Национална конференция с международно участие „ГЕОНАУКИ 2021“
National Conference with International Participation “GEOSCIENCES 2021”

Palynological and calcareous nannofossil investigation of the Gosau Group deposits from three boreholes in the Vienna Basin, Austria

Палинологско и нанофосилно изследване на Гозавския тип отложения от три сондажа във Виенския басейн, Австрия

Polina Pavlishina¹, Michael Wagreich²
Полина Павлишина¹, Михаел Ваграйх²

¹ Sofia University “St. Kliment Ohridski”, Faculty of Geology and Geography, Tsar Osvoboditel Blvd 15;
E-mail: polina@gea.uni-sofia.bg

² University of Vienna, Department of Geology; E-mail: michael.wagreich@univie.ac.at

Abstract. Palynological and calcareous nannofossil investigations on samples from the basal part of the Gosau Group succession in three boreholes (Glinzendorf T1, Gänserndorf T3 and Markgraf Neusiedl T1) in the Vienna Basin provide calibrated age assessment of late Coniacian to early Campanian age for this thick non-marine to marginal-marine siliciclastic interval.

Keywords: Santonian, Campanian, palynomorphs, nannofossils, Vienna basin.

Introduction

The subground of the Neogene Vienna Basin consists of several Alpine thrust units (nappes) that provide reservoirs for hydrocarbons and geothermal energy plants, especially within buried units of the Northern Calcareous Alps. Potential seals include Upper Cretaceous to Paleogene strata within and above large Mesozoic carbonate reservoirs, such as the clayey-marly Gosau Group deposits. Three partly cored OMV wells of the Glinzendorf syncline were sampled for biostratigraphy, concentrating on the basal part of the Gosau Group succession, which includes a several 100 m thick non-marine to marginal-marine siliciclastic interval. Palynological and calcareous nannofossil investigations were carried out on 35 core samples from three boreholes (Glinzendorf T1, Gänserndorf T3 and Markgraf Neusiedl T1) in the Vienna Basin with the aim to establish a stratigraphic framework and paleoenvironmental reconstruction. The study is focused on integrated biostratigraphical analysis and calibrated age assessment, based on these important fossil groups.

Palynological data

The palynological record indicates a rich and diverse palynoflora, dominated by angiosperm pollen belonging to the age diagnostic Normapolles group, various ferns (e.g., Gleicheniaceae, Schizaeaceae, Osmundaceae) and some conifer families (incl. Araucariaceae, Podocarpaceae). The relative abundance of dinoflagellate cysts is generally low and decreases upward in the succession in favor of sporomorphs. Main biostratigraphic indicators within the encountered palynological associations are the representatives of the Normapolles group. The pollen assemblages correlate well in the three boreholes. Most profuse taxa in the borehole Glinzendorf T1 are: *Oculopollis zaklinskaiae*, *O. orbicularis*, *O. praedicatus*, *O. sibiricus*, *Krutzschipollis spatiosus*, *Kr. crassus* as well as *Trudopollis* spp. and *Hungaropollis* spp. (samples GT1–3477.5; GT1–3249; GT1–3247.5 and GT1–3245). These assemblages are denominated as the *Krutzschipollis spatiosus* – *Krutzschipollis crassus* Association and based on correlations within the Normapolles province (Siegl-Farkas, Wagreich, 1996, Pavlishina, 1999;

Pavlishina et al., 2004) suggest late Santonian–early Campanian age for this part of the succession. The *Krutzschipollis spatiosus* - *Krutzschipollis crassus* Association is indicated also in the Gänserndorf T3 borehole (samples GFT3–3083.5; GFT3–3080.5 and GFT3–3079.5). One sample from this succession (GFT3–3080.5) shows high abundance of various species belonging to the *Nudopollis* genus such as *Nudopollis thiergarti*, thus indicating the FO of its representatives within this Santonian–lower Campanian interval.

