HISTORY OF THE GETIC NAPPE DEFINITION

STELEA Ion

Abstract. Highlighted at a time when the theory of thrusts was little accepted by the Romanian geologists, the history the Getic Nappe definition reveals lesser-known details regarding the elaboration of this tectonic concept that Gheorghe Munteanu-Murgoci intuited as early as 1895. After checks on the field in the Carpathians and the Balkans, he officially communicated it in 1910 knowing that he had a problem with the separation of the allochthonous and autochthonous terms of the Mesozoic sedimentary cover under the nappe, implicitly with the Cretaceous age of the second thrust phase. In 1911, Murgoci realized that he could not solve this problem for the simple reason that there was not enough paleontological data. Such data would be found by Alexandru Codarcea only in 1940.

Keywords: Getic Nappe, Southern Carpathians, Murgoci, Romania.

Rezumat. Istoria definirii Pânzei Getice. Evidențiată într-o perioadă în care teoria șariajelor era puțin acceptată de geologii români, istoria definirii Pânzei Getice relevă detalii mai puțin cunoscute cu privire la elaborarea acestui concept tectonic pe care Gheorghe Munteanu-Murgoci l-a intuit încă din 1895. După verificări pe teren în Carpați și Balcani, a comunicat-o oficial în 1910 știind că a avut o problemă cu separarea termenilor alohtoni și autohtoni ai cuverturii sedimentare mezozoice de sub pânză, implicit cu vârsta cretacică a celei de-a doua faze de șariaj. În 1911, Murgoci a realizat că nu poate rezolva această problemă din simplul motiv că nu există suficiente date paleontologice. Aceste date vor fi găsite de Alexandru Codarcea abia în 1940.

Cuvinte cheie: Pânza Getică, Carpații Meridionali, Murgoci, România.

INTRODUCTION

Geologists currently know that the Getic Nappe was communicated by Gheorghe Munteanu-Murgoci (1872-1925) in 1910 at the 11th International Congress of Geology in Stockholm, possibly also that it had been announced since 1905 through a series of three conferences held at the Academy of Sciences of Paris. Few geologists know what the author of the Getic Nappe did before 1905, between 1905 and 1910, and after 1910.

A careful analysis of the history of the Getic Nappe definition reveals lesser-known details, very interesting, some contradictory, regarding the elaboration of this ample tectonic concept that Murgoci understood as early as 1899 and sought to refine it until 1911. In this year Murgoci realized that he could not find the paleontological evidence for establishing the correct age of the second phase of the Getic thrust and gave up searching for them. To intuit its correct age and not be able to provide arguments is a paradoxical situation difficult to accept. Only after three decades, in 1940, these evidences would be found by Alexandru Codarcea (1900-1974), another great tectonicist and a great admirer of Murgoci.

THE STAGES OF THE GETIC NAPPE DEFINITION

In the central Southern Carpathians, the Getic Nappe was outlined since the end of the 19th century, on the geological maps drawn up by Murgoci in this region. In the Parâng Mountains area, the future route of the thrust plan (surface) is prefigured by a reverse fault at an angle of approx. 45º on the map from 1895 (publ. 1898), at the scale of 1:50,000 (Fig. 1a). The fact that on the geological sections attached to the map the fault appears vertical (Fig. 1b) shows that Murgoci did not give it much importance. It should be noted that the geological sections show the structure of the metamorphic formations in the region slightly wavy, practically unfolded (Fig. 1b), as it actually is.

On the map from 1898 on regional scale (1:200,000) Murgoci identifies the same fault in the area of the Șureanu, Lotru and Căpățâna mountains (Fig. 1c), with the fallen compartment (future autochthonous) folded and the raised compartment (future Getic) unfolded. Very likely, the author of the map was surprised by the somewhat semicircular trail of the fault, which from the general E-W direction in the Parâng Mountains area becomes N-S in the Lotru Mountains area, in order to continue in the NNE-SSW direction in the Căpățâna Mountains area. In fact, the tectonic plane molds the anticlinal structure in the area where it changes the direction.

