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SOME RECENT BORINGS IN THE YPRESIAN AND LOWER LUTETIAN OF NORTHWESTERN BELGIUM

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SOME RECENT BORINGS IN THE YPRESIAN AND LOWER LUTETIAN OF NORTHWESTERN BELGIUM.

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SUMMARY. In two borings near Brugge (Oostkamp and Sijsele), important thickness variations have been found in the Vlierzele Member. In Oostkamp, the Vlierzele Member is at least 40 m thick and its base is immediately in contact with the Egem Member. The Pittem and Merelbeke Members are lacking. In Sijsele, no more than 7 m of Vlierzele Sands have been recorded. Both borings have been compared with the Ursel-Maldegem borings, where the Vlierzele Member was about 26 m thick, covering 15 m of Pittem and Merelbeke Clays. The unusual thickness of the Vlierzele Member in Oostkamp could indicate deposition in a gully, about 15 m deep, but comparing of the different thickness variations suggests that this cannnot be the only reason for the unusual dimensions of this deposit in northwestern Belgium. The Vlierzele Member in Oostkamp and Ursel-Maldegem consists of the remains of large sandbanks, Depressions between these sand bodies were probably filled in by the Beernem Member, as it is the case in Sijsele.

SOMMAIRE: Dans deux sondages dans la région de Bruges (Oostkamp et Sijsele), l'épaisseur du Membre de Vlierzele montre des variations importants. A Oostkamp le Membre de Vlierzele à une épaisseur d'au moins 40 m et son base est en contact immédiat avec le Membre d'Egem, donc sans intercalation des Membres de Pittem et Merelbeke. Au sondage de Sijsele, on ne trouve que 7 m des Sables de Vlierzele. Les deux sondages ont été comparé aux sondages d'Ursel-Maldegem, où le Membre de Vlierzele mesurait 26 m, en couvrant les Argiles de Pittem et Merelbeke (15 m). l'Epaisseur abnormale du Membre de Vlierzele au sondage d'Oostkamp pourrait indiquer qu'il a été déposé dans un chenal d'une profondeur d'environs 15 m. Mais en comparant les variations de l'épaisseur des différents dépôts fait croire qu'il y a encore une autre raison pour les dimensions inhabituels du Membre de Vlierzele. A Oostkamp et Ursel-Maldegem, il represente des anciens bancs de sable. Les depressions entre ces massifs sableux ont été rempli par le Membre de Beernem, comme c'est le cas à Sijsele.

KEYWORDS. Eocene, Ypresian, Vlierzele Member, Egem Member, Knesselare Formation,

INTRODUCTION.

Two hydrogeological borings in the region of Brugge allowed to recognise remarkable facies differences in the Ypresian deposits. The borings of Oostkamp (38W227 (V,d)) and Sijsele (23E90 (VII,a)), situated respectively south and east of Brugge, and only 10 km apart from each other (Fig. 1), were executed for the installation of a piezometer for the Primary Groundwater Control Network of the Environment Administration of the Flemish Community. The holes were drilled by means of swilling.

The interpretations are compared to the results of the study of the cored borings of Maldegem-Ursel (39W212 and 213), that were executed a few years ago by the State University of Ghent. The grain size distribution of a few more samples from the Egem Member was analysed.

DESCRIPTION OF THE BORINGS.

OOSTKAMP.

The Oostkamp boring was situated along the Waterstraat, at the place named Kampveld, close to the road Brugge-Torhout, on the slope of a modest elevation. Following the geological map, the subsoil of the site consists of the base of the Vlierzele Member and soon, the clays of the Pittem Member should be found. However,the following section was obtained:

0-2 m : greyish sandy clay with stones
EOCENE:
Mont Panisel Formation
2-42 m: Vlierzele Member
- 2-24 m : greenish grey medium sand, rich in glauconite
- 24-32 m : green glauconitic clayey fine sand
- 32-42 m : greenish grey medium sand, rich in glauconite

IEPER FORMATION

42-66 m: Egem Member
- 42-60 m : green glauconitic fine sand
- 60-66 m : green glauconitic clayey very fine sand

66-174 m : Vlaanderen Member
- 72-174 m : grey heavy clay

LANDEN FORMATION

174-180 m: green glauconitic fine sand

SIJSELE:

The boring in Sijsele also took place in March 1989. It was located near the Meibosvijvers. The following succession was found (Fig. 2):

PLEISTOCENE:
0-9 m: brown to grey medium sand.

