Poster Session g1

DINOFLAGELLATE CYSTS AND DINOFLAGELLATE BIOLOGY

Evolution of dinocysts and palynomorphs in deposits of marine palaeogenes in the North of Easterh slop of the Urals and central regions of West Siberia

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The Palaeogene of West Siberia unites six regional horizons in which marine facies are represented by the Talitskaya, Lulinvorskaya, Serovskaya, Irbitskaya and Tavdinskaya formations, and to the south the Shadrinskaya and Kurganskaya beds. A stratigraphic investigation of 12 boreholes has been conducted in the northern Sosvinskaya Highland, the northern Kondinskaya Lowland and the Siberian Urals. Changes in dinocyst assemblages in the Palaeocene and Eocene are observed, with 23 biostratigraphic horizons based on dinocysts being established. This has allowed correlation to stratotype areas and dating of strata. Evidence from the Acritarcha, Prasinophyceae and Chlorophyceae are also considered. The data show that Yurkovskay Formation (the facies analogue of the Tavdinskaya Formation) contains marine horizons. Parallel studies of microphytoplankton and palynomorphs permit refinement of the age of continental deposits. Some biozones studied across Western Siberia are calibrated using western European dinocyst zonations; but a few biozones have their own provincial particularities.

Palaeogene deposits from the lowest to highest include:

1) Talitskaya Formation (Lower Paleocene): Dinozone: *Cerodinium striatum* and *Spinidinium densispinatum;* Palynozone: *Oculopollis giganteus - Nudopollis endangulatus - Trudopollis menneri*, beds with palynocomplex *Oculopollis giganteus - Oculopollis sibiricus - Nudopollis endangulatus.*

2) Talitskaya Formation (Upper Paleocene): Dinozone *Alterbidinium circulum - Cerodinium speciosum*, beds with *Isabelidinium? viborgense* and beds with *Cerodinium medcalfii - Isabelidinium bakeri*; Palynozone *Oculopollis giganteus - Trudopollis nonperfectus - Anacolosidites insignis* (in the lower part, beds with *Normapolles* spp. - *Sphagnum putillum).*

3) Serovskaya Formation (Upper Paleocene): Dinozone *Deflandrea denticulata (= Alisocysta margarita)*, beds *Cerodinium speciosum subsp. glabrum - Deflandrea oebisfeldensis;* beds with palynocomplex *Triporopollenites robustus - Triatriopollenites myricoides - Interpollis suppligensis.*

4) Irbitskaya and Lulinvorskaya formations (middle and higher parts) a) Lower and b) Middle Eocene: a) beds with dinocysts *Cerodinium speciosum* subsp. *glabrum - Fibrocysta bipolare*), Dinozone *Deflandrea oebisfeldensis* (acme), Dinozone *Wetzeliella meckelfeldensis*, Dinozone *Dracodinium simile,* Dinozone *Dracodinium varielongitudum*, Dinozone *Charlesdowniea coleothrypta* s.l. (united beds with *Dracodinium? condylos /Dracodinium politum*, beds with *Charlesdodniea coleothryptea* subsp. *rotundata* and beds with *Diphyes colligerum*), beds with *Pentadinium laticinctum*; beds with palynocomplex *Triporopollenites robustus - Triatriopollenites myricoides - Plicapollis pseudoexcelsus*, Palynozone *Castanea crenataeformis - Pompeckjoidaepollenites subhercynicus- Myrica* sp., Palynozone *Castanopsis pseudocingulum - Pompeckjoidaepollenites subhercynicus - Araliaceoipollenites euphorii - Sapotaceoipollenites manifestus*; b) Dinozone *Charlesdowniea fasciata - Wetzeliella ovalis - Wetzeliella articulata* (acme) (united beds with *Charlesdowniea fasciata - Wetzeliella ovalis - Wetzeliella articulata* (acme), beds with *Wetzeliella coronata - Wetzeliella fasciata - Wetzeliella ovalis* and beds with *Rhombodinium? pentagonum - Charlesdowniea fasciata*), beds with *Areosphaeridium arcuatum - Heteraulacacysta porosa*; Palynozone *Castanea crenataeformis - Castanopsis pseudocingulum* (in the upper part, beds with *Castanea crenataeformis - Castanopsis pseudocingulum - Quecus* spp.).

