Paleoecology and biostratigraphy of the Oligocene from the NW Transylvanian Basin (Romania) based on calcareous nannofossils

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Abstract

Previous studies of calcareous nannofossils in the Transylvanian Basin were done by Mészáros and Ghergari (1979), Mészáros (1984), Mészáros and Ianoliu (1989), Mészáros (1991), Melinte and Brustur (2008) and had the goal of establishing the stratigraphic sequences in the Paleogen and Neogene deposits from the NW Transylvanian basin. Mészáros abd Ghergari (1979) and Mészáros (1984) have studied the calcareous nannoplankton assemblages, between Cuciulat and Hida Formations (Preluca area), with the goal of biostratigraphical calibration of Vima Formation, located between them. Based on calcareous nannoplankton, the Vima Formation, in Fântânele area, was considered to be Oligocene-Lower Miocene. In a later study, based on calcareous nannofossils, in Fântânele (Rohia), Mészáros (1991) establish the Oligocene/Miocene limit.

The Fântânele section is part of Vima Formation (Rusu 1969) and is located south of Preluca Masif (lat: N 47,41477 E 23,82699), in NW of Transylvanian Basin (Fig.1). The Preluca area is characterized by continuous marine sedimentation within the Oligocene - Early Miocene interval (Melinte and Brustur 2008), which started in Early Oligocene (Rupelian) with the deposition of Cuciulat Formation (grey and brown marlstone and claystone), followed by the bituminous marls of Bizuşa Formation and by the bituminous shales of Ileanda Formation. The sedimentation continued in the Late Oligocene (Chattian) with Buzaş Formation (alternation of sandstone and marls), followed by the marlstones of Vima Formation. In the NE of this area, the Vima Formation replaced progressively the Buzaş Formation, being placed between Ileanda (in base) and Hida Formations (at the top).

Key words: *Oligocene, NW Transylvanian Basin, calcareous nannofossils, biostratigraphy, paleoecology*

Materials and methods

The studied section is part of Vima Formation and consists of marly clays deposits alternating

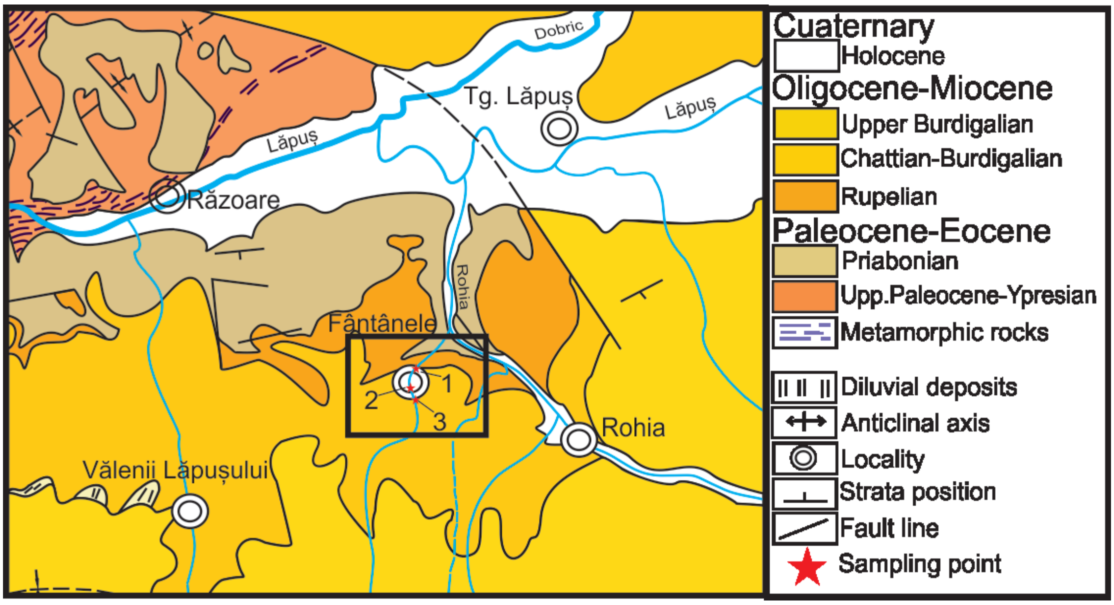

Figure1. Geological map of Rohia-Fântânale area, page 3 Baia Mare 1:200 000 (redrawn after Giuşcă and Rădulescu, 1967).

with sandy clays and sandstones. A number of 75 samples from three outcrops (outcrop 1; lat. N 47,41477 E 23,82699 , alt. 320 m, outcrop 2; located at with coordinates N 47,41356 E 23,82637, alt. 381m and outcrop 3; lat. N 47,41195 E 23,82692 alt. 387m), have been analysed from Fântânele section, for calcareous nannofossils study. The sampling was done at intervals of 10 cm, 30 cm and 50 cm. Smear slides for all samples were prepared using gravity settling technique (Bown and Young 1998).

