

## MAGNETOSTRATIGRAPHY OF THE UPPER NEOGENE DEPOSITS IN THE EASTERN DACIAN BASIN: AN OVERVIEW

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**Abstract.** For the present paper the following 12 sections – Cozieni, Jitia, Trestieni, Berca-Joseni, Beceni, Berca-Pleşcoi, Slatina, Râmnicu Sărat, Badislava, Topolog, Bizdidel and Valea Vacii have been taken into account. The first 10 of those sections have been used in the elaboration of a magnetostratigraphic framework (in accordance with ATNTS scale) of the Sarmatian – Uppermost Pliocene deposits from the eastern Dacian Basin. The most significant results refer to the following stage/substage boundaries: Kossovian-Sarmatian = ~12.8 Ma (C5Ar2n); Volhynian-Bessarabian = ~11.6 Ma (C5r1n); Early-Late Bessarabian = ~10 Ma (C5n1r); Bessarabian-Kersonian = ~9.4 Ma (C4Ar1n); Sarmatian-Meotian = ~8.85 Ma (uppermost chron C4An); Lower Meotian (Baguerovian) – Upper Meotian (Akmanaian) = ~8.1 Ma (base of subchron C4n2n); Meotian-Pontian = ~7.55 Ma (C3Br3r); Odessian-Portaferrian = ~7.3 Ma (C3Br1n); Early Portaferrian-Late Portaferrian = ~7.0 Ma (mid. chron C3Ar); Portaferrian – Bosphorian = ~6.8 Ma (upper chron CrAr); Pontian-Dacian = ~5.25-5.3 Ma (= ~ C3r-C3n4n „Tvera” boundary); Getian – Parscovian = ~4.75 Ma (mid subchron C3n2r); Parscovian-Siensian = ~4.2 Ma (basal C2Ar chron, or top C3n1n „Cochiti”); Siensian (Upper Dacian)-Pelendavian (Upper Romanian) = ~3.7 Ma (terminal C2Ar); Pelendavian-Valahian (Upper Romanian) = ~2.7 Ma (uppermost C2An1 = Gauss terminal); Romanian-Pleistocen = 1.8 Ma (top C2n = „Olduvai”).

**Keywords:** Dacian Basin, Upper Neogene, magnetostratigraphy, integrated sections, stratotypes.

**Rezumat. Magnetostratigrafia depozitelor Neogen superioare din estul Bazinului Dacic: o revizuire.** Pentru prezenta lucrare au fost luate în considerare secțiunile Cozieni, Jitia, Trestieni, Berca-Joseni, Beceni, Berca-Pleşcoi, Slatina, Râmnicu Sărat, Badislava, Topolog, Bizdidel și Valea Vacii. Dintre aceste secțiuni primele 10 au fost utilizate în elaborarea, revizuită în acord cu scala ATNTS, a cadrului general magnetostratigrafic al depozitelor Sarmatian – Pliocen superioare din estul Bazinului Dacic. Rezultatele mai semnificative se referă la următoarele limite: Kossovian-Sarmatian = ~12,8 Ma (C5Ar2n); Volhynian-Bessarabian = ~11,6 Ma (C5r1n); Bessarabian inferior-Bessarabian superior = ~10 Ma (C5n1r); Bessarabian – Kersonian = ~9,4 Ma (C4Ar1n); Sarmatian-Meotian = ~8,85 Ma (partea terminală a cronei C4An); Meotian inferior (Baguerovian)-Meotian superior (Akmanaian) = ~8,1 Ma (baza subcronei C4n2n); Meotian-Pontian = 7,55 Ma (C3Br3r); Odessian-Portaferrian = ~7,3 Ma (C3Br1n); Portaferrian inferior-Portaferrian superior = ~7,0 Ma (partea mediană a cronei C3Ar); Portaferrian-Bosphorian = ~6,8 Ma (partea superioară a cronei C3Ar); Pontian-Dacian = ~5,25-5,3 Ma (= ~limita dintre crona C3r cu subcrona C3n4n „Tvera”); Getian-Parscovian = ~4,75 Ma (partea mediană a subcronei C3n2r); Parscovian-Siensian = ~4,2 Ma (partea bazală a cronei C2Ar, sau top C3n1n „Cochiti”); Dacian (Siensian)-Romanian (Pelendavian) = ~3,7 Ma (partea terminală C2Ar); Pelendavian-Valahian = ~2,7 Ma (partea terminală C2An1 = Gauss terminal); Romanian-Pleistocen = 1,8 Ma (top C2n = „Olduvai”).