5) Tavdinskaya and Yurkovskaya formations of c) Middle and d) Upper Eocene. c) Beds with dinocysts *Soaniella granulata* (acme) - *Kisselovia ornata* f. *reticulata*; beds with palynocomplex *Quercus gracilis - Quercus graciliformis - Castanopsis pseudocingulum*; d) beds with dinocysts *Charlesdowniea clathrata / Deflandrea*; Palynozone *Quercus graciliformis - Quercus gracilis* (in lower part of the palynozone there are beds with *Quercus graciliformis - Quercus gracilis - Hydropteris indutus*). Beds with *Deflandrea phosphoritica subsp. australis* var. *lata* characterize the top of the Tavdinskaya Formation in the north of the Kondinskaya Lowland and

include other rare representatives of the genus *Deflandrea*, this genus occurring both in Eocene and Oligocene. Along with dinocysts, pollen of the complex *Quercus gracilis - Quercus gracilliformis - Pinaceae* were determined, close to that from Kurganskiy beds of Rupelian (early Oligocene) age. This suggests that the composition of palynocomplexes and microphytoplancton associations in regressive facies of the Tavdinskaya Formation and transgressive facies of lower beds of the Atlymskiy horizon differ only slightly.

The results presented have applications for improving regional biostratigraphic precision for the West Siberian Palaeogene, and provide new insights into the marine boreal realm during the Palaeogene.

The small peridinioid biofacies in Paleocene strata of South Carolina, U.S.A.

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In shallow marine deposits of Cretaceous and Tertiary age, it is not uncommon to find abundant species of Peridiniaceae that have certain morphological characteristics in common: they are relatively small, tend to be thin walled and pale, have a basically peridinioid shape with one apical and two antapical horns, and they have a high degree of intraspecific variability in such details as surface ornament, size and overall shape. Many of these species occur in assemblages of low specieis diversity, in strata of Paleocene age on the Savannah River Site (SRS) in South Carolina, USA. Floods of these small, pale peridinioid forms may be considered to be a "biofacies".

Lithofacies interpretations of the Paleocene at Savannah River Site are presented in Aadland et al. (1995) and in Fallaw and Price (1995). Although the peridinioid biofacies is associated with shallow water environments generally, it is evident that the dominance of small pale peridinioids is not confined to any one specific paleoenvironment. It may be present in upper delta plain, lower delta plain or shallow clastic shelf paleoenvironments. For this study, the author attempted to find any correlation of the small pale peridinioid biofacies with lateral distribution, lithofacies, lithology, pollen abundance and/or kerogen facies, but no consistent correspondence with any of these parameters was apparent.

No truly analogous group of peridinioid cysts has been reported from the modern record, i.e., small peridinoid cysts that occur in floods and dominate the samples. Some cyst genera have species that do resemble this group morphologically, e.g., *Lejeunecysta*, *Selenopemphix*, and these are mainly protoperidiniacean. Almost all protoperidiniacean species are non-photosynthetic. Supposing, then, that the small, pale peridinioids are ancestral to *Protoperidinium* and analogous to it, then we might conclude as Bujak (1984) that they would be highly dominant in settings favorable to non-photosynthetic (presumably heterotrophic) dinoflagellates.

Bujak (1984) linked protoperidiniacean cyst dominance to high diatom productivity and waters rich in dissolved nutrients, such as upwelling regions. Such an interpretation of the meaning of the small peridinioid biofacies is consistent with the inconsistency of the biofacies occurrence, although the Paleocene rocks at SRS are not diatomaceous. The biofacies could be s indicative of nutrient conditions rather than water depth or distance from shore. The delta plain and shallow shelf environments may have been rich in dissolved nutrients from the river input. At particular spots in these environments where nutrients were especially rich, or diatoms present, protoperidiniacean dinoflagellates might have bloomed and then encysted. These spots would not necessarily correspond to any of the parameters examined here and could occur anywhere in the near-shore environments.