Results

The examined material contains good to poorly preserved calcareous nannofossil assemblages (Fig. 2), represented by specimens typical for Middle-Upper Rupelian and Chattian. The assemblages are generally dominated by: *Cycligargolithus floridanus* (up to 56.31 %), *R. minuta* (up to 49.09 % in 1st – 2nd profile and up to 84.64 % in 3rd profile), *Reticulofenestra lockeri* (up to 32.71%), *Reticulofenestra* gr. 3 – 5 µm (up to 16.98 %), *R. bisecta* (up to 17.23 %), *Cy. abisectus* (up to 15.38 %), *R. stavensis* (12 %), followed by *Pontospheraceae* which are represented by *Pontosphaera multipora*, *P. enormis, P. desueta*, *P. pygmea*. High percentages of *Braarudosphera bigelowii* were observed in the upper part of 3rd profile. *Coccolithus pelagicus* reaches values up to max. 56.31%. Sphenoliths are very rare (up to 18.71%) and are represented by *Sphenolithus moriformis*, *S. predistentus, S. ciperoensis, S. distentus*. Continuously but in low number occur *Helicosphaera recta, H. intermedia, H. euphratis.* Rare and irregularly distributed are *Zygrhablithus bijugatus* and *Pyrocyclus orangesnis*. Stratigraphicaly important species *Chiasmolithus altus* and *Sphenolithus dissimilis* appear very rare.

Interpretation

The absence of index species *Reticulofenestra umbilica* (NP16 – NP22), indicates that the lowest part of the section, respectively from sample 1 to 14, would belong to the NP 23 standard zone of Martini (1971), *Sphenolithus predistentus* Zone (Rupelian age). According to the FO of marker species *Sphenolithus distentus* in sample 7, we would suggest that the interval between samples 7 – 14 belongs to the upper part of NP23.

The boundary between *Sphenolithus predistentus* Zone (NP23) and *Sphenolithus distentus Zone* (NP24) was observed in sample 15, at the FO of marker species *Sphenolithus ciperoensis,* in base of NP24 (Rupelian age). The boundary between biozones NP24/NP25 (Chattian age) was set by the LO of index species *Sphenolithus distentus* (in samples 34). As a result, the interval between samples 15 – 34 belongs to *Sphenolithus distentus* Zone (NP24). The interval between above sample 34 is attributed to the lower part of *Sphenolithus ciperoensis* Zone (NP25) (of Chattian age).

The following species were used for paleoecological interpretations: *Braarudosphaera bigelowii*, *Coccolithus pelagicus*, *Cyclicargolithus floridanus*, *Reticulofenestra* small, *Reticulofenestra* gr., *Helicosphaera* spp., *Pontosphaera* spp. Blooms of *B. bigelowii* in the uppermost part of the 3rd profile (samples F67 - F73), with more than 90 % of this species point to the fresh water influence (lower salinity) and high nutrient input. Blooms of *Pontosphaeraceae* (*P. multipora* and *P.pygmea*) observed in the interval between samples F9 - F13 (the 3rd profile) were interpreted as shallowing. Higher percentages of *Cyclicargolithus floridanus* show episodes of stable marine environment. Sequences with lower percentages of *Coccolithus pelagicus* can be interpreted as lower nutrient input and warmer water temperature.

Conclusions

The calcareous nannoplankton studied in Fântânele section, suggest that the material is of Middle-Upper Rupelian-Chattian age and is assigned to the nannofossils standard zonation of Martini (1971) upper NP23 - NP25. Stratigraphical attribution to Oligocene (NP23 to NP25) is confirmed by the absence of Miocene taxa. Quantitative results document fluctuations in water salinity, temperature and nutrient availability.