**Cuvinte cheie:** Bazinul Dacic, Neogen superior, magnetostratigrafie, secțiuni integrate, stratotipuri.

### INTRODUCTION

Magnetobiostratigraphic investigations in the Dacian Basin started several decades ago (POSPELOVA, ANDREESCU, 1977) and then, our research in the field lasted till the end of 1998.

Preliminary and/or final results of those investigations have been rendered out in a series of papers (ANDREESCU 1981; ANDREESCU et al., 1981; GHENEA et al., 1982; ALEXEEVA et al., 1983; ANDREESCU et al., 1987 etc.).

Many of the preliminary results have subsequently been reconsidered and included in a more comprehensive magnetobiostratigraphic study referring to the Sarmatian-Pliocene deposits from the eastern Dacian Basin (ANDREESCU, 2008), by taking into account the paleomagnetic polarities pointed out by Valerii Trubihin (Moscow) in the following sections:

- Cozieni: Uppermost Badenian (Kossovian) – Early Volhynian – Early Bessarabian;
- Jitia: Upper Volhynian – Bessarabian – Kersonian – Early Meotian (Baguerovian);
- Mânzălești: Upper Bessarabian – Kersonian – Early Meotian (Baguerovian);
- Bisoca: Upper Bessarabian – Kersonian – Lowermost Meotian;
- Trestieni: Uppermost Kersonian – Meotian (Baguerovian-Akmanaian) – Early Pontian (Lower Novorossian = Odessian);
- Berca: Meotian – Lowermost Pontian;
- Berca-Joseni: Upper Meotian (Akmanaian) – Pontian (Novorossian – Bosphorian) – Lower Dacian (Getian);
- Beceni: Upper Pontian (Bosphorian) – Dacian type-section (Getian – Parscovian – Siensian) – Romanian type-section;
- Vintilă Vodă: Parscovian – Siensian;
- Berca-Pleşcoi: Upper Dacian (Siensian) – Romanian (Pelendavian) – Lower Valahian;
- Slatina: Upper Romanian (Valahian) – Lowermost Pleistocene.

For the above named study the GPTS scales of CANDE & KENT, 1992; 1995, have been used.

Meanwhile several sections: Putna, Râmnicu Sărat, Badislava and Topolog (VASILIEV et al., 2004) and Slănicu de Buzău, Valea Vacii, Bizdidel and Badislava (SNEL et al., 2006) have been paleomagnetically investigated in the eastern Dacian Basin.

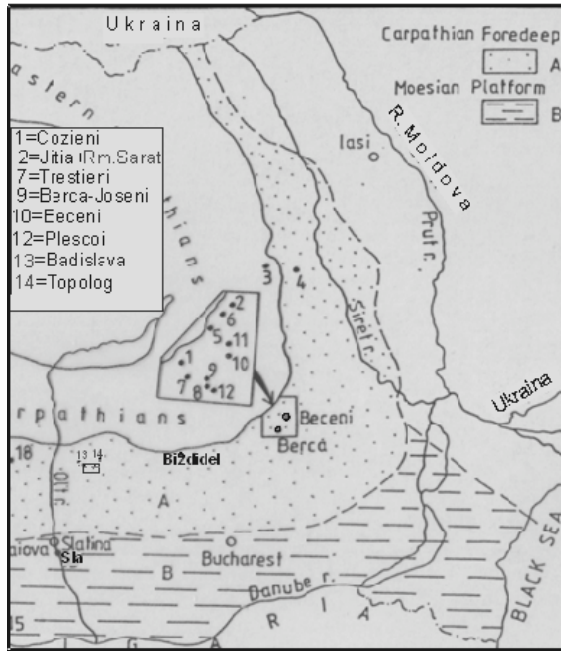


Figure 1. Location of the sections taken into account in the present paper.  
 Figura 1. Localizarea secțiunilor prezentate în această lucrare.