It is also sometimes inferred that the extreme dominance of one species or several similar species indicates a restricted environment such as a bay or lagoon. This notion is appealing as an explanation of the floods of small pale peridinioids in some samples, but there is corroborating evidence for those samples contained floods of peridinioids. Their environments seem to range from upper delta plain to lower delta plain, to embayments and lagoons, to shallow clastic shelf environments with many possible variations.

Many new species occur in the assemblages from SRS and some show promise of biostratigraphic utility in spite of their being basically facies fossils

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BUJAK, J. 1984. Cenozoic dinoflagellate cysts and acritarchs from the Bering Sea and northern North Pacific, DSDP Leg 19, **Micropaleontology**, 30:2, pp. 180-212.

FALLAW, W, & PRICE, V., 1995. Stratigraphy of the Savannah River Site and vicinity, **Southeastern Geology** 35:1, pp. 21-58.

New dinoflagellate cyst and incertae sedis taxa from the Pliocene of northern Belgium, southern North Sea Basin

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In Belgium, marine deposits of Pliocene age are restricted to the northern part of the country where they represent shallow-water deposition along the southern margin of the North Sea Basin. A detailed analysis of the Kattendijk and Lillo formations from a temporary outcrop near the city of Antwerp has yielded a diverse record of marine palynomorphs. Of these, two new genera and four new species of dinoflagellate cysts are recognized: one goniodomacean genus and species, one protoperidiniacean genus and species, and two species of each the gonyaulacacean genera *Spiniferites* and *Pyxidinopsis*. These new species have stratigraphic ranges within the Lower and Upper Pliocene, except for the new protoperidiniacean genus and species, which seems to be restricted to the Upper Pliocene. The excellent preservation of the assemblages in both the Kattendijk and Lillo formations is particularly evident amongst the abundant protoperidiniaceans. This accounts for the new observations on the tabulation of *Barssidinium pliocenicum* (Head, 1993) Head, 1994 emend. Furthermore, a new marine incertae sedis palynomorph genus and species is also proposed.

Organic- and Calcareous-walled Dinoflagellate Cysts from SE Asia: palaeoenvironmental interpretations over the past 30 ka.

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A total of 109 marine coretops from SE Asia were analysed for their organic-walled dinoflagellate cyst content. Multivariate analyses have been performed on the data to identify the main assemblages and species composition, and to determine relationships with present day sea-surface parameters such as salinity, temperature and nutrient levels. Principal component (PCA) and canonical correspondence analysis (CCA) on two marine cores within this dataset (SHI-9016 and BAR-9403) allows for a high-resolution palaeoclimatic and palaeoceanographic reconstruction of SE Asia over the past ~30 ka to be made. SHI-9016 (cored during the Shiva 1990 cruise) is located in the Leti Strait offshore East Timor, within the pathway of the Indonesian Throughflow, and is therefore important for detecting variations in the strength of the Throughflow since the Last Glacial Maximum. BAR-9403 was taken during the Barat cruise in 1994 and is located offshore Sumatra within the pathway of the South Java Current. The chronologies for both cores were derived from stable oxygen isotope records of the planktic foraminiferid *Globigerinoides ruber*, with SHI-9016 spanning ~81 ka for the section 0-232cm, and BAR-9403 approximately 30 ka for the upper 241cm. SHI-9016 shows a relatively low diversity of dinocyst taxa (<28 species) throughout the core, with cyst concentrations ranging from 21 to 1252 cysts/g dry weight. *Brigantedinium* spp. dominate the majority of assemblages and give a good reflection of changing productivity and upwelling through the Last Glacial Maximum. Ten dinocyst-rich horizons from BAR-9403 have also been selected to trial AMS radiocarbon dating.

