

COMMENTS ON OLD GEOLOGICAL MAPS REGARDING OLTENIA (1876-1940)

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Abstract. Many old geological maps of the orogen between Olt and Danube are of historical importance because they mark the stages of deciphering the South Carpathians structure starting with the highlighting of the Getic Nappe (Murgoci, 1895; 1899, 1910) and continuing with the separation of autochthonous sedimentary formations and the para-autochthonous units (Ghika-Budești, 1932; Gherasi, 1937; Manolescu, 1937; Paliuc, 1937; Codarcea, 1940). Some of these are appendices to doctoral theses. To illustrate the geognostic context, I have also included in the work other author geological maps, as well as the first two geological maps of Romania (the Old Kingdom): the map of the Geological Bureau of Romania, at the scale of 1:175, 000 (1882-1889) and the map compiled by Popovici-Hațeg (1900) at the scale of 1:300,000.

Keywords: Oltenia, old geological maps, Southern Carpathians, thrust nappes

INTRODUCTION

There are 20 geological maps commented in this paper, two, numbered with Roman numerals, relating to the entire territory of Romania (the Old Kingdom), made by geological institutions, and 18 author maps, numbered with Arabic numerals, relating to various regions of Oltenia, especially from the mountain area. In accordance with the subject, the structure of the work is less usual, the bibliography being part of the text.

The maps are listed in chronological order, at the author maps also mentioning the scientific works to which they were attached. We adopted this formula because otherwise we had to make two bibliographic lists, one in the text, with the commented maps, and one at the end of the text, with the scientific works to which they belong. It would have been redundant, boring and especially, useless.

NATIONAL GEOGNOSTIC CONTEXT

I. Geological Bureau of Romania, 1882-1889 (director Gregoriu Ștefănescu). Geological map of Romania, scale 1:175, 000.

It is the first official geological map of Romania, its preparation being requested by the second International Geological Congress (Bologna, 1881) to be integrated into the International Geological Map of Europe, scale 1:1, 500, 000, printed in Berlin between 1894-1910. The map of Romania has 54 sheets, 27 of which were printed in Vienna during the seven years of operation of the Geological Bureau. Of these, 19 sheets cover Oltenia and western Muntenia. The other 27 sheets were printed in

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Bucharest between 1894-1910. The map has a standardized color range, according to the recommendations made by the Congress of Bologna, with 13 color separations, 7 for sedimentary rocks, 5 for igneous rocks and one for metamorphic rocks. It has no topographic base, only hydrographic network to an unbelievable detail. At the Faculty of Geology in Bucharest, in the Paleontology Laboratory, there is an almost complete wall montage of this map on which, unfortunately, a wrong scale 1:200,000 is displayed.

II. Service of Mines and Quarries. V. Popovici-Hațeg, 1900. Geological map of Romania, scale 1:300,000. Private collection.

It is the second official geological map of Romania and the first with topographic base, rendered by fine hatches in sepia. It is cartographically and geognostically superior to the map made by the Geological Bureau. It has 34 separations in standardized colors, of which 24 are for sedimentary rocks, unequal in content: eratem level for Paleozoic, system for Triassic, series for 'Liassic', Eocene and Oligocene, and stage for Middle and Upper Jurassic, Cretaceous and Neogene. The degree of knowledge is lower for eruptive rocks (8 separations) and metamorphic rocks (only 2 separations). Unique specimen, hand-colored, in a fairly advanced state of damage. It was presented in 1900 at the Universal Exhibition in Paris and at the 8th International Congress of Geology held in Paris, also in 1900.

AUTHOR MAPS

1. Ștefănescu G., 1876. Geological sketch map of the Bahna Basin and vicinity, without scale. Note on the Tertiary Basin and on the Bahna Lignite. *Buletinul Societății Regale Române de Geografie*, nr. 9, p. 97-106.

