continued to our days, with the two maximum phases of thrust. CODARCEA (1940) will demonstrate that both phases of the Getic Nappe emplacement are of Cretaceous age.

MURGOCI (1911). Geological map of the Getic Bend, scale 1:500 000 (manuscript). Concerned with the refinement of its structural model, Murgoci tried to separate the allochthonous and the autochthonous terms of the sedimentary cover under the nappe (Fig. 2a). The Getic thrust on this map appears lowered at the base of the allochthonous Sinaia Beds from the Mehedinți Plateau, on the path of the future Severin Nappe thrust (CODARCEA, 1940). In this sense, Codarcea also evokes the draft, now lost, of the 1:500 000 map of the South Carpathians, drawn in 1915 after the geological data of Murgoci, where the thrust plane also appears at the base of Sinaia Beds.

The nappe structure of the South Carpathians had been internationally well received, but not in the country. The Getic Nappe does not appear on the first edition of the geological map of Romania scale 1:1 500 000 (MRAZEC et al., 1926). The omission is all the more obvious as both the Bukovinian Nappe and the Marginal Nappe of flysch are rendered in the East Carpathians. How can this be explained? In certain circumstances, the distrust of the Geological Institute leadership in the tectonic model of Murgoci was invoked. However, it cannot be due to the fact that the Getic Nappe had been adopted by the geologists from neighbouring countries working in Carpathians and western Balkans. Mrazec, the director of the Geological Institute, had enough reasons to envy the success of Murgoci. As petrographers, the two great geologists collaborated in the central South Carpathians, but only Murgoci intuited the nappe structure of the region. He died in 1925 and the map in question appeared the following year.

Only DRĂGHICEANU (1928, publ. 1930) dared to criticize this map. In reply, the head of the Geological Survey of the Institute, Sava Athanasiu, answered: “We are not yet convinced of the crystalline basement thrust in Carpathians (i.e. South Carpathians) if there are thrust faults or nappes. The observations of Mr. Drăghiceanu will be taken into account when printing the future geological map ". Honestly or not, the answer wants to suggest a certain distrust. Real or not, it was publicly expressed after Murgoci death.

THE SUPRAGETIC NAPPE

Highlighting the Getic Nappe stimulated the development of structural studies in the South Carpathians area, especially regarding the crystalline basement of the nappe and the Getic and Infragetic sedimentary formations. With small corrections, due to subsequent detailed geological mapping, the erosion contour of the Getic thrust remained unchanged. Instead, various tectonic planes in the nappe basement were interpreted as thrust planes of more or less argued Supragetic nappes, the proof being their variable geometry from one author to another and even to the same author. A first such nappe appears in the Făgăraș Massif, at about the same time with the completion of the tectonic concept of the Getic Nappe.

POPESCU-VOITEȘTI (1909, publ. 1911). Geological sketch of the Getic Nummulitic, scale 1:500 000. The map (Fig. 2b) is attached to the doctoral thesis. After the faults on the map of REINHARDT (1909), Popescu-Voitești delimits a Lower Miocene nappe in the crystalline basement of the Făgăraș Massif, which also includes the Leaota Mountains basement. After its post-tectonic cover, it was called the Bucegi Conglomerate Nappe.