An analysis of calcareous dinocysts from SHI-9016 over the past ~30 kyr is being studied in an attempt to correlate the results with organic-walled dinocysts from the same core. Calcareous dinocysts are greatly understudied in the Southern Hemisphere, although work in the Northern Atlantic has shown their value in palaeoenvironmental reconstructions.

Shallow marine organic-walled palynomorph assemblages from the Miocene of the Southern North Sea Basin (Belgium)

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For many decades the Belgian Miocene at the southern rim of the North Sea Basin was the topic of stratigraphical studies and is consequently relatively well known. The rather uniform sandy Miocene sequence is characterised by many unconformities, reflecting discontinuous deposition in a shallow marine environment. Calcareous microfossils and macrofossils are well documented and allowed the construction of a robust, but local biostratigraphic framework for the Belgian Miocene. However, the correlation of the Belgian biozones with the standard biozonations, often defined in lower latitudes, remained difficult because of the boreal nature of the fossils. Moreover, large parts of the Belgian Miocene are decalcified.

A biostratigraphical study with marine, organic-walled palynomorphs of the Belgian Miocene, mainly dinoflagellate cysts and acritarchs, was initiated some years ago, since recent studies demonstrated dinoflagellate cysts and acritarchs to be very useful tools for palaeoenvironmental reconstruction of the depositional area and relative dating. Diverse and well preserved assemblages were recoverd from the Miocene sequence of northern Belgium and allowed, for the first time, an accurate contraint of the age of the deposits. Biostratigraphic correlation is mainly based on comparison with the dinoflagellate cyst biozonation erected in the western North Atlantic (de Verteuil & Norris, 1996). However, endemism and regional environmental parameters hamper a detailed correlation with the Mediterranean biozonation of Zevenboom (1995).

The paper discusses and illustrates two Lower Miocene, three Middle Miocene and two Upper Miocene marine palynomorph assemblages. A biostratigraphic synthesis for the southern North Sea basin follows, together with a sequence stratigraphic assessment.

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ZEVENBOOM, D. (1995). Dinoflagellate cysts from the Mediterranean Late Oligocene and Miocene. **CIP-gegevens Koninklijke Bibliotheek Den Haag**, 221 pp. (Ph.D. thesis, University of Utrecht, The Netherlands.)

Palaeoclimatic-palaeoceanographic records from a deep sea core of the Anaximander Mountains, Eastern Mediterranean

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The mud volcanoes Amsterdam, Kula and Kazan in the Anaximander Mountains, Eastern Mediterranean were sampled during the first cruise of the "Anaximander" project with the R/V Aegaeo in May 2003. The target of the project funded by the EU is the examination of gas hydrates and associated deep biosphere occurring at the Anaximander Mountains.

In the thirty box and gravity cores collected, the presence of gas hydrates and sapropel layers were observed, although they were never found to co-occur in the same core.

A palynological study was carried out on a 200 cm-long gravity core from Kula MV (site AN11GC1, long. 35° 43' 712, lat. 30° 27' 589, at a water depth of 1644 m) in which the S1 layer and the well known Y² ash tephra layer (Cape Riva eruption of Santorini), widespread in the Eastern Mediterranean, were present. The target was to outline the palaeoclimatic and palaeoceanographic changes during the period of sapropel deposition by using records of the included palynomorph assemblages (pollen, terrestrial spores, and dinoflagellates). Five AMS 14C dates and tephra chronology constrained the age of the examined sapropel between about 21 ka and 6.5 ka BP. The data display a correlation with the palynomorph assemblages in the high abundance of Artemisia and low abundance of *Quercus*. The last Glacial Maximum and the deglaciation are combined particularly well on these taxa associated with Amaranthaceae/Chenopodiaceae and *Brigantedinium simplex*. This period is characterized by the dominance of cold species and increase in aridity. The most pronounced period coincides with the formation of sapropel S1 that appears in two layers (S1a and S1b). There, the palynological assemblages are characterized by higher increase of *Quercus* accompanied by *Spiniferites*, Lingulodinium machaerophorum and *Operculodinium* centrocarpum. They indicate that the sapropel S1 resulted from a combination of stagnant deep water in isolated depressions, increased terrigenous organic matter, and periods of high primary productivity, as indicated by pollen and dinoflagellates.

