

On the Sarmatian Tuff at the Basis of Limestone Quarry from Năeni (Buzău County)

Dumitru Frunzescu, Octavian Georgescu,
Cehlarov Aura, Gheorghe Brănoiu

Universitatea Petrol-Gaze din Ploiești, Bd. București 39, Ploiești,
e-mail: dfrunzescu@yahoo.com

Abstract

This paper details the mineralogical-petrographical aspects of the pyroclastic formations developed at the basis of the stratigraphic series of Sarmatian Istrița limestone. There has been carried out the analysis of optical microscopy and X-rays diffraction, the determined diagnosis being afterwards worked out by correlation and extended observation in the adjacent formations.

Key words: *optical microscopy, X-rays diffraction, Sarmatian volcanic tuff, limestone quarry from Năeni*

Introduction

In this paper we are going to present several stratigraphical-sedimentological details that may highlight the presence of a pyroclastic material at the basis of Sarmatian Istrița limestone, on which a mineralogical-petrographical characterization is intended.

The limestone of Upper Sarmatian age has been for a long time the object of geological studies and prospecting. It appears as a carbonatic complex placed in the flanks of an anticline structure with a general orientation west south-west - east north-east and an extension of about 10km, but with numerous interruptions. Despite these separations (grouped in sectors like Năeni, Istrița, Pietroasele, Ciuhoiu, etc.) the rocks have generally the same characteristics and thus they can be regarded as a whole, but with mentions whenever some specific elements or clear differences may appear. In Istrița sector the organogenous limestone appears as important accumulation in the eastern extremity of the peak Piatra Șoimului, about 500m north north-east of Istrița peak.

Around Pietroasele perimeter the Sarmatian deposits have a great expansion, thus there can be established several sectors limited by the system of faults sustained in 7 compartments (the south sector - Istrița peak; the sector Fântana Romanilor, sector Mățioana valley - Pietroasele valley, sector Pietroasele - Gruiu valley, sector Gruiu Dării, sector Dara valley - Câlțești hill, sector Ciuhoiu, in which the Sarmatian limestone shows stratiform, tabular accumulations with high extension in the surface and thickness between 5 and 25 meters, generally well delimited.

The geological-stratigraphical settings

From a regional stratigraphic point of view Năeni perimeter belongs to the middle Miocene from Muntenian Subcarpathians to the deposits of the internal folded flank of the Carpathian Foredeep, respectively. In the Molasse formations of middle Miocene age, which made up the post-tectogenetic couverture of Moldavide (Sandulescu M. et al, 1995), there stand Langhian lithostratigraphic formations: Slanic Tuff, the Evaporite formation; Kossovian lithostratigraphic formations: the Schists with Radiolars, Spirialis Marls; Volhynian-Bessarabian lithostratigraphic formations.

The Sarmatian formations are represented by Volhynian, Bessarabian, and Kersonian. The Sarmatian is very well represented and completely developed only in the region between Cricovul Sărat valley and Buzău valley. The existent macrofauna permits the distinction of subages Volhynian, Bessarabian and Kersonian. According to the area of deposition the lithology of the lower Sarmatian is varied. On Dara valley (the alignment of the external diapir folds), Volhynian is mainly clayey.

The middle Sarmatian (Bessarabian) south of Buzău valley up to Cricovul Sărat valley, the Bessarabian is made up of clayey deposits at the lower part (the layers with *Cryptomacra pesansensis*) and grezocalcareous deposits (*Istrița limestones*) at the upper part. The Bessarabian deposits from the region contain macrofauna with kinds of *Macra*, *Cryptomacra*, *Pahia*, *Plicatiforma*, *Obsoletiforma*, *Duplicata*, *Calliostoma*.

The upper Sarmatian (Kersonianul) is homogeneous from a lithologic point of view being made up of grezocalcareous deposits (the upper part of *Istrița limestone*). The macrofauna contains only species of the *Macra* genre, more frequently being *Macra bulgarica* and *Macra caspia*.

