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# WELLFILE

18/11-1 WELL (NORWAY)

PALYNOLOGICAL STUDY OF THE MESOZOIC

BETWEEN 950 AND 2055 m

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LISTE DE DIFFUSION

DESTINATAIRES :

DIRECTION EXPLORATION	1
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Palynological report on the Mesozoic

between 950 m and 2055 m

Seventy seven samples were studied in the interval 950 - 2055 m. (55 side wall core samples and 22 cutting samples). They are poor in the MIDDLE and UPPER CRETACEOUS, but contain a fairly rich marine microflora from the BARREMIAN to the CALLOVIAN. As usual, the microflora is essentially of continental origin in the DOGGER.

Palynology points out a lack of the main part of ALBIAN (which can be proved by micropaleontology) of CENOMANIAN, and of UPPER PORTLANDIAN.

( There is another evidence of reworking of continental microflora of Rhetian origin into the Upper JURASSIC and the Lower CRETACEOUS. ~~~~~

1 - PALYNOLOGICAL ZONATION AND STRATIGRAPHY

1.1 - Samples 965 and 985. (The sample 950 is barren)

These two samples contain a very poor but well preserved marine microflora with *Xenascus ceratioides*, *Palaeoperidinium basilium*, *Odontochitina striatoperforata*.

Age : UPPER CRETACEOUS, probably SENONIAN

1.2 - From 1005 to 1050 m. (s.w. cores)

The new dinoflagellate assemblage is extremely different : *Odontochitina operculata*, *Cribroperidinium edwardsi-orthoceras*, *Oligosphaeridium* complex, *Aptea polymorpha*, *Chlamydophorella nyei*, *Systematophora schindewolfi*, *Fromea amphora*. All these species exist in the APTIAN-ALBIAN of Europe but some other species like D 594, *Carpodinium* sp, *Stephodinium* sp..., generally occur in the ALBIAN of North Sea, which were not observed here.

Probable age : lower part of ALBIAN or UPPER APTIAN

1.3 - From 1080 to 1225 m. = NC 4 zone of the palynological scale of Northern Europe

The marine assemblage becomes richer : *Cauca parva* (the index fossil) *Astrocysta cretacea*, *Protoellipsodinium spinocristatum*, *Dingodinium alberti*... The continental microflora is composed of well known but long-ranging taxa as *Cyathidites* sp, *Cerebropollenites mesozoicus*, *Callialasporites dampieri*, *Classopollis torosus*, and many bisaccate pollen grains.

Age : APTIAN

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In the interval there are some microscopic algae such as *Tyrrhodiscus* which are indicators of sapropelic environment.

1.4 - From 1262 to 1405 m. NC 3 zone

Dinoflagellates are very abundant. *Cassiculosphaeridia magna* in the lower part, and D 805 in the Upper part, are the main fossils of the zone. In the NC 3 b the best fossils are D 805, *Achomosphaera neptuni*, *Gardodinium eisenacki*..., and in the NC 3 a, *C. magna*, *Sirmiodinium grossi*, *Pseudoceratium pelliiferum*, *Heslertonia heslertonense*, *Phoberocysta neocomica*...

Age : BARREMIAN

1.5 - From 1405 to 1455 m. ? Zone NC 2

The NC 2 - NC 3 boundary is underlined by the presence of *Nelchinopsis kostromiensis*. But the NC 2 Zone is thin and nearly badly palynologically defined (*Dinoflagellate* D 8843, *Muderongia simplex*, *Muderongia crucis*, *Hystrichodinium pulchrum*...)

Age : HAUTERIVIAN

1.6 - From ? 1480 to 1575 m. Zone NC 1

The classic dinoflagellates of the Valanginian are relatively rare. *Hystrichosphaeridium* D 480 A, *Cordosphaeridium* D 500, *Hystrichosphaeridium* D 480 B, *Meiourogonyaulax* D 477. *Phoberocysta neocomina* has its typical berriasian aspect.

Age : VALANGINIAN

The first level of obvious reworking occurs at the NC 2 - NC 1 boundary. It concerns some specimens of *Palaeoperidinium bicuneatum* and *Gonyaulacysta* which were observed in the Upper Jurassic and nowhere else. There is also the classic Neocomian zone (essentially Valanginian) of reworking with *Rhaetipollis germanicus*, *Ovalipollis ovalis* and *Ricciisporites tuberculatus*.