Keywords: palynology, palaeoclimate-palaeoceanography, Late Pleistocene–Holocene, sapropel, Eastern Mediterranean

Distribution of dinoflagellate cysts during the Early–Middle Pleistocene transition in the central Mediterranean Sea, ODP Site 963

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The distribution of dinoflagellate cysts during the Early–Middle Pleistocene transition has been studied for ODP Holes 963A and B which are located in the central Mediterranean Sea, 50 km south of Sicily, and are characterised by high sedimentation rates (7.8–8.9 cm/kyr). Magneto- and stable isotope stratigraphies, and planktonic foraminiferal and nannofossil biostratigraphies are already established for these holes.

The transition from Early to Middle Pleistocene is marked by fundamental changes in Earth's climatic cyclicity. Orbital obliquity at 41 ka cycles which had dominated the earlier part of the Pleistocene was superseded progressively about a million years ago by a 100 kyr rhythm of climate change, accompanied by increased-amplitude climatic oscillations. Our study assesses the responses of dinoflagellates to climatic changes that characterized the Early–Middle Pleistocene transition in the central Mediterranean, and improves understanding of the dinoflagellate biostratigraphy across this poorly studied interval. Our samples span the interval 0.64–1.14 Ma with a temporal resolution of 3.37–13.5 kyr. Samples incorporate four 100 kyr and three 40 kyr climatic cycles.

Assemblages are characterised by such taxa as *Spiniferites* spp., *Impagidinium* spp., *Lingulodinium machaerophorum*, *Tectatodinium pellitum*, *Bitectatodinium tepikiense*, *Hystrichokolpoma rigaudiae*, *Polysphaeridium zoharyi*, *Operculodinium israelianum*, *Tuberculodinium vancampoae*, and the marine acritarch *Nannobarbophora walldalei*. The taxa *Impagidinium velorum*, *Stelladinium reidii*, *Impagidinium* cf. *velorum* and *Selenopemphix brevispinosa* subsp. *brevispinosa* may prove biostratigraphically useful.

Fluctuations in relative abundance and concentrations of these taxa reveal the sensitivity of dinoflagellates to hydrographic changes during this interval, while the general trend reveals that cold and warm water cyst assemblages accord with glacial and interglacial episodes respectively.

Maastrichtian to Early Eocene dinoflagellate cysts of Nigeria, West Africa

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Major changes in dinoflagellate cyst assemblages reported from the Maastrichtian to lower Eocene sections worldwide appear to be associated with intense biotic and environmental changes that occurred during this time interval. While a substantial amount of information is currently available about dinoflagellate cyst bioevents in mid to high latitudes from both hemispheres, tropical regions remain practically unknown. Further information from tropical dinoflagellate cyst assemblages can contribute to a better appreciation of environmental change during times of biotic turnover.

The dinoflagellate cyst assemblages in fifty samples from the Maastrichtian to early Eocene interval of the ALO-1 well, located in south-eastern Nigeria, West Africa, were examined. Recovery and preservation of the assemblages are excellent to good and all samples were productive. The stratigraphic and quantitative data were compared with detailed and well calibrated dinoflagellate cyst distributions from ODP Leg 159 in the Guinea Gulf, north-western Europe and southern Hemisphere, New Zealand.