The detailed stratigraphy

Stratigraphic specifications for middle and upper Miocene in the southern area of the Eastern Subcarpathians can be done by formalization to the point of view in the works of Munteanu (1998) and Crihan (1999), naming the series of the following formations:

- *Formation of Câmpinița* (Crihan, 1999): an equivalent of “the horizon of tuffs with globigerine “described by Popescu (1951) and by Olteanu (1951), or of *Slanic Tuff* mentioned by Murgeanu et al. (1968), respectively *Dej Tuff* = *Slanic* according to Meruțiu (1912); Popescu-Voitești (1915). Biostratigraphic according to Mărunțeanu et al. (1997); Crihan (1999), the age belongs to upper Langhian – lower Serravalian.
- *Breccia of Cosmina* (Popescu, 1951): equivalent with the „horizon of salt breccia” after Popescu (1951), Olteanu (1951); equivalent with “the evaporitic formation” after Săndulescu et al. (1995). The age of Breccia of Cosmina is Serravalian or Wielician, if the regional system of ages is considered.
- *Formation of Telega* (Crihan, 1999): equivalent to what Popescu (1951) and Olteanu (1951) separated under the name „the clayey horizon with Radiolars” and „the marly horizon with Spirialis”. Telega Formation is defined by Crihan (1999) having the sense of some deposits with a normal marine character, disposed between the Cosmina Breccia at the base and saltish deposits of Formation of Măceșu in the cover. From a biostratigraphic point of view it belongs to the Kossovian age (= Serravalian partim).
- *Formation of Valea Neagoșului* (Papaianopol, 1992): it refers to clayey facies under which there develop both upper Badenian deposits and lower Sarmatian, the limit between them being based on the fauna of mollusks, foraminiferas and, sometimes, on nannoplankton (between the areas NN6 and NN7 after Mărunțeanu and Papaianopol, 1994). After Munteanu (1998), this lithologic formation, made up of silty clays, clayey silts, sands with

trovants, sandstones and conglomerates, has accumulated in the upper Kossovian – Buglovian. After Popescu (1997) the kossovian fauna is reframed in Sarmatian sediments, which would exclude a transition (through *Venus konkensis*) to Sarmatian.

- *Formation of Valea Vizuinei* (Munteanu, 1998): is defined out by the accumulation between two regressive phases marked by gypsum deposits: one at the end of Kossovian and the other at the end of Buglovian, and it refers to a monotonous series, mainly clayey, which contains calcareous clays and silty clays, grey-bluish, with intercalations of bentonitic clays, tuffs or gypsum. From a biostratigraphic point of view (Munteanu, 1998, and other authors) the Buglovian age of this formation is certain. It is mentioned that some authors study together the Buglovian-Sarmatian deposits, and others (Motaş et. al., 1976; Papaianopol, 1992; Papaianopol and Mărunţeanu, 1992, 1993) deny Buglovianul as a separate chronostratigraphic formation.
- *Formation of Şipotelu* (Andreescu, 1972): it refers to deposits of predominantly clayey facies (calcareous clays, grey-bluish, silty clays, grey with rare clayey silts, yellowish or with strips of fossiliferous sandstones) of upper Volhynian – Bessarabian age. It is to be mentioned that Papaianopol (1992) considers that the clayey deposits of the lower Sarmatian and those from the base of middle Sarmatian belong to the *Layers of Dara*.
- *Formation of Râmnic* (Andreescu, 1972): contains siliciclastic rough strips/bands (sands, sandstones, clayey schists, sometimes conglomerates) of the upper Bessarabian – Kersonian age, in which there appear different lithologic separations made by different researchers at the level of upper Bessarabian: „the sandy-marly horizon” (Bolgiu, 1944); „marly-sandy oolitic horizon” (Iorgulescu, 1953); the lower part of „Istriţa limestone” (Papaianopol, 1992). At the south of the alignment/line of the valleys Cricovul Sărat – Nişcov, the Bessarabian sector from the formation of Râmnic develops under the lithofacies of *Istriţa limestone*, considered of a upper Bessarabian – Kersonian age (Papaianopol, 1992). In Istriţa hill, the superior part of the Formation of Râmnic (= *Istriţa limestone*, Papaianopol, 1992) is represented by sandstones, calcareous sandstones and shell-like limestone, with rare intercalations of clays and sands.
- *Formation of Valea Ciomegii* (Andreescu, 1973): it refers to deposits at the top of the Kersonian previously formulated (Ciocârdel, 1950; Pană, 1966; Macarovici et al., 1967; Motaş and Papaianopol, 1972; Andreescu, 1972, etc., from Munteanu, 1998) like „the motley complex”, „the striped complex”, „the package of burgundy-greenish clay”, „the series of burgundy-greenish marls”, „the saltish-freshwater complex”. The lithology in the Formation of Valea Ciomegii, on Pietroasa valley and at Hospital Nifon, is marked by fine, white sands (with intercalations of cemented sands, lumachelle, rich in *Maetra*) followed by yellowish sands, medium granulated and coarse sands with oblique stream lamination. In the old limestone quarry from the Măgura-Pârscov anticline, the formation includes a pile of red, clayey silts non-fossiliferous (suprajacente to limestone), with a lens of gravels and boulders at the upper part. In Istriţa hill „the motley complex” includes an alternation of reddish clays and greenish clays.