In the present contribution Cozieni, Jitia, Trestieni, Berca-Joseni, Beceni, Berca-Pleşcoi and Slatina sections are taken into consideration, together with Râmnicu Sărat, Badislava (13) and Topolog (14) ones (Fig. 1). Given interpretations of the above mentioned authors for the last two sections are rendered out in Fig. 2.

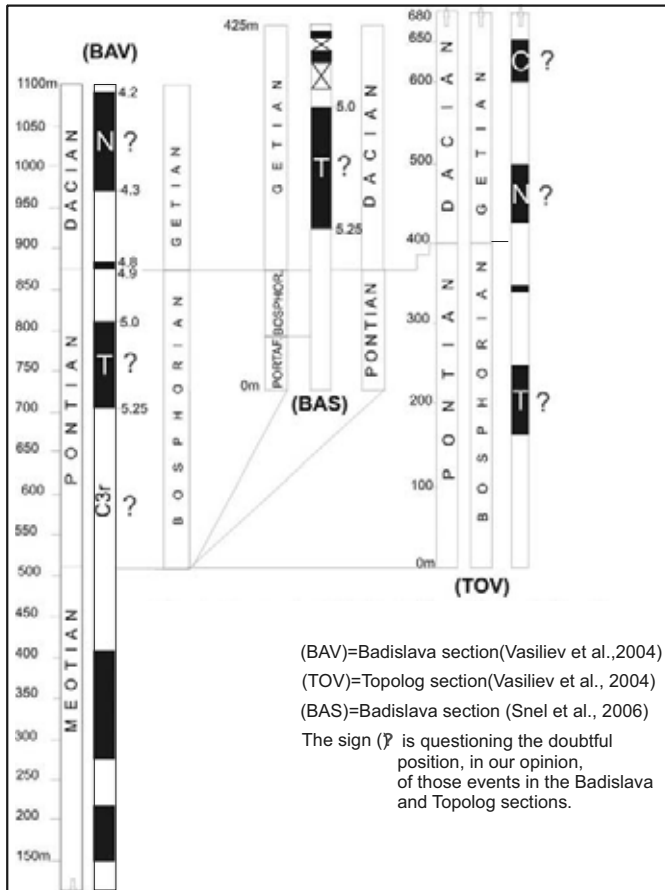


Figure 2. Magnetostatigraphy of the Neogene deposits from Badislava and Topolog sections according to VASILIEV et al., 2004 versus SNEL et al., 2006.

Figura 2. Magnetostatigrafia depozitelor neogene din secțiunile Badislava și Topolog în accepțiunea lui VASILIEV et al., 2004, comparativ cu SNEL et al., 2006.

The Fig. 3 refers to the sections: Badislava, Bizdidel, Valea Vacii and Râmnicu Sărat, in our interpretation, together with the Trestieni section, and Fig. 4 includes the above mentioned 10 revised sections, involved in the present contribution.

In this paper the ATNTS of LOURENS et al., 2004, scale has been used.

Badislava section (VASILIEV et al., 2004; SNEL et al., 2006) refers to the Late Meotian, Late Pontian and Early Dacian, but the paleomagnetic polarity records concerning the Pontian and Dacian deposits is quite different according to each of the two teams (Fig. 2). Thus, VASILIEV et al., 2004, found that the Bosphorian deposits in the Badislava section, and in the Topolog one as well, do include, in the middle-upper part, an important normal event, thought to represent the C3n4n Subchron (=Tvera).

SNEL et al., 2006, found no normal events in the Bosphorian deposits, but the C3n4n Subchron, has been pointed out lasting on about 150 m, in the Getian (Early Dacian) deposits from Badislava section (Fig. 2).

On the other hand, in the stratotypic section of the Dacian Stage (Slănicu de Buzău River, Beceni locality) the “Cochiti” (C3n1n Subchron) and “Nunivak” (C3n2n Subchron) events have undoubtedly been proved to characterize the Parscovian Substage (Middle Dacian) (ANDREESCU, 1981; GHENEA et al., 1982; ALEXEEVA et al., 1983; ANDREESCU, 2008 etc.).