The Maastrichtian to Early Paleocene dinoflagellate cyst assemblages are divided into four zones A to D. Characteristic of the stratigraphically oldest Zone A are: *Cordosphaeridinium exilimurum*, *Diphyes colligerum*, and *Diphyes* sp.1. The FO of *Palaeocystodinium australinum*, *Andusiella* cf. *mauthei* and *Cerodinium* spp. occurs in Zone B. Zone C is characterized by the FO of *Muratodinium* cf. *lappeceum*, *Operculodinium* spp. and consistent occurrence of the genera *Areoligera* and *Spiniferites*. *Senoniasphaera inornata*, *Impagidinium aspinatum*, *I.* cf. *celineae*, *Areoligera coronata* and *Hafniasphaera septatus* have their FO's in Zone D. The dinoflagellate cyst assemblage from Zone D comprises several different species of *Kenleyia* and *Kallosphaeridinium*. An increase in relative more offshore dinoflagellate cyst genera such as *Spiniferites* and *Impagidinium* indicates an increasingly more offshore environment during the latest Maastrichtian to Early Paleocene.

Comparison with previous zonations from the upper Cretaceous to lower Paleocene strata in the tropical areas show that the first and last occurrence of taxa in the ALO-1 well, south-eastern Nigeria, are in good accordance with Oloto's (1989, 1990) records from the Gbekebo-1 well, south-western Nigeria. The over all trends in dinoflagellate cyst assemblages shown by Yepes (2001) from sections in Colombia and Venezuela, South America, were also recognised in the ALO-1 well. The genus *Manumiella* was not recorded in the ALO-1 well. This suggests that a part of the uppermost Maastrichtian to lowermost Paleocene might not have been sampled in the ALO-1 well or that the West African dinoflagellate cyst assemblages belongs to a slightly different dinoflagellate cyst suite compared with the South America assemblages.

Preliminary results indicate that changes occurred in the dinoflagellate cyst assemblages across the Paleocene-Eocene transition. The late Paleocene is characterized by stable assemblages with high percentages of endemic dinoflagellate cysts, mainly *Ifecysta* spp. In contrast, the latest Paleocene to early Eocene dinoflagellate cyst assemblages is similar to those of the Tethyan region. In the earliest Eocene the dinoflagellate cyst assemblages are dominated by *Apectodinium* spp. with high relative percentages of *Polysphaeridium* spp. and *Adnatosphaeridium* spp. These changes in the dinoflagellate cyst populations may reflect changes in relative sea-surface temperatures, the availability of nutrients and degree of runoff from nearby landmasses.

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Palynostratigraphic analysis of the Belverde borehole (Miocene), Lower Tagus Basin, Portugal

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A palynological analysis of the Miocene of the Belverde borehole (38°35'54"N; 9°8'24"W) is presented. This borehole (619m depth) with continuous sampling was drilled through Neogene deposits of the distal part of the Lower Tagus Basin (ANTUNES *et al.*, 2000; PAIS *et al.*, 2002). It crossed 130 m of Plio-Pleistocene continental deposits, and 460m of marine Miocene overlying red continental conglomeratic deposits (the Benfica Group) regarded as Paleogene in age. A total of 400 samples were collected for micropaleontological and palynological studies. Some diagraphies were done. Eight $^{87}Sr/^{86}Sr$ isotopic ages (H. Elderfield, Cambridge Univ.) and planktonic foraminiferal markers were used to establish a chronostratigraphic framework.

Twenty palynological samples [Pal, 595.97 m; Belv387, 580.60 m; Belv344, 536.55 m (Aquitanian); Belv329, 520.62 m; Belv292, 481.15 m; Belv253, 440.45 m; Belv237, 460.85 m; Belv187, 370.55 m; Belv160, 340.79 m (Burdigalian); Belv133, 310.38 m; Belv120, 295.58 m; Belv107, 281.13 m (Langhian); Belv83, 251.28

m; Belv68, 231.88 m (Serravallian); Belv54, 205.86 m; Belv42, 179.51 m; Belv32, 162.18 m; Belv17, 146.59 m; Belv7 135.66 m; Belv1, 130.35 m (Tortonian)] were studied. The samples were collected based upon biostratigraphic and isotopic criteria. The samples were prepared following standard treatment with HCl, HF and $ZnCl_2$. The residue was sieved at 15µm and strew mounts were prepared.