In the series of the Sarmatian deposits the *Limestone of Istriţa* has a special evolution, belonging to the Formation of Râmnic estimated as being of an upper Bessarabian – Kersonian age. The limestone of Istriţa has been long researched, as a consequence of its long practiced use as a raw stone or carved for constructions (buildings, fences, wells, board fences, etc.), funeral monuments and as raw material for preparing the lime, for making the filler for covering the asphalt of the roads. Labeled as “lumachellic limestone with *Maetra*”, the limestone of Istriţa it combines a variety of carbonatic and siliciclastic lithofacies, in which the mineralogical-petrographical analyses detected three types of main varieties: (1) organogenous limestone – lumachelle-like, with an organomorphous structure and organogenous structure of chemical precipitation; (2) organogenous limestone, slightly oolitic, with an organomorphous structure,

cryptocrystalline and mezocrystalline and organogenous texture/structure of chemical precipitation, sometimes mechanical; (3) uncrystallized organogenous limestone, with an organomorphous structure and organogenous texture of chemical precipitation.

Belonging, from the exploitation point of view, to two main banks separated by a sandy intercalation, the series afferent to “the limestone of Istrița” show several intercalations of fine pyroclastic material, developed especially near the base. We intend to detail and give a mineralogical-petrographical diagnose of the pyroclastic intercalations in order to establish stratigraphic limits and integrate them in the series of Neogene volcanic manifestation.

From the total thickness of 20-25m of the lithostratigraphic column of “Istrița limestone”, on the first 8m of the base there are over 20 fine intercalations (centimetrical or even decimetrical) of a tuffaceous or tuff-like material (fig. 1). Some decimetrical intercalations of tuffaceous arenite or siltic-arenite have flowing structure of the type *slump* up to *debris-flow* incorporating clasts-rudites of bivalve. There also appear transitions from parallel structures to fluidal structures or, for thicker, decimetrical intercalations there appear structures of quick depositing of the type *load-cast*.

Mineralogical-petrographical investigations

The analysis of X-rays diffraction revealed contents of the component minerals according to table 1.

Table 1.

No. sample	Quartz (%)	Clinocllore (%)	Muscovite (%)	Feldspars (%)	Calcite (%)	Zeolites (%)
1	47,04	2,32	6,65	3,41	-	3,54
2	40,85	6,19	4,04	-	2,15	12,46
3	43,42	2,47	4,74	6,11	-	2,89
4	36,52	-	14,97	4,13	30,23	13,31
5	13,78	1,61	1,69	-	45,99	1,62
6	3,68	-	-	-	35,01	1,74
7	29,09	3,58	2,77	-	34,9	3,12
8	6,84	-	1,48	-	30,19	1,22
9	32,32	-	-	-	18,18	1,94

It distinguishes the absolutely normal prevalent feature of the diagenetic calcite in an increasing percentage from the base to the proximity of the bank of lumachellic and allochemical limestone belonging to Istrița type. The existence of quartz in percentage of over 40% in the evidences from the base of the series suggests the belonging of these rocks to the calcitic epiclastites with pyroclastic material. The high degree of alteration of these tuffaceous epiclastites is explained by the high content of muscovite, this relatively enriching itself in the rock due to the resistance to alteration, by comparison with the mineralogical frame in which it initially existed. The presence in a reduced quantity of the zeolites confirms the high degree of alteration of these tuffs, which is proven by the presence of hybrid structures of the type analcime or the type faujasite of Ca or of Na and K. The ash of the rio-dacitic type was sedimented in a marine area, the saline medium helping the alteration of glass, followed by the forming of quartz and zeolites. The enriching with calcite of the tuffs is a diagenetic effect resulted afterwards due to the proximity of the suprajacente limestone.

Taking into account the above mentioned mineralogical considerations, together with the sedimentological observations, we can conclude that the analyzed rocks belong to the category of slightly zeolitic tuffs, rich in carbonates, sometimes with an aspect of tuffaceous arenites.