In the same stratotypic section of the Dacian Stage and in the Berca – Joseni section, as well (Fig. 4), the Getian deposits are developed in the time span between the base “Tvera” (C3n4n Subchron) and the middle part of the reverse event (C3n2r subchron) above “Sidufiall” event (C3n3n Subchron).

Taking into account the above mentioned observations and considering the polarity record is accurately identified, we tried to integrate the sections Badislava and Topolog in a more logically assessment of paleomagnetic frame by reporting them to other well dated sections in the Dacian Basin (Figs. 3; 4).

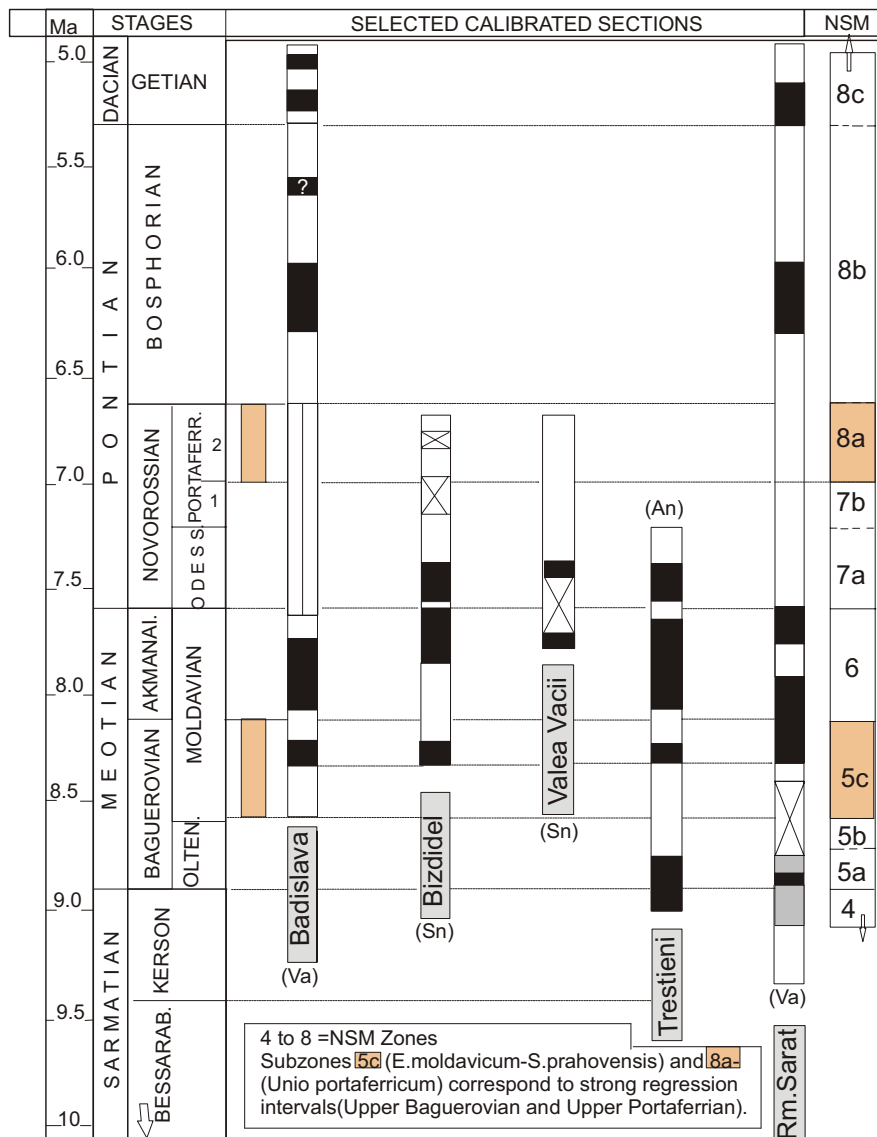


Figure 3. Integrated sections Badislava, Bizdidel, Valea Vacii and Râmnicu Sărat with Trestieni section, in our actual interpretation. (Va) = VASILIEV et al., 2004; (Sn) = SNEL et al., 2006; (An) = ANDREESCU, 2008.