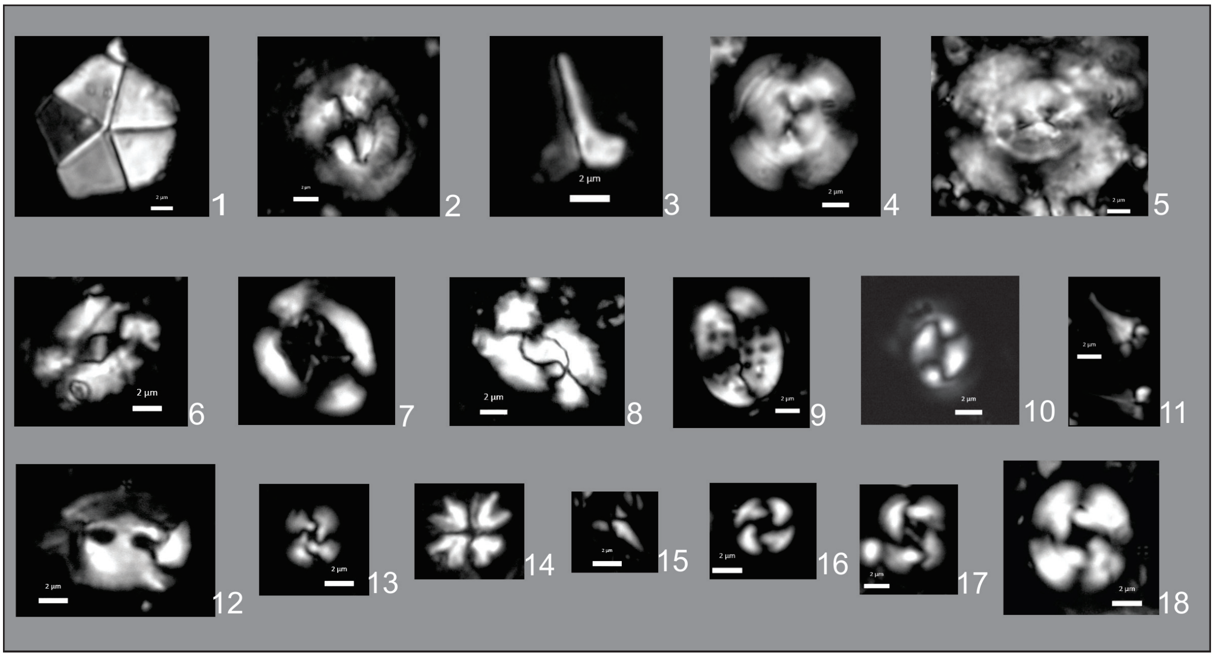

Figure 2. Calcareous nannofossils assemblage from Fântânele (Rohia) Section. All photographs are captured cross-polarized light.

1. *Braarudosphaera bigelowii* (Gran and Braarud 1935) Deflandre, 1947 (Sample 5); 2. *Coccolithus pelagicus* (Wallich 1877) Schiller, 1930 (Sample 20); 3. *Zygrhablithus bijugatus bijugatus* (Deflandre in Deflandre and Fert, 1954) Deflandre, 1959 (Sample 13); 4. *Reticulofenestra bisecta* (Hay, Mohler and Wade, 1966) Roth, 1970 (Sample 21); 5. *Reticulofenestra stavensis* (Levin and Joerger, 1967) Varol, 1989 (Sample F18); 6. *Helicosphaera euphratis* Haq 1966 (Sample 20); 7. *Chiasmolithus altus* Bukry and Percival, 1971 (Sample 20); 8. *Helicosphaera intermedia* Martini, 1965 (Sample 20); 9. *Pontosphaera multipora* (Kamptner, 1948 ex Deflandre, 1954) Roth, 1970 (Sample 18); 10. *Coccolithus pelagicus* (Wallich 1877) Schiller, 1930 (Sample 27); 11. *Sphenolithus distentus* (Martini, 1965) Bramlette and Wilcoxon, 1967 (Sample 17); 12. *Helicosphaera recta* (Haq, 1966) Jafar & Martini, 1975 (Sample 21); 13. *Cyclicargolithus floridanus* (Roth and Hay, in Hay et al., 1967) Bukry, 1971 (Sample 18); 14. *Sphenolithus moriformis* (Bronnimann and Stradner, 1960) Bramlette and Wilcoxon, 1967 (Smaple 28); 15. *Sphenolithus ciperoensis* Bramlette and Wilcoxon, 1967 (Sample 18); 16. *Pyrocyclus orangensis* (Bukry, 1971) Backman, 1980 (Sample 4); 17. *Reticulofenestra lockeri* Müller, 1970 (Sample 28); 18. *Cyclicargolithus abisectus* (Muller, 1970) Wise, 1973 (Sample 20).

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