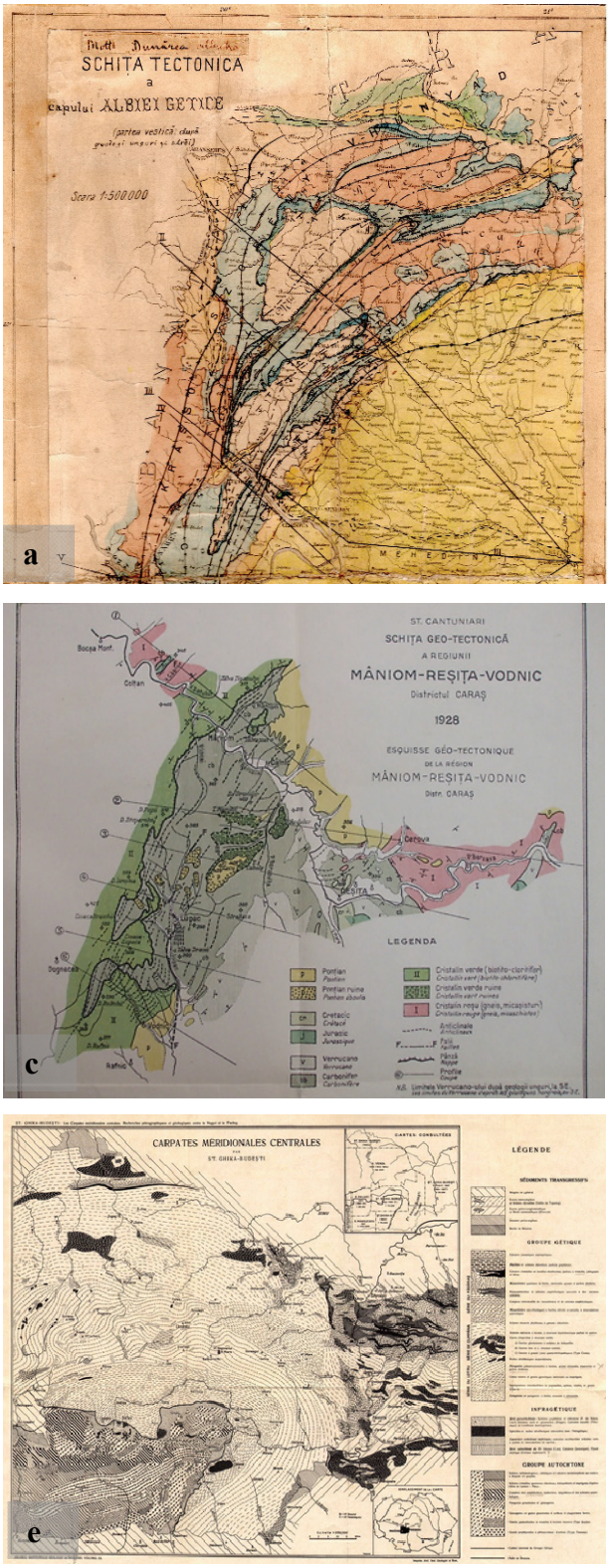


Figure 2. a) Extract from the tectonic sketch of the Getic Bend, scale 1:500 000, manuscript (MURGOCI, 1911); b) Geological sketch of the Getic Nummulitic (POPESCU-VOITEȘTI, 1909); c) Geo-tectonic sketch of the Reșița region, scale 1:100 000 d) Tectonic map of the South Carpathians, scale 1:800 000 (STRECKEISEN, 1932); e) Geological map of the central South Carpathians, scale 1:250 000 (GHIKA-BUDEȘTI, 1940); f) Tectonic sketch of the Lotru Mountains, (GHIKA-BUDEȘTI, 1932); g) Tectonic map of the Southeastern Banat and Mehedinți Plateau, scale 1:200 000 (CODARCEA, 1940).

The nappe contour is figured as thrust plane only in the basins of the Doamnei and Vâlsan rivers, where it had also been drawn by Reinhardt. Determining the Paleogene and Miocene ages of the underthrusted sedimentary formations, and taking into account the spatial relationships between different lithological sequences, the author establishes that the thrust age is Miocene. Later, POPESCU-VOITEȘTI (1929) will develop a multiple-nappe theory of the South Carpathians structure, then dismantled by CODARCEA (1940).

CANTUNIARI (1928, publ. 1930). Geo-tectonic sketch of the Mâniom-Reșița-Vodnic region (Caraş District), graphic scale 1:100 000 (Fig. 2c). On this map the author outlines a true Supragetic nappe in the northwest of the Semenic Mountains, now correlated with Locva Nappe (SĂNDULESCU, 1984). The nappe consists of greenschists belonging to the second group (MRAZEC, 1903), thrusted over the Permo-Carboniferous molasse of the Getic Crystalline. In his commentary on the paper presentation, Mrazec admits that the notion of metamorphic groups no longer corresponds to the current stage of geological knowledge and recommends that it no longer be used.

STRECKEISEN (1932). The tectonic map of the South Carpathians, scale 1: 800 000. Streckeisen separates inside the Getic Nappe a large upper nappe, known today as the Supragetic Nappe. The author includes in this nappe the epimetamorphic schists from the Locva Mountains and the northern Poiana Ruscă Mountains, the mesometamorphic crystalline on the north-eastern border of the Sebeș-Cibin-Lotru Massif and the partially retrograded crystalline east of the Olt River, but without the Cozia gneisses (Fig. 2d).