It is the second Romanian geological map, after the map of Grigore Cobălcescu from 1862 regarding the Vaslui region. It is a simple map with four non-standard color separations. Realistically but in a somewhat naive manner, the map also shows the cliffs that appeared in the Danube bed when the water level of the river was lower.

2. Munteanu-Murgoci G., 1895 (published 1898). Geological map of the Urde, Muntin and Găuri mountains, scale 1:50, 000. Contribution to the petrographic study of the rocks in the central area of the Romanian Southern Carpathians, IV. The serpentines of Urde, Muntin and Găuri. *Anuarul Muzeului de Geologie și Paleontologie*, vol. II/1895, p. 52-84.

It is a non-standard color map. The important thing is that on the future thrust plan of the Getic Nappe in the Latoriței and Parâng Mountains, the author mapped a big reverse fault (Fig. 1). It is the first step in deciphering the Getic thrust.

3. Munteanu-Murgoci G., 1899. Geological sketch of the Parâng Massif, scale 1:200, 000. Reports of geological researches, summer 1898, V. The upper crystalline group in the Parâng Massif. *Buletinul Societății Inginerilor și Industriașilor de Mine*, vol. III, fasc. I, p. 37-62.

It is a very important map, drawn in sepia and black. With the making of this map (Fig. 2) Murgoci understood that the tectonic plane between the two crystalline groups, I (future Getic) and II (future autochthonous), is a thrust plane. The author traces the

fault mapped in 1895 on a regional scale and defines it as a fault with the upper compartment (future Getic) not folded (observation consistent with the reality) and the lower compartment (future Danubian) folded. The Getic thrust was already in the author's mind. In 1905 it will be notified at the French Academy in a series of three lectures.

4. Munteanu-Murgoci G., 1900. Geological maps of the Parâng Massif, scales 1:10, 000 and 1:25,000. *Granat und Vesuvianfels aus dem Serpentin von Parângu. PhD Thesis.* Buletinul Societății de Științe, București, nr. 9, p. 568-612 and 764-831. These are the first Romanian geological maps with the topography rendered by level curves, the elevations being made by his good friend, the great geographer Em. de Martonne, in 1899.

5. Munteanu-Murgoci G., 1905. The geological sketch of the Subcarpathians of Oltenia and the geological sketch of the Mehedinți-Miroci Planina Plateau and the Cernei Mountains, without scale. Published in Romanian in *Anuarul Institutului Geologic al României*, vol. I (1908), fasc. I, p. 1-143.

The two geological sketches are the first maps on which the thrust plane of the Getic Nappe is depicted, in the Cerna Mountains and in the southwestern Căpățâna Mountains.

6. Ionescu-Bujor D., 1909. Geological sketch of the Șușita granite massif, scale 1:142, 857. Contributions to the petrographic and geological study of the Southern Carpathians. The Șușita granite. *PhD Thesis.* Separatum, 107 p. Institutul de Arte Grafice Carol Göbl, București.

In 1911 Ionescu-Bujor described an enclave of hornfels with cordierite and andalusite in the granite of Șușita. To our knowledge, it is the only granitic body in the South Carpathians containing enclaves of hornfels with cordierite and andalusite.

7. Munteanu-Murgoci, 1910. Geological sketch showing the structure of the South Carpathians, scale 1:500, 000 (Fig. 3). The Geological Synthesis of the South Carpathians. C.R. XI-ème Congr. Intern. Géol. Stockholm, p. 871-880. Published in Romanian in *Dări de Seamă ale Institutului Geologic al României*, vol. I (1923), p. 48-58.