Two distinct successive pollen associations have been recognized in the Markgraf Neusiedl T1 borehole. The lower is defined as *Oculopollis zaklinskaiae* dominated Association. It is characterized by

the predominance of the *Oculopollis* species and the concurrent occurrence of *Oculopollis orbicularis*, *O. zaklinskaiae*, *O. principalis*, *Vacuopollis pyramis*, *V. percentus* and *Complexiopollis funiculus*. The pollen association suggests latest Coniacian–early Santonian age for this lower part of the succession (sample 4023, 70). The lack of representatives of the *Krutzschipollis* genus confirms this age assessment since their FO is considered around the base of the upper Santonian. The succeeding palynofloras (samples 3931, 10–30 and 3409, 24–32) could be differentiated from the preceding one by the presence of the age diagnostic species *Krutzschipollis spatiosus* and *Krutzschipollis crassus*. In this interval, they associate with *Oculopollis orbicularis*, *O.*

Fig. 1. Normapollis species from the Markgraf Neusiedl T1 and Glinzendorf T1 boreholes: a, b, *Bakonyipollis galerus* Goczan, 1967; c, d, *Vacuopollis pyramis* Pflug, 1953b; e, f, *Extratropipollenites emaciatu* Skarby, 1968; g, h, *Praebasopollis praebasalis* Groot & Krieger, 1967; i, *Complexiopollis funiculus* Tschudy, 1973; j, k, *Vacuopollis percentus* Pflug, 1953b; l, m, *Oculopollis orbicularis* Goczan, 1967; n, *Oculopollis principalis* Weyland & Krieger, 1953; o, *Krutzschipollis crassus* (Goczan, 1964) Goczan, 1967; p, *Oculopollis zaklinskaiae* Goczan, 1964; q, *Krutzschipollis spatiosus* Goczan, 1967

zaklinskaiae, *Extrapollis bohemicus*, *Praebasopolis praebasalis*, *Bakonyipollis galerus* and *Interropollenites* spp. The registered species indicate the *Krutzschipollis spatiosus* – *Krutzschipollis crassus* Association in this interval and suggest late Santonian–early Campanian age for this part of the borehole.

Palynofacies analysis indicates proximal environments without a prolonged transport for the phytoclasts and high continental input. Rare representatives of the *Circulodinium* genus belonging to the littoral group of dinocysts are characteristic for near-shore, restricted marine environments. The presence of *Araucariacites* species in all samples gives signals for humid and subtropical to tropical climate since this genus is related to a tropically centered group, which is found in lowland deposits of Cretaceous age.

Calcareous nannofossil data

Nannofossil-bearing samples (about 50% of the total samples) show generally low abundances and moderate to poor preservation. In the Gänserndorf T1 section, at 3097 m, an upper Coniacian–Santonian interval is presented as evidenced by the marker *Marthasterites furcatus* and *Micula staurophora*. At Glinzendorf T1, a similar, Santonian interval is indicated at 3200–3250 m by *Lucianorhabdus cayeuxii*, *Calculites obscurus* and *Arkhangelskiella cymbiformis*. The Markgraf Neusiedl T1 samples show several marine intercalations of Coniacian–Santonian in a non-marine succession, e.g. at 3406 m, 3545 m, 3745 m, 3933 m, with *Lucianorhabdus cayeuxii* and *Calculites obscurus*.

Chronostratigraphic interpretation

Marine intercalations into a generally non-marine to marginal marine setting of the Gosau Group are proven to be of late Coniacian–late Santonian age by calcareous nannofossils. No distinct proof for a Campanian age could be found. In contrast, palynology indicates both an upper Coniacian–Santonian to upper Santonian–lower Campanian interval, thus indicating that large parts of the non-marine succession may be of early Campanian age.

Acknowledgements: The study is contribution to the Bilateral Bulgarian-Austrian collaboration within the project “Late Cretaceous palaeoclimate events and stage boundaries correlations – evidence from Tethyan key sections of Bulgaria and Austria” (project KP-06-Austria/9). Core material and sampling were kindly provided by OMV E&P during a cooperation project OMV-University of Vienna (FA536004).

References

- Pavlishina, P. 1999. Palynology of three Santonian–Campanian sections in North Bulgaria. – *Geologica Carpathica*, 50, 2, 199–202.
- Pavlishina, P., R. Verreussel, H. Leereveld, H. Summesberger, M. Wagneich. 2004. Palynological study of Gosau group deposits (Upper Cretaceous) of the Northern Calcareous Alps (Austria). – *Ann. Naturhist. Mus. Wien*, 106, A, 67–90.
- Siegl-Farkas, A., M. Wagneich. 1996. Correlation of palynology (spores, pollen, dinoflagellates) and calcareous nannofossil zones in the Late Cretaceous of the Northern Calcareous Alps (Austria) and the Transdanubian Central Range (Hungary). – *Advances Austrian-Hungarian Joint Geol. Res.*, 127–135.