So, in 1898 Murgoci knew that in the Central South Carpathians area there is a thrust nappe but he still did not know the thrust extent. He makes these statements in his work on the *Tertiary of Oltenia* published in Romanian (1908), when, after many checks in the field, he was convinced of the vast sizes of the nappe. In 1908, Murgoci gives all the details about the nappe, less the age of the second thrust phase for which he either did not find sufficient arguments or even thought that it did not exist. The paper also presents the first geological sketches with the erosion trace of the thrust plane, one from the Mehedinți- Miroč Planina Plateau and the Cernei Mountains and one with the thrust from the southwestern Căpățânii Mountains (Fig. 1d). In the same paper, previously published in English (1905), Murgoci had only presented the geological sketch of the Căpățânii Mountains on which the tectonic plane is drawn as a fault, not as a thrust plane.

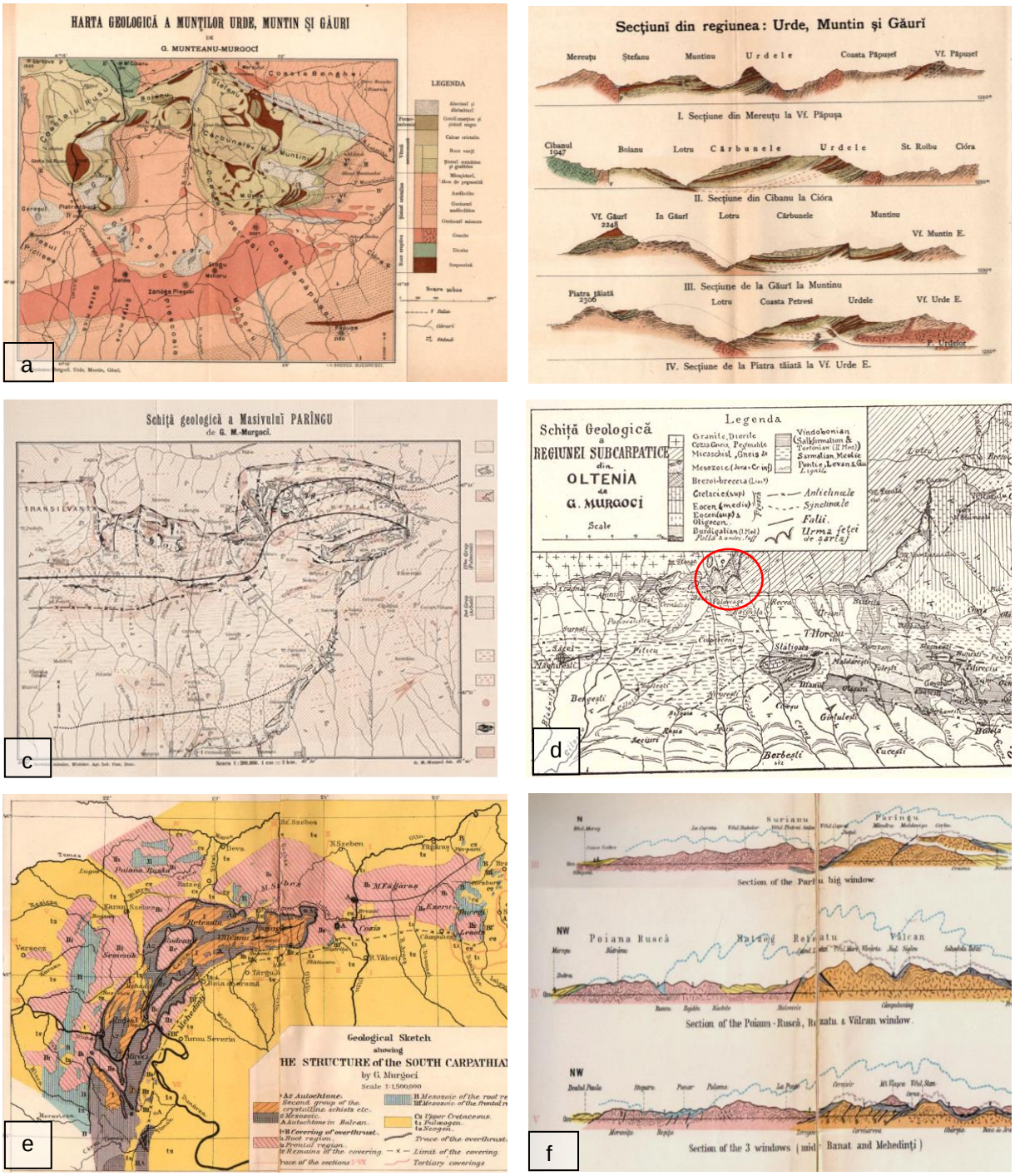

Figure 1. a) Geological map of the Urde, Muntin and Găuri Mountains, scale 1:50 000 (1895). b) Geological sections in the region Urde, Muntin and Găuri (1899). c) Geological sketch of the Parâng Massif, scale 1:200 000 (1898). d) Geological sketch of the Subcarpathian region of Oltenia (1905). e) Geological sketch of the South Carpathians structure (1910). f) Structure of the South Carpathians in geological sections (1910).

However, in 1905 Murgoci officially announced the existence of a large covering nappe in the Southern Carpathians through three communications held in France. The last of them, concerning the age of the thrust, was also published in Bucharest, in 1907. Even in this work, Murgoci does not refer to the existence of a second thrust phase, apparently suggesting that the nappe was formed in a single thrust phase, occurred in the Lower Cretaceous, between Barremian and Cenomanian.

The classic image of the Getic Nappe is the one from 1910, presented at the International Congress of Geology in Stockholm. On this map (Fig. 1e; scale 1:1,500,000), accompanied by seven geological sections (Fig. 1f), Murgoci represents the erosion contour of the Getic Nappe at the scale of the Southern Carpathians. The image of the nappe, with its covering outliers and the autohtonous window, is a spectacular one that must have impressed the audience,