It is a famous structural sketch, with the outline of the Getic Nappe and the covering outliers in the Danubian window. The development of this structural concept lasted 15 years (1895-1910). The author attributed the formation of the Getic Nappe to a long process of overfolding that began in the Paleozoic and continued until now, with two moments of paroxysm, during the 'Mid'-Cretaceous (post-Barremian / ante-Cenomanian) and during Miocene. The cause of the Carpathians overfolding consists in the underthrusting exerted by the Russian Platform, Dobrogea and the Prebalkans. Certainly, Murgoci was aware that the overfolding mechanism of the Getic Nappe emplacement contradicted his correct observation from 1895 regarding the unfolded structure of the upper compartment of the fault mapped at that time. (In our opinion, the underthrusting of the Pericarpathian crustal blocks can explain both the nappe emplacement and its unfolded internal structure).

8. Munteanu-Murgoci G., 1911. Tectonic outline of the head of the Getic area, scale 1:500, 000 (Fig. 4). Manuscript. Collection of the Polytechnic University of Bucharest.

On this cartographic manuscript Murgoci tried to separate the allochthonous (Getic) terms from the autochthonous (Danubian) terms of the sedimentary cover under the Getic Nappe to precisely establish the age of the Getic thrust. It did not succeed because the sedimentary formations were not sufficiently dated paleontologically. The manuscript also has a motto: The Blue Danube.

9. Munteanu-Murgoci G., Protopopescu-Pake E., 1912. Geological map of Romania at the scale 1:500, 000, Oltenia sheet. Manuscript. Private collection. It is all that remains of the geological map of Romania at the scale 1:500, 000, Oltenia sheet, existing in the archive of the Geological Committee in the 60^s, but now lost.

10. Ionescu-Argetoia I.P., 1918. Geological map of the Pliocene of Oltenia, scale 1:500,000. The Pliocene of Oltenia. *PhD Thesis*. Anuarul Institutului Geologic al României, vol. VIII, p. 261-350.

The topographic basis of the map and the geology of the mountain area (simplified) is according to the manuscript of the geological map of Romania at the scale of 1:500, 000, Oltenia sheet.

11. Grozescu H., 1923. Sketch of the Pliocene lignite deposits in Oltenia, scale 1:350, 000. Coal deposits in Romania. Pliocene lignite deposits of Oltenia. *Studii Tehnice și Economice*, vol. III, fasc. 4. Separatum, 57 p.

The topographic base of the map is reduced after the topographic base of the geological map of Romania at the scale 1:500, 000, Oltenia sheet.

12. Roman D., 1924. Geological sketch of the Jiului basin from the source to Filași, scale 1:500, 000. *Studii Tehnice și Economice*, vol. IV, fasc. 1.

The topographic base of the map is also that on the geological map of Romania at the scale 1:500, 000, Oltenia sheet.

13. Ghika-Budești Ș., 1932. Carte géologique et pétrographique des Monts Lotru, scale 1:75, 000. Étude géologiques et pétrographiques dans les Monts Lotru (Carpates Méridionales, Roumanie). *PhD Thesis*. Anuarul Institutului Geologic al României, vol. XVI, p. 419-480.

It is a black drawn map, like his later maps. Instead of colors, the author used a varied range of hatches and signatures in black that allowed him to render, in a suggestive manner and closer to reality, the graduated transitions between the metamorphic formations of the Getic Crystalline. It is a cartographic work of great finesse. In a medallion, the map contains the first tectonic outline of a para-autochthonous unit in the Southern Carpathians.

14. Gherasi N., 1937. Carte géologique des Monts Godeanu et Țarcu, scale 1:50, 000. Étude géologiques et pétrographiques dans les Monts Godeanu et Țarcu. *PhD thesis*. Anuarul Institutului Geologic al României, vol. XVIII, p. 1-78.

It is the second map on which a para-autochthonous complex (Infragetic) is separated. In the text of the thesis, the author gives the most accurate description and with modern terms, mylonites and ultramylonites, of the rocks deformed on the Getic thrust plane.

15. Manolescu G., 1937. Carte géologique de la partie est des Munții Vulcan, scale 1:75, 000. Étude géologiques et pétrographiques dans les Monts Vulcan (Carpates méridionales, Roumanie). *PhD thesis*. Anuarul Institutului Geologic al României, vol. XVIII, p. 79-172.