Figura 3. Secțiunile: Badislava, Bizdidel, Valea Vacii și Râmnicu Sărat integrate cu secțiunea Trestieni, în prezenta interpretare.

As concerns the Râmnicu Sărat and Putna sections, VASILIEV et al., 2004, committed an artificial shifting of sediment piles from a stage/ sub-stage to other neighbour units.

As for example: ~250-300 m of Kersonian deposits, in Putna section, had been transferred to the Early Meotian and ~200 m of lower Pontian deposits passed to the Upper Meotian. In Râmnicu Sarat section the Getian loses ~400 m, transferred to the Bosphorian, but gains ~500 m from the Parscovian.

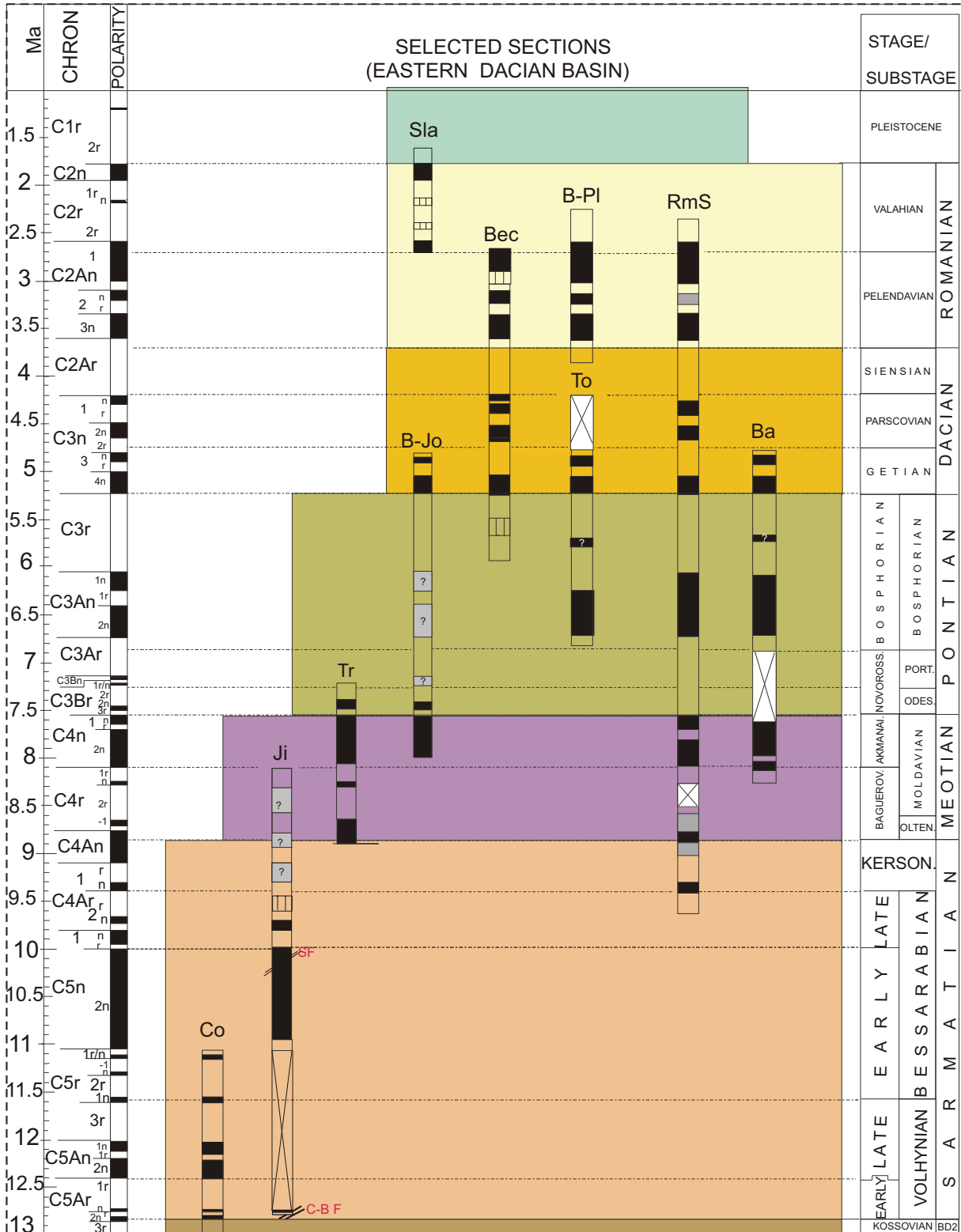


Figure 4. Revised paleomagnetically investigated sections in the eastern Dacian Basin.

Co = Cozieni; J = Jitia (C-BF = Cașin-Bisoca-Fault; SF = Sărule-Fault); Tr = Trestieni; B-Jo = Berca-Joseni; Bec = Beceni; B-Pl = Berca-Pleșcoi; Sla = Slatina; RmS = Râmnicu Sărat; Ba = Badislava; To = Topolog.

Figura 4. Secțiunile revizuite, investigate paleomagnetice, din estul Bazinului Dacic.

In fact, the Parscovian deposits reach up to 675 m, while in the fig. 9 of VASILIEV et al., 2004, the thickness of those deposits does not reach 350 m.

The most spectacular, amazing, transfer concerns the Upper Dacian and Early Romanian deposits: ~1,800 m-2,000 m have been taken away from the Pelendavian Substage for the benefit of the Siensian Substage, which, actually, does not exceed 800 m.