In the central-eastern area of the South Carpathians, the decisive argument for the author was the identification of some tectonic dislocations along the Olt Valley. In this key, the chlorite schists on the right bank of the river were interpreted as a facies of the Schela Formation, the Mesozoic infragetic series. The marbles in the northern Sebeș Mountains were considered sedimentary rocks and interpreted as a Mesozoic cover of the Getic Crystalline. The necessary corrections will be made by GHIKA-BUDEȘTI (1940).

GHIKA-BUDEȘTI (1940). Geological map of the central Southern Carpathians, scale 1:250 000. The map (Fig. 2e) represents the synthesis of geological mapping works for the geological map of Romania at a scale of 1: 500 000, being integrated in sheet 5a (printed in 1942) of this map, coordinated by Ghika-Budești himself. Under the influence of HARKER (1932), the author approaches the metamorphism in modern terms of petrographic facies, mapping metamorphic zones characterized by certain typomorphic minerals: sillimanite for katazone, disten, staurolite, garnet and biotite for mesozone, epidote and chlorite for epizone. All the maps of Ghika-Budești are drawn in black, the geology being rendered through a wide range of hashes and signatures. In the author's opinion, they have the advantage of representing without arbitrary limits the petrographic series and metamorphic zones where the graded transitions are frequent. In terms of drawing, his maps are true works of graphic art.

The arguments of STRECKEISEN (1932) regarding the Supragetic Nappe in the central-eastern area of the South Carpathians become just as many counter-arguments for Ghika-Budești. The limestones in the north of the Sebeș Mountains become metamorphic again, part of the Getic Crystalline, and the chlorite schists from the right bank of the Olt River are interpreted as an epizone facies of the Getic Crystalline. The author finds that the plan of the supposed Supragetic thrust has no spatial continuity, which is partly true, especially in the north of the Sebeș-Cibin Massif where the transition from the mesozonal Getic Crystalline to the epizonal schists (actually mylonitic schists) is usually graded. For almost three decades, there will be no more talk about the Supragetic Nappe in the eastern half of the South Carpathians, where it is contested even today.

THE SEVERIN NAPPE

The tectonic concept of a para-autochthonous nappe appeared immediately after the publication of the Getic Nappe and gradually developed over three decades. We saw how close MURGOCI (1911) came to separating such a nappe in the Mehedinți Plateau, which was elegantly recognized even by Codarcea, the author of the Severin Nappe. Later, POPESCU-VOITEȘTI (1915, publ. 1923) inferred from the geological sections of MURGOCI (1910), the existence of an intermediate nappe in the Parâng Mountains, naming it the Urdele Nappe. In his doctoral thesis, GHIKA-BUDEȘTI (1932) separates a para-autochthonous tectonic unit in the Lotru Mountains. This was followed by a series of three doctoral theses on the central area of the South Carpathians, published in 1937, in which the authors (PALIUC, MANOLESCU and GHERASI) classify the meta-sedimentary formations with uncertain Palaeozoic and Mesozoic ages in an Infragetic petrographic complex. Gherasi makes the most correct description of the mylonites on the Getic thrust which he defines as ultramylonites. Like GHIKA-BUDEȘTI (1932) in the Lotru Mountains, the author notices the absence of deformations inside the Getic Nappe, in contrast to the strongly deformed autochthonous.

GHIKA-BUDEȘTI (1932). The geological and petrographic map of the Lotru Mountains, scale 1:75 000, with no scale tectonic sketch (Fig. 2f). The map is attached to the doctoral thesis, in which Ghika-Budești makes some very important structural and petrographic observations. First of all, he notes the undeformed structure of the Getic Crystalline, which is why he considers that it slid like a rigid block over the autochthonous domain. It is an observation which calls into question for the first time the overfolding mechanism of the Getic Nappe emplacement. After long time, the nappe will be redefined as basement shear nappe (DUMITRESCU et al., 1962). Secondly, Ghika-Budești separates a para-autochthonous tectonic unit between the Getic Nappe and the autochthonous in the Latorița Valley (Fig. 2f), consisting of meta-sedimentary rocks with different uncertain ages (Carboniferous, Liasic and Lower Cretaceous) and ophiolites. It is a first cartographic image of a para-autochthonous nappe in the Parâng Massif area.