The Infracretic Complex (para-autochthonous) is described under the term of Jieș Series.

16. Manolescu G., 1937. Geological sketch of the Jiului basin (Carpathian region), scale 1:300, 000. The geological and petrographic study of the Jiu Valley region. Academia Română. Memoriile Secțiunii Științifice, seria III, tom XII, mem. 6, p. 16-33.

It is a geological synthesis of the South Carpathians between Gilort and Motru rivers. The author wanted to specify that the term Infracretic Complex has a tectonic meaning, not petrographic.

17. Paliuc G., 1937. Carte géologique du Massif du Parâng et des Monts Cimpiei, scale 1:150, 000. Étude géologiques et pétrographiques du Massif du Parâng et des Monts Cimpiei (Carpates Méridionales). *PhD thesis*. Anuarul Institutului Geologic al României, vol. XVIII, p. 173-280.

Like his colleague in the Vulcan Mountains, Paliuc separates the Infracretic Complex (Jieș Series) into the Parâng Mountains and the Cimpiei Mountains.

18. Codarcea A., 1940. Carte tectonique du Banat de SE et du Plateau Mehedinți, scale 1:200 000. Vues nouvelles sur la tectonique du Banat et du Plateau de Mehedinți (Fig. 5). Anuarul Institutului Geologic al României, vol. XX, p. 1-74.

With this map, Codarcea finalized Murgoci's work on the age of the Getic thrust: phase I Albian and phase II ante-Campanian. Referring to Murgoci's manuscript from 1911, Codarcea shows an elegant and full fair play: "*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, we would not have had much news to add to his observations.*"

STATISTICAL SUMMARY OF THE AUTHOR MAPS

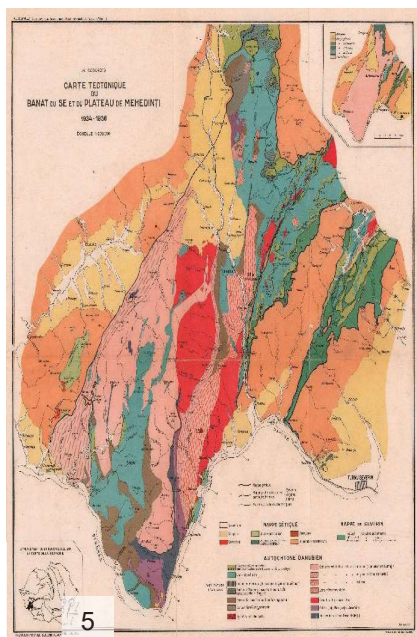
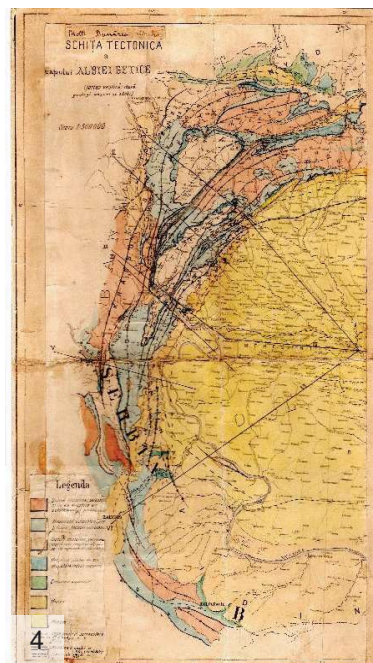
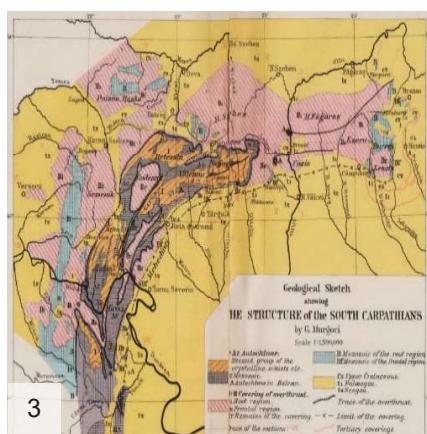
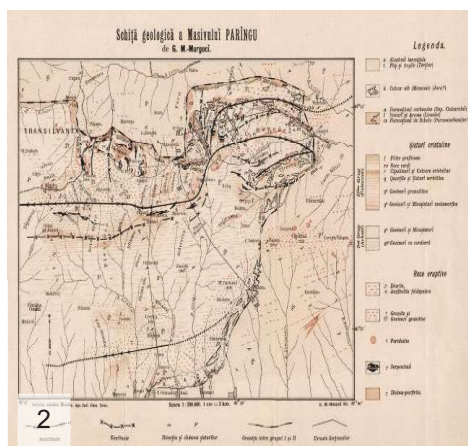
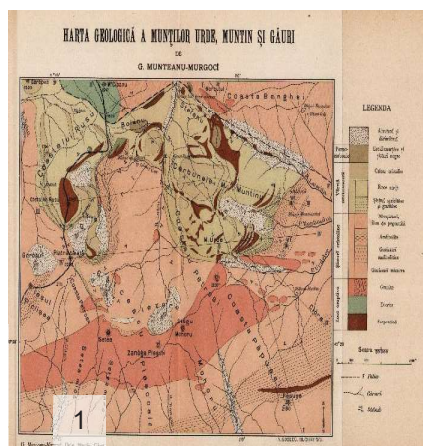
The list of maps presented in this paper contains 18 author maps, of which 7 are annexes to doctoral theses: Murgoci, 1900; Ionescu-Bujor, 1909; Ionescu-Argetoiaia, 1918, Ghika-Budești, 1932; Gerasi. 1937; Manolescu, 1937; Paliuc, 1937. The last three authors coordinated their fieldwork and decisively contributed to the delineation of the para-autochthonous unit in the central South Carpathians.