Without any tie-point and reliable biochronologic marker, the paleomagnetic assignment of the Neogene deposits in Putna and Râmnicu Sărat sections, in VASILIEV et al., 2004, manner is, in our opinion, more than questionable.

Whether VASILIEV et al., 2004 would have in view the Uppermost Kersonian - Lowermost Meotian Mammal site from Reghiu (=MN11 Unit, according to STIUȚĂ, 2003), corresponding to the Lower Turolian, whose basal limit is dated at ~ 9.5 Ma, and if they would take into account the tens and tens of reliable radiometric datings concerning the Sarmatian-Meotian-Pontian or Sarmatian-Pannonian-Pontian interval from Paratethys, and would have in view the magnetostratigraphic investigations carried out by PEVZNER, 1987, PEVZNER & VANGENGEIM, 1984; VANGENGEIM et al., 2006 etc., on the Sarmatian-Kimmerian deposits from the north-euxinian region, then the calibration of the Sarmatian-Romanian deposits from Putna and Râmnicu Sărat sections could certainly be rendered out in a more appropriate manner.

This assignment we intended to be illustrate in Figs. 3 and 4 which, taken together, do not need additional explanations.

Finally, several words about the approach of CLAUZON et al., 2008, concerning one of the best investigated and best known Neogene area of the Dacian Basin, namely the stratotypical sections of the Dacian and Romanian Stages (Fig. 5).