CODARCEA (1940). Tectonic map of the south-eastern Banat and Mehedinți Plateau, scale 1:200 000, with tectonic sketch 1:500 000. On this map, Codarcea cartographically outlines the Severin Nappe in the Mehedinți Plateau (Fig. 2g) consisting of allochthonous flysch deposits in the Upper Jurassic-Lower Cretaceous (Barremian-Aptian) age. Sedimentary deposits newer than Barremian-Aptian are missing in the Severin foredeep, completely covered by the Getic Nappe during the Albian, when the first paroxysmal phase of thrusting took place, followed by the great Cenomanian transgression. During the second phase, which took place before the Campanian, the sole thrust occurred at the base of the Severin sedimentary series, thrusted over the autochthonous (Danubian) domain together with the Getic Nappe above and its sedimentary cover. Between the Getic Nappe and the Danubian autochthonous, a new nappe appeared, called the Severin Nappe. This orogenic phase is followed by a new major marine transgression during the Campanian.

In the paper, Codarcea also makes a critical commentary on the Supragetic tectonic units separate in the South Carpathians by POPESCU-VOITEȘTI (1929) and STRECKEISEN (1932). In his opinion, these units are only internal (i.e. western) tectonic blocks of the Getic domain slightly tilted on the external (i.e. eastern) tectonic blocks. These blocks could be considered thrusted only in eastern Serbia. Later, Codarcea will admit the existence of the Supragetic Nappe in the western South Carpathians.

DISCUSSIONS AND CONCLUSIONS

The geological knowledge of the South Carpathians evolved in half a century from the confusing concept of metamorphic groups (MRAZEC, 1897; 1903) to the nappe structure (MURGOCI, 1910; CODARCEA, 1940) and from metamorphism attributed to magmatic intrusions and pegmatitic injections (MRAZEC, 1903; STRECKEISEN, 1932) to the regional metamorphism and metamorphic zonality, mainly induced by stress (GHIKA-BUDEȘTI, 1933, publ. 1938; 1940). At the level of 1940, the Getic Crystalline and the Infragetic meta-sedimentary formations had a much higher degree of geological knowledge compared to that of the Danubian domain.

The structural-tectonic concept of the Getic Nappe gradually developed. The tectonic relationships between the Getic and the Danubian domains were observed by Murgoci since the end of the 19th century (MURGOCI, 1895, publ. 1898; 1899). The same author also intuited the existence of a para-autochthonous nappe in the Mehedinți Plateau (MURGOCI, 1911) which could not be defined because the age of the Sinaia Beds in this region was not well known at that time. The existence of a para-autochthonous nappe in the Parâng Mountains area was intuited by POPESCU-VOITEȘTI (1923). A first such nappe was cartographically outlined by GHIKA-BUDEȘTI (1932) in the Lotru Mountains area.

CODARCEA (1940) is the tectonician who completed the work of Murgoci. He highlighted the Severin Nappe and corrected the ages of the two paroxysmal phases of the Getic Nappe emplacement, establishing that both took place during Cretaceous. The overfolding mechanism of nappe emplacement has not been confirmed. The overfolding was in contradiction with the unfolded structure of the Getic Crystalline, noticed even by MURGOCI (1899) in the central South Carpathians, later by GHIKA-BUDEȘTI (1932) in the Lotru Mountains, and by GHERASI (1937) in the Godeanu Mountains. Murgoci was probably aware of this contradiction, but he made a necessary compromise to explain the formation of the Getic Nappe in accordance with the thrust hypotheses developed in the Alps, according to which the true thrust nappes are those formed by overfolding and associated shearing of the recumbent folds.

The Supragetic Nappe was and remains a contested structural-tectonic concept in the eastern half of the South Carpathians. The first supragetic nappe that stood the test of time was highlighted by CANTUNIARI (1928, publ., 1930) in the north Semenic Mountains. STRECKEISEN (1932) extended this nappe in the Locva Mountains, northern Poiana Ruscă Mountains, north-eastern Sebeș-Cibin Massif and on the right slope of the Olt Valley, including the Făgăraș, Iezer and Leaota Mountains. GHIKA-BUDEȘTI (1940) demonstrated that the Supragetic Nappe does not exist in the central-eastern South Carpathians.

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Stelea Ion
Geological Institute of Romania
1 st Caransebeș Street, 012271 - Bucharest, Romania.
E-mail: ionstelea@yahho.com

Ghenciu Monica
Geological Institute of Romania
1 st Caransebeș Street, 012271 - Bucharest, Romania.
E-mail: monica ghenciu@yahoo.com

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