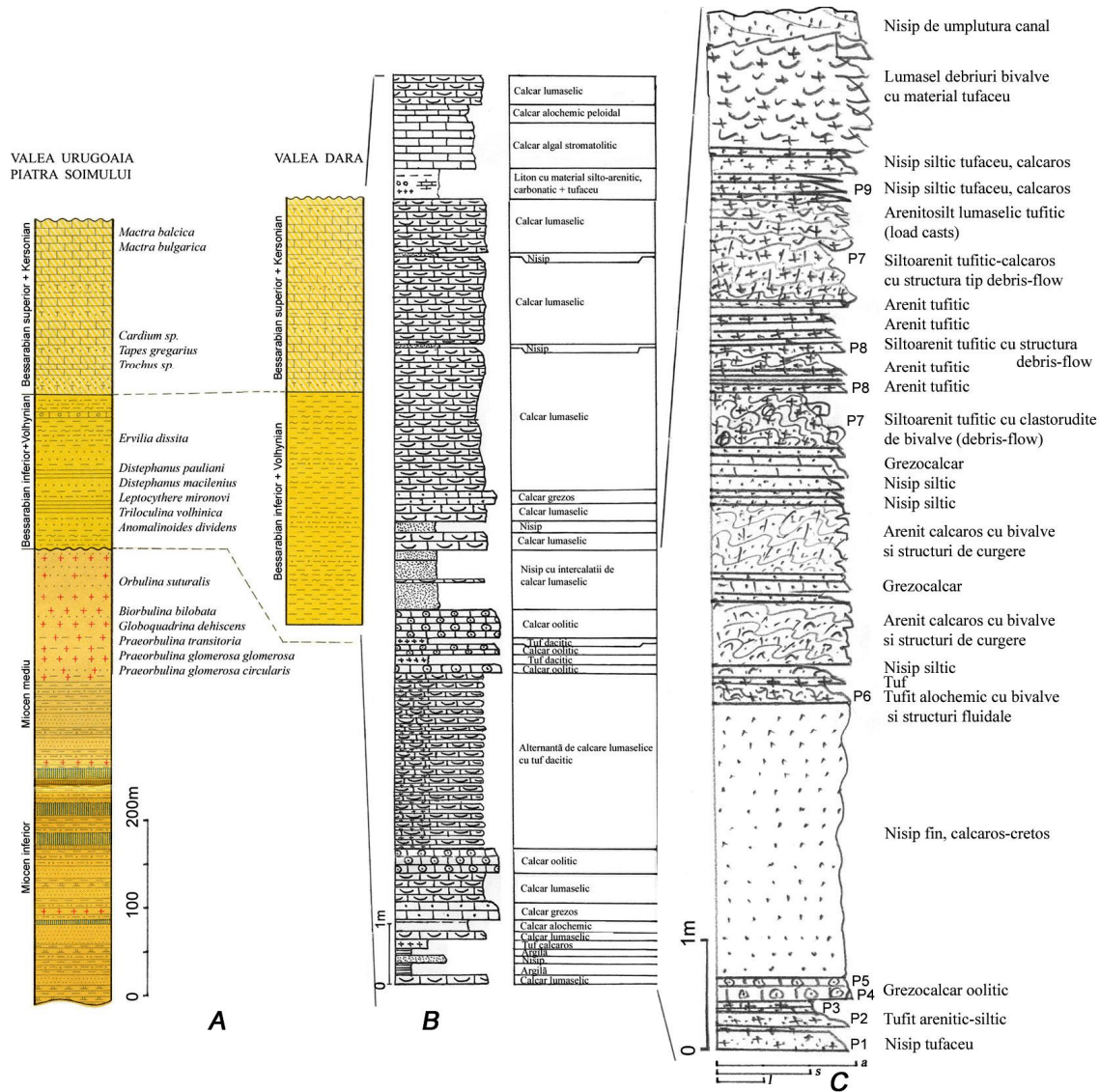


Fig. 1. Lithological columns of Istrița limestone:
A – synthetic column; B, C – detailed columns (P1-P9=samples)

Conclusions

In Năeni (Buzău County) outcrops the deposits of “Istrița limestone” belonging to the Sarmatian Formation of Râmnic (upper Bessarabian – Kersonian) made up of lithofacies: (1) organogenous limestone - lumachelle; (2) organogene limestones, slightly oolitic; (3) uncrystallized organogenous limestone, inside which there appear intercalations of a pyroclastic material, especially towards the basis, and this represents the detailed subject of the present paper. The macroscopic analysis, the optical one and the X-rays diffraction reveal a mineralogical composition which permits us to consider the pyroclastic material from the basis of Istrița limestone from Năeni as belonging to the category of tuffite, of the rio-dacitic type.



Fig. 2. Outcrop with tuffaceous arenite in the basis of slope 2 from the quarry of Istrița limestone at Năeni.



Fig. 3. Pyroclastic intercalations in the medium third of slope 1 of the Istrița limestone quarry from Năeni



Fig. 4. Tuffaceous arenite in the basis of slope 1 of the Istrița limestone quarry from Năeni



Fig. 5. Overview of the basis of the slope 1 from the quarry of Istrița limestone



Fig. 6. View of the superior slope of the quarry with an interval of about 8m of transition of sandy layers with subdecimetric intercalations of lumachellic limestone, situated between the lower and the upper bank of Istrița limestone



Fig. 7. View of the top of the limestone upper bank of the Istrița limestone quarry from Năeni

Here the high frequency of quartz and the presence of zeolites with hybrid structures of the type analcime or faujasite of Ca or of de Na and K show a high degree of alteration.