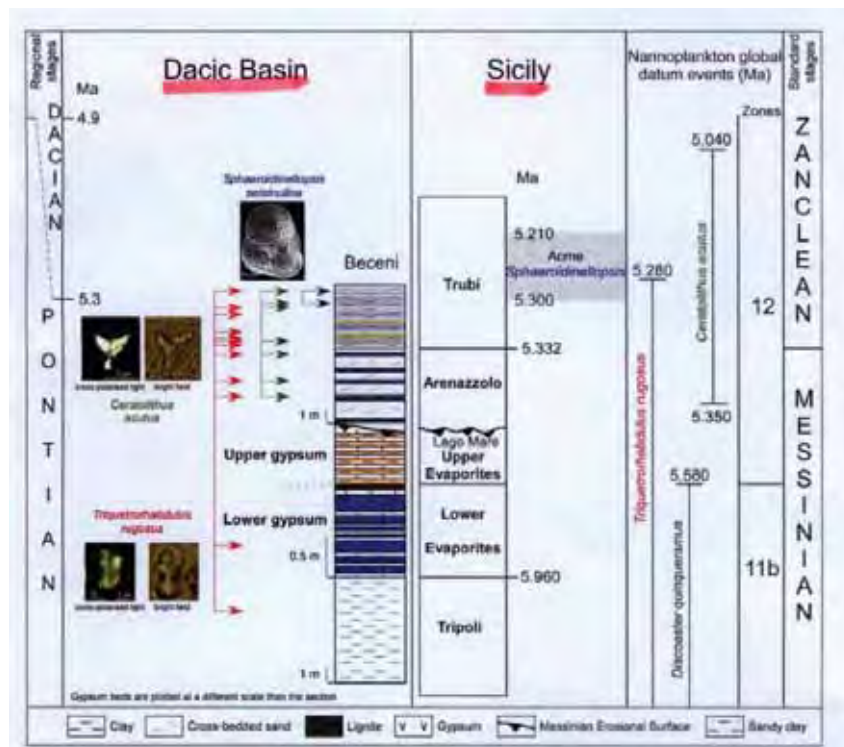


Figure 5. "Beceni Site" of the Messinian and Zanclean according to Clauzon et al., 2008.

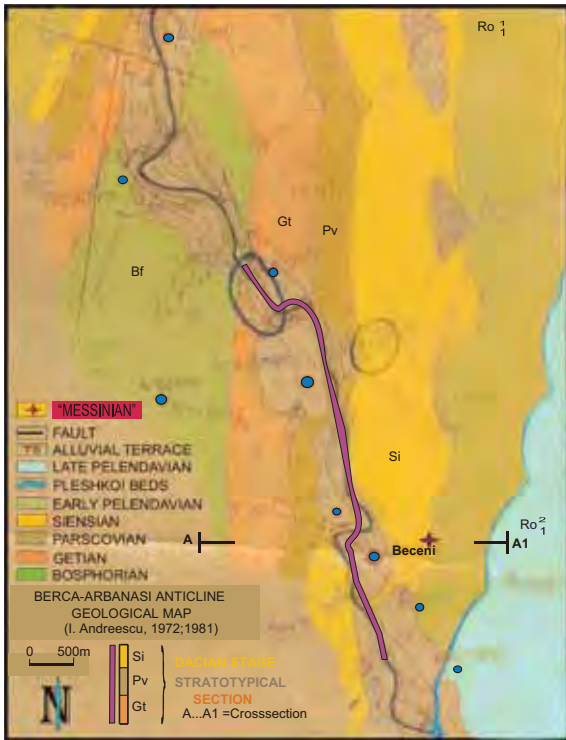
Figura 5. „Situl Beceni” cu ocurența Messinianului și Zancleanului în opinia lui Clauzon et al., 2008.

... "We discovered in central-eastern Romania two conformable sequences of gypsum alternating with clays, overlain by an erosional surface and fluvial sands, topped by cyclic clays [...].

This succession, dated using marine calcareous plancton remarkably resembles those of the Mediterranean marginal Messinian - Zanclean series: Sicily, Crete, Spain" (CLAUZON et al., 2008, p. 36).

From the Fig. 5 and subsequent text the reader is informed that the Messinian and Zanclean Stages descended with all their attributes ("Lower gypsum", "Upper gypsum", marine forams ("Sphaeroidinellopsis seminulina"), marine calcareous nannoplankton ("Triquetrorhabdulus rugosus", „Ceratolithus acutus"), from the Mediterranean to the "Beceni Site", in the eastern Dacian Basin.





A careful inspection of the Figs. 6 and 7 shows the two Mediterranean stages have been intruded in the Uppermost Siensian Substage (Upper Dacian) at a level (red cross) close to the lower boundary of the Peleandavian Substage (=Early Romanian = Ro1-1 in Fig. 6 = Pe1-1 in Fig. 7) whose base is estimated at ~3.7 Ma (Figs. 4; 7).