The preservation of the palynomorphs is good. Samples Belv7 and Belv1 (Upper Tortonian) are almost barren. Palynomorphs are scarce (n<50 in one slide) in Belv387 (Aquitanian), Belv329, Belv292 and Belv237 (Burdigalian). In Pa1, Belv387, Belv344, Belv292, Belv237, Belv133, Belv107, Belv83, Belv68, Belv42, Belv32 and Belv17 spores/pollen are more common than dinoflagellates. Dinoflagellates are particularly frequent (n>100) in samples from the Burdigalian (Belv253, Belv187, Belv160), Langhian (Belv120, Belv107), Serravallian (Belv83) and Tortonian (Belv54, Belv17).

The poor spore-pollen assemblages are dominated by the Pinaceae. They are abundant in the Aquitanian (Pa1, Belv344), reduce during the remaining Lower Miocene and are very abundant in the Middle and Upper Miocene. Less frequent are spores (Ricciaceae, Sphagnaceae, Pteridaceae), and angiosperms (Asteraceae, Poaceae, Plumbaginaceae). A few acritarchs and peridinioids are represented in the Upper Burdigalian to the Tortonian. The acritarchs *Cyclopsiella granosa*, *Pterospermella* sp. and *Quadrina* sp. occur. *Selenopemphix nephroides*, *S. brevispinosa* and *S. dinaeacysta* are the most common peridinioids. The presence of peridinioids and acritarchs in the Tortonian suggests a shallow marine brackish environment rich in nutrients.

Twenty-eight gonyaulacoid taxa were identified. They are very abundant (n>300) during Upper Burdigalian (Belv187), Langhian (Belv120), Serravallian (Belv83) and Lower Tortonian (Belv54); they are abundant (n>100) in the Burdigalian (Belv253, Belv106) and Langhian (Belv107); they are absent in Belv237, Belv7 and Pa1; in other samples they are scarce (n<50).

During the Burdigalian, *Polysphaeridium zoharyi*, *Cribroperidinium tenuitabulatum*, *Systematophora placacantha* and *Lingulodinium* sp. are represented. In the Langhian, *Apteodinium australiense* is very abundant and *Operculodinium centrocarpum* and *O. israelianum* are common. *Spiniferites* sp., *Spiniferites/Achomosphaera*, *Hystrichosphaeropsis obscura*, *Lingulodinium machaerophorum* and *O. israelianum* are frequent in the Serravallian. *Lingulodinium machaerophorum*, *Homotryblium vallum*, *Spiniferites/Achomosphaera*, *S. pseudofurcatus* and *O. israelianum* are common during the Tortonian.

Belverde was under continuous marine influence during the Miocene. The abundance of dinoflagellate cysts indicates littoral environments during the Burdigalian and Tortonian.

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Poster session g2

PRE-CAMBRIAN PALYNOLOGY/CIMP SYMPOSIUM

Microfossils from the Upper Vendian, Volyn, Ukraine

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The field of my research was the Vendian microfossils, which have been studied with the help of optical microscope.

Earlier, the Vendian paleontology of Volyn were studied by Timofeev B.V., Shepeleva O.D., Asseyeva O.A., Burzin M.B., Kiryanov V.V.

In the argillite samples from bore-holes in Volyn, Ukraine there have been found two associations of microfossils: one in the Mogyliv-Podilska series and another in the Kanylivska one.

The first one is represented by *Spumosina rubiginosa Andr.*, *Botuobia wernadskii* (Schep.), *Circumiella mogilevica* Ass., *Obruchevella valdaica* (Schep.) Ass., *Leiosphaeridia atava* (Naum.), *L. crassa* (Naum.), *L. exsculpta* Tim., *L. jacutica* (Tim.), *L. laminarita* Tim., *L. minutissima* (Naum.), *L. obsuleta* (Naum.), *Stictosphaeridium sinapticuliferum* Tim. *Circumiella mogilevica* Ass., *Obruchevella valdaica* (Schep.) Ass. are characteristic only of the lower part of the Mogyliv-Podilska series.