especially since the author came from a country where few geologists had accepted the thrust theory, in fact only three, Murgoci, Mrazec and Voitești. Moreover, the work was well received by the international geological community. In this sense, I found a short eulogy from Professor Stefan Bončev (1870-1947), considered by our neighbours the greatest geologist of Bulgaria, in the form of a dedication written in German on a copy of the pre-Balkan anticline map BONCHEV, 1910) given to Murgoci in 1911: "To the great tectonicist of the Southern Carpathians, my friend Dr. Murgoci". Signed Dr. St. Bontscheff, Sofia 24 Dec. 1911 (Stelea, personal collection).

THE AGE OF THE THRUST

MURGOCI (1910) considered that the Getic thrust is the result of some tectonic movements that began in the Paleozoic and continued without interruption until now, with two paroxysmal phases in the Lower Cretaceous and Miocene. The nappe is thrusted over the flysch of the Sinaia Beds representing the upper term of the Mesozoic sedimentary cover, which the author believed to be common to both paleogeographic domains, but he was not very convinced, and we will see why. Insufficiently dated paleontologically, the age of the Sinaia Beds has been assigned to the Lower Cretaceous (Neocomian and Barremian). Consequently, the age of the first thrust phase was considered to be Lower Cretaceous, post-Barremian and ante-Cenomanian.

The Miocene age of the second phase of thrust was assigned based on the completely erroneous data provided by POPESCU-VOITEȘTI (1909, publ. 1911). Voitești considered that in the eastern extremity of the Cozia Mountains there is a thrust plane between the crystalline basement of the Făgăraș and Iezer mountains and the Oligocene-Miocene formations of the Getic Subcarpathians. With paleontological arguments, CODARCEA (1940) will finalize Murgoci's work by demonstrating that both paroxysmal thrust phases are Cretaceous, i.e. Albian, respectively ante-Campanian. With current data, the ages of the two thrusting phases have been corrected as being intra-Aptian, respectively intra-Campanian (e.g. SĂNDULESCU, 1984).