In addition, several mentions need to be made:

- the so-called “Lower gypsum” and “Upper gypsum” in the “Beceni Site” do represent but thin, up to 1-2 cm, of secondary gypsiferous alteration crusts occurring as a result of sulfides reduction from the clayey-silty-sandy lignite beds (0.1-0.6 m) interbedded with thick (0.4-5,5 m) coarse detritics (sands, small pebbles) and/or fine detritics (silts, silty clays, clays, marls) sequences;
- the macrofaunal content of those deposits, pertaining to the Râmna Formation, is exclusively represented by freshwater molluscs of the *NSM10<sub>b</sub>-Bittneriella mrazeci-Viviparus bifarcinatus Subzone* (ANDREESCU,1981), characterizing the Upper Siensian;
- both lithological and faunal content preclude the presence, at this stratigraphic level (~3.8 Ma), of any marine Messinian and/or Zanclean nannoplankton and forams taxa.

Figure 6. Geological map of the Berca-Arbănași region (ANDREESCU, 1972; 1977; 1981).  
 Figura 6. Harta geologică a zonei Berca-Arbănași (ANDREESCU, 1972; 1977; 1981).

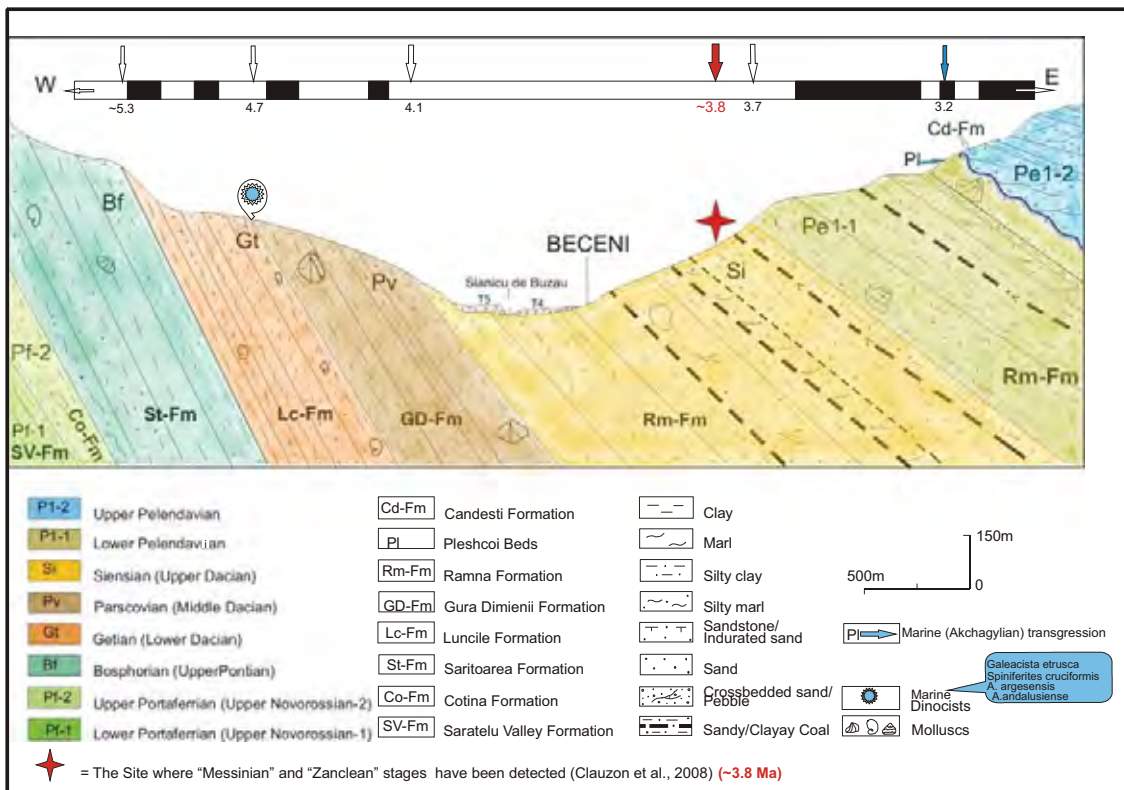


Figure 7. Cross-section in the Dacian and Romanian Stages stratotypic area.  
 Figura 7. Secțiune în aria stratotipică a etajelor Dacian și Romanian.

Consequently, one may say the CLAUZON et al., 2008 “findings” concerning the “Beceni Site” based on a series of spurious lithological, microfloristic and microfaunistic data are illusive.

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