1.7 - Limit Jurassic - Cretaceous

The Jurassic - Cretaceous boundary occurs between the s.w. core 1575 m and the s.w. core 1600m. This boundary is especially obvious owing to the lack of the NJ 9 which is generally characterized both by a Purbeckian continental microflora and a "Purbeck" to Upper Portlandien marine microflora.

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1.8 - From 1600 to 1750 ? Zone NJ 8

{ There is a nearly complete change of the marine microflora. The new assemblage is composed of *Imbatodinium villosum*, *Gonyaulacysta* D 8842, "Adnatosphaeridium" D 515 d, *Systematophora areolata*, *Gonyaulacysta* D 432 b, *Dingodinium jurassicum*... *Palaeoperidium bicuneatum*, "Adnatosphaeridium" D 544 and *Ascodinium* D 535 appear only at 1665 m.

The continental assemblage is the same as above, with *Classopollis echinatus* in addition.

Age : LOWER PORTLANDIAN to UPPER KIMMERIDGIAN

1.9 - From 1775 to 1843 m. Zone NJ 7 + NJ 6

{ There is a very characteristic assemblage of Kimmeridgian dinoflagellates ; *Scriniodinium luridum*, *Gonyaulacysta longicornis* s.s., *Gonyaulacysta jurassica*, and *Meiourogonyaulax staffinensis* which indicates the basis of Kimmeridgian..

Age : Middle KIMMERIDGIAN to Upper OXFORDIAN

For the terrestrial microflora the only interesting data are the disappearing of *Classopollis echinatus*, the abundance of *Callialasporites dampieri* and *Classopollis tororus*, and the presence of *Perinopollenites* sp. and *Laricoidites* sp.

1.10 - From 1873 to 1935 m. Zone NJ 5

The NJ 5 is well defined by the typical association of dinoflagellates : *Gonyaulacysta cladophora*, *Wanaea spectabilis*, *Gonyaulacysta areolata*, *Adnatosphaeridium aemulum*, *Nannoceratopsis pellucida*, *Stephanelytron redcliffense* and *S. caytonense*.

The continental assemblage is very rich, especially in *Cerebropollenites mesozoicus*, but its composition is always the same.

Age : NJ 5 c (G., *cladophora* only) OXFORDIAN  
NJ 5 b (G. *cladophora* with the typical marine assemblage)  
LOWER OXFORDIAN to UPPER CALLOVIAN

1.11 - Samples 1947 and 1955 m.

*Araucariacites* sp. and *Laricoidites* sp. which are very abundant give a "DOGGER aspect" to the continental assemblage. The marine assemblage is very poor but well preserved. It includes some *Ctenidodinium* sp. and *Kalyptea jurassica*.

Age : Probably LOWER CALLOVIAN to UPPER BATHONIAN

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1.12 - From 1968 to 2045 m. Zone NJ 4

In this interval there is an alternation of very rich samples (s.w.c. samples) and of very poor or barren samples. The exclusively continental microflora is composed of bisaccate pollen grains, *Densoisporites perinatus*, *Staplinisporites caminus*, *Klukisporites* sp...

Age : DOGGER

*Cerebropollenites mesozoicus* and *Callialasporites dampieri* become rare. *Lycopodiacidites rugulatus* and *Apiculatisporites 1622* may indicate the existence of LOWER DOGGER (BAJOCIAN to AALENIEN from 2029 to 2045) The sample 2055 (s.w.c.) is barren.

2 - ECOLOGICAL DATAS

The histogram of the plate 1 shows the vertical evolution of the percentages of marine microfossiles. There is an irregular increase of the marine microplankton from the DOGGER to the KIMMERIDGIAN. The most evident marine influences are located immediately below and above the "Radioactive Shales".

There is a new regular increase from PORTLANDIAN to Upper HAUTERIVIAN. The most marine conditions seem to occur in the Lower BARREMIAN. In the middle and Upper Cretaceous, the palynological assemblages are too poor to give valuable or interpretable percentages.

3 - ORGANIC FACIES AND THERMAL ALTERATION INDEX

Coaly and ligneous organic matter of continental origin is very abundant (up to 100 %) in the CRETACEOUS, in the PORTLANDIAN and from the OXFORDIAN to the DOGGER. Amorphous and generally sapropelic organic matter occurs in the APTIAN and principally in the KIMMERIDGIAN. We admit that the small amount of valanginian amorphous matter and *Palaeoperidium bicuneatum* were reworked at the same time.

There is a regular increase of the Thermal Alteration Index from 965 to 2045 m., but it remains low (from 2 at 965 m to 3 - 3,5 at 2045 m.)