Regarding the Paleozoic tectonic movements, STILLE (1953) is the only tectonicist who claimed that the Getic thrust was mostly realized during the Hercynian orogeny. His conviction started from the general finding that the crystalline basement of the Getic Nappe was structured at the end of the Paleozoic and suffered only weak Alpine deformations, an inexplicable fact for an Alpine overfolding nappe. In the same work, Sttile states that only the basement of the Banat Carpathians was post-Hercynian regenerated, while the basement of the Olt Carpathians preserved its Hercynian structure. With the exception of the northern Făgăraş Mountains, which have an Alpine structure, we must specify.

At the time, Murgoci was the only one who knew that his structural model had a problem with the sedimentary cover beneath the nappe, and he immediately proceeded to solve it by trying to separate the allochthonous terms from the autochthonous terms. On the manuscript of the geological map of the western Getic Basin from 1911, i.e. one year after the publication of the Getic Nappe, the author descends the thrust plane from the Mehedinți Plateau and the Godeanu Mountains to the base of the allochthonous Sinaia Beds, anticipating the future thrust plane of the Severin Nappe (CODARCEA, 1940). The attempt of Murgoci was not successful because he did not find the paleontological evidence to separate all the Upper Cretaceous flysch from the Mehedinți Plateau, leaving a flysch considered Lower Cretaceous in the autochthon that later proved to be Upper Cretaceous (CODARCEA, 1940). But we are left with the proof of his tenacity, a beautiful geological map with the motto "The Blue Danube".

So, Murgoci was very close to separating a para-autochthonous nappe and correcting the ages of the two thrust phases. This fact was elegantly recognized even by the author who solved the problem. Commenting the cartographic manuscript of Murgoci, CODARCEA (1940) writes the following on page 60: "Murgoci saw correctly; he was on the right track. I must admit that if he had found evidence of a second orogenic paroxysm in the region (Mehedinți Plateau, our note) we would not have had many new things to add to his observations". And say this another great tectonicist, who considered Murgoci the greatest tectonicist of the Southern Carpathians. And he says it with fine humor, because Codarcea's work even refers to news about the tectonics of the southern Banat and the Mehedinți Plateau.

THE TECTONIC MECHANISM OF THE NAPPE EMPLACEMENT

The overfolding processes (Fig. 1f) that led to the formation of the Getic Nappe were attributed by MURGOCI (1910) to the sub-thrusting movements exerted by the Pericarpathian platforms on the orogenic area. But the overfolding mechanism contradicts the unfolded structure of the Getic Crystalline, noted by the author himself (1899) in the Parâng Mountains (Fig. 1b) and later confirmed by GHIKA-BUDEȘTI (1932) in the Lotru Mountains and by GHERASI (1937) in the Godeanu Mountains.

Certainly, Murgoci was aware of this contradiction but he considered that he had to make a compromise in order for the Getic Nappe to be internationally accepted. The French and Austrian geologists who had developed the thrusts theory in the Alps considered that the true thrusts are only those formed by overfolding. A tectonic mechanism, unknown at the time, that can explain the emplacement of a thrust nappe without penetrative internal deformation is the low-angle shearing. Much later, the Getic Nappe would be redefined as shear nappe (DUMITRESCU et al., 1962; BERCIA, 1972).

A CONCLUSION

From what is presented above, it follows that the Getic Nappe gave a lot of trouble to Romanian geologists. The main stages of the nappe definition cover a very long period of time, almost 100 years, starting with MURGOCI (1898, 1899, 1905a,b,c,d, 1910, 1911) and continuing with CODARCEA (1940), STILLE (1953), DUMITRESCU et al. (1962), BERCIA (1972) and SĂNDULESCU (1984). Without diminishing the important role of Murgoci, it can be said that the definition of the Getic Nappe is a collective work.

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

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