The second one is represented by *Leiosphaeridia atava* (Naum.), *L. crassa* (Naum.), *L. exsculpta* Tim., *L. jacutica* (Tim.), *L. minutissima* (Naum.), *L. obsuleta* (Naum.), *Botuobia wernadskii* (Schep.), *Stictosphaeridium sinapticuliferum* Tim., *Synsphaeridium*, *Cochleatina canilovica* (Ass.), *Cochleatina rara* (Pask.). Apart from this, different filamentous algae and organic films are met. Of special importance are spiral large forms of *Cochleatina* as they have rather narrow stratigraphic distribution (the Lower Cambrian-Kanylivska series from the Upper Vendian). This allows to recommend them as an index genus for determining the age of boundary layers of the Cambrian and Pre-Cambrian.

The obtained results confirmed the stratigraphic division of the Upper Vendian into two series.

Neoproterozoic (Ediacaran) radiation of Acritarchs – a new record from the Murnaroo 1 Drillcore, Officer Basin, Australia

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The terminal Neoproterozoic radiation of planktonic photosynthetic microbiota (acritarchs) is one of the most significant evolutionary events of the time, including diversification of prokaryotic cyanobacteria and eukaryotic green and brown algae, the appearance of thecoamoebaens and subsequently metazoans (the Ediacara fauna). The Ediacaran radiation of phytoplankton is recognizable by the first appearance of more than fifty new species of large ornamented acritarchs in a short interval of time at ca. 570 Ma. This radiation event occurred after the Snowball Earth conditions returned to a kind of "normal" environmental stasis, and it may be interpreted as a recovery diversification of phytoplankton after a major biotic extinction caused by the global glaciation.

The appearance of numerous, morphologically innovative and large acritarch taxa may also be connected with the Acraman impact event in South Australia, suggested recently by Grey et al. (2003), as a biotic recovery after the catastrophic environmental disturbance caused by the giant bolide. The latter hypothesis has to be tested, however, because a few individual taxa of ornamented acritarchs may have actually appeared below the ejecta layer, which is difficult to recognize with certainty in some borehole successions.

The Ediacaran acritarch records are from Australia (the Officer and Amadeus Basins), China and Siberia, showing a worldwide distribution in a relatively short interval of time (ca. 20 Ma; Grey, 2004, in press). The greatest taxonomic diversity is known from Australia (ibidem), and the present study is focused on the investigation of Ediacaran microbiota in greater detail and from different stratigraphic levels, their palaeobiology and affinities, mode of life and reproduction cycle. The new assemblage of organic-walled microfossils from the Murnaroo 1 borehole comprises filamentous cyanobacteria, and ornamented and spheroidal acritarchs.

The Ediacaran successions in Australia have been well documented in terms of lithostratigraphy, depositional settings and structural geology. The sedimentation proceeded in two different depositional regimes, recognized today in a series of sub-basins. One of them is the Officer Basin, comprised of complex intracratonic, east-west trending troughs and sub-basins extending from Western Australia to South Australia. The studied Murnaroo 1 borehole is also located there. The sediments accumulated in tidal, sub- and intertidal shelf conditions, and the predominantly mudstone lithology from which the samples were collected, is ideal for palynological processing and preservation of microfossils. The lack of macrofossils in the successions rendered efforts and advances in acritarch biostratigraphy since the 1980's, which helped to reveal a complex history of the Officer Basin. The discovery of two distinct palynofloras, an older leiosphere-dominated flora (ELP) and a younger acanthomorph-dominated flora (ECAP), is suggested to be largely environmentally independent (Grey, 2004, in press) in terms of the observed lithology and sedimentological sequences. However, the possible coupling between the Marinoan glaciation, the Acraman impact and the radical change in the palynofloras was inferred (ibidem) and