The first para-autochthonous unit was outlined by Ghika-Budești (1932) in the Lotru Mountains, it being made up of geological formations of uncertain age at the time (Carboniferous, 'Liassic' and Lower Cretaceous). The Severin para-autochthonous nappe was separated by Codarcea (1940) on structural and paleontological data (1940).

The selection includes the second Romanian geological map (Ștefănescu, 1876) and two unique cartographic manuscripts (Murgoci, 1911; Protopopescu-Pake and Murgoci, 1912). The manuscript of Murgoci from 1911, representing the author's attempt to separate the autochthonous (Danubian) terms from the allochthonous (Getic) ones of the sedimentary cover under the Getic Nappe, doomed from the start

to failure due to the low degree of knowledge of the paleontological content, also has a great dramatic charge.

Finally, the geological maps that led to the idea of the Getic thrust (Murgoci, 1885, 1899), the map of the Getic Nappe (Murgoci, 1910), the author's heroic manuscript from 1911 and the map of Codarcea from 1940, which completes the work of Murgoci, are grouped in the plate at the end of the paper. The five maps in this plate graphically depict the emergence, development and completion of the Getic Nappe concept, which lasted fifty-five years (1895-1910-1940).



Development of the Getic Nappe concept.

Fig. 1: Geological map of the mountains Urde, Muntin și Găuri, scale 1:50, 000 (Murgoci, 1895). Fig. 2: Geological sketch of the Parâng Massif, scale 1:200, 000 (Murgoci, 1899). Fig. 3: Structural sketch of the South Carpathians, scale 1:1 500, 000 (Murgoci, 1910). Fig. 4: Tectonic sketch of the head of the Getic area, manuscript scale 1:1 500, 000 (Murgoci, 1911). Fig. 5: Tectonic map of the SE Banat and the Mehedinți Plateau, scale 1:200, 000 (Codarcea, 1940). Details in text.