The found diagnosis is going to be verified in similar parts during the intention of finding a stratigraphic limit with a regional utilization.

References (selective)

1. Andreescu, I. – *Contribuții la stratigrafia Dacianului și Romanianului din zona de curbură a Carpaților Orientali*. D.S. Inst. Geol. Geof. (Stratigrafie), vol. 58 (4), p. 131–156, 1972.
2. Crihan, I.M. – *Litobiostratigrafia Miocenului mediu dintre valea Prahovei și valea Teleajenului la sud de sinclinalul Slănic*, Teza de doctorat, Universitatea Babeș-Bolyai Cluj-Napoca, 1999.
3. Frunzescu, D., Vasiliu, V.E., Georgescu, O. – *Studiu geologic cu calculul rezervelor la 01-01-1995 pentru zăcămintul de calcar sarmațian Năeni, județul Buzău*, contract cercetare, beneficiar S.C. EUROPA S.A. Slobozia, 1995.
4. Frunzescu, D. – *Studiul stratigrafic și sedimentologic al evaporitelor miocene dintre Valea Buzăului și Valea Teleajenului*, Teza de doctorat, Universitatea București, 1998.
5. Frunzescu, D. – *Noțiuni de sedimentologie*, Editura Premier, Ploiești, 2000.
6. Frunzescu, D., Brănoiu, Gh. – *Monografia geologică a bazinului râului Buzău*, Editura Universității Petrol-Gaze din Ploiești, 2004.
7. Ghenea, C., Ghenea, A., Motaș, I., Papaianopol, I. – *Harta Geologică a României, scara 1:50.000, foaia Istrița*, Inst. Geol. Geof., București, 1978.
8. Olteanu, Fl. – *Observațiuni asupra aparițiilor de breccia sării cu masive de sare în zona miopliocenă dintre Teleajen și Bălăneasa (cu privire specială pentru regiunea Pietraru-Buzău)*, D.S. Inst. Geol., vol. XXXII (1943-1944), p. 12-18, București, 1951.
9. Papaianopol, I. – *Studiul stratigrafic al Neogenului din molasa pericarpatică (sectorul dintre valea Cricovului Sărat și valea Nișcovului)*, Teza de doctorat, Universitatea Al.I. Cuza Iași, 1992.
10. Popescu, Gr. – *Observațiuni asupra „brecciei sării” și a unor masive de sare din zona paleogenă-miocenă a jud. Prahova*, D.S. Inst. Geol., vol. XXXII (1943-1944), p. 3-12, București, 1951.
11. Mărunțeanu, M., Papaianopol, I. – *Associations de nannoplanton dans les depots sarmatiens de Muntenie (Bassin Dacique)*, The Miocene from Transylvanian Basin – Romania, p. 47–54, Cluj-Napoca, 1994.
12. Mărunțeanu, M., Papaianopol, I., Popescu, Gh., Olteanu, R., Pestrea, S., Macaleț, R. – *Studii pentru scara biostratigrafică standard a Neogenului – Subcarpații Munteniei*, Raport Arh. Inst. Geol., București, 1997.
13. Micu, M. – *Miocenul presarmațian din culmea Istrița*, D.S. Inst. Geol. Geof., vol. LXVI/4, p. 197–202, București, 1981.
14. Munteanu, E. – *Studiul faunei sarmațiene din regiunea cuprinsă între valea Lopatna și valea Buzăului*, Teza de doctorat, Universitatea Al.I. Cuza Iași, 1998.
15. Săndulescu, M., Mărunțeanu, M., Popescu, Gh. – *Lower-Middle Miocene Formations in the folded Area of the East Carpathians*, Guide to Excursion B1 (post-congress), X-th Congress RCMNS, Romanian Journal of Stratigraphy, vol. 76, Supplement 5, București, 1995.

Asupra tufului sarmațian din baza carierei de calcare de la Năeni (jud. Buzău)

Rezumat

În lucrare se detaliază aspectele mineralogo-petrografice ale formațiunilor piroclastice dezvoltate în baza suitei stratigrafice a calcarului de Istrița din Sarmațian. S-a procedat la analize de microscopie optică și difracție de raze X urmând ca diagnosticul determinat să fie prelucrat în sensul corelării și urmării în extensie în formațiuni limitrofe.