EOCENE:
Knesselare Formation
9-26 m: Beernem Member:
green glauconitic fine sand, sometimes clayey, and between 12 m and 21 m, rich in fossils.
26-37 m Green glauconitic clayey very fine sand or sandy clay, with soft stone layers.

Mont Panisel Formation
37-44 m: Vlierzele Member:
brownish gray glauconitic sands, with lignite and sandstone.
At the base: coarser quartz grains.
44-49 m: Pittem and Merelbeke Members:
green glauconitic sandy clay and clay

Ieper Formation
49-60 m: Egem Member:
Green glauconitic fine sands with some shell hash.
From 52 m on: gradually more clay.

URSEL-MALDEGEM

The most recent interpretation of the combined Ursel-Maldegem borings is given by DE BREUCK et al. (1989):

QUATERNARY:
0-0.95 m Brown medium sand

EOCENE:

Kallo or Meetjesland Formation
0-26 m: Clays and fine sands

Lede Formation
26-29.15 m: Fine sand with nummulites and sandy limestone beds

Knesselare Formation
29.15-43.70 m: Oedelem Member:
Glauconitic fine clayey sands with fossils and sandy limestone beds

Mont Panisel Formation
43.70-69.90 m: Vlierzele Member:
Glauconitic fine sand with sandstone layers.
69.90-79.30 m: Pittem Member:
Glauconitic sandy clay with sandstone beds
79.30-83.70 m: Merelbeke Member:
Heavy clay

Ieper Formation
83.70-98.00 m: Egem Member
98.00-102.0 m: Kortemark Member

INTERPRETATION.

1) Knesselare Formation: In the Ursel-Maldegem borings, the Knesselare Formation was only represented by its Oedelem member (15 m). In Sijsele two Members can be distinguished: the Oedelem Member (17 m) overlays the Beernem Member (11 m). The upper part of the Oedelem Member is very rich in fossils, while the basal zone (21-26 m) is not. This subdivision was mentioned by GEETS & JACOBS (1977) when they defined the different members of the Knesselare Formation. The transition to the Beernem Member near 26 m was marked by the appearance of a much more clayey sediment and by the presence of stone layers.

2) Vlierzele Member: During the first 72 m of the Oostkamp boring, only sand was found, starting at the top with rather coarse grained material. A close examination of the grain size distribution of this sandy sequence (Fig. 3) shows an important break near 42 m, exactly at the level of transition between grey and greenish sands. The latter are finer grained. The slight occurrence of clayey material between 25 m and 32 m is also visible in the (figure). The sand found between 2 and 42 m are attributed to the Vlierzele Member, because of the large similarities with the same deposit in Ursel-Maldegem (Fig. 4). In Oostkamp, we probably found the thickest sequence of the Vlierzele Member ever recorded. The thickness of this deposit in the Ursel-Maldegem borings (26 m) was also rather exceptional. In Oostkamp, the top of the Vlierzele Member had been truncated by Quartering erosion. Nevertheless, large amounts of sandstone were found at a level corresponding to the upper meters of the Oostkamp boring. In the Vlierzele Member, sandstones are usually found in the upper meters, and their occurrence indicates that the boring started only several meters below the top of the deposit.

The difference between the Oostkamp and Sijsele borings is remarkable. In Sijsele, the Vlierzele Member is only 7 m thick. It consists entirely of the lignitic Aalterbrugge facies. This Aalterbrugge bed is normally found at the top of the Vlierzele Member and is considered to represent the transition between the Ypresian and the Lutetian. In Sijsele, the base of the Aalterbrugge Bed contains coarse quartz grains, it could be separated from the Pittem Member by a hiatus. Coarse grains at the base of the Vlierzele Member have also been mentioned in descriptions of borings in the city of Brugge in the files of the Belgian Geological Survey (23W97, 23W98, 23W224).

3) Pittem and Merelbeke Members: The Pittem and Merelbeke members were found in Ursel-Maldegem and Sijsele but they seem to be absent in the Oostkamp section. In the upper 72 m of this boring, nearly only sand was found. The sandy sequence was interrupted a while between 24 and 30 m by a more clayey sediment, but the speed of the boring did not slow down drastically as it usually happens when the clays of the Pittem and Merelbeke Members are reached.

4) Egem Member: In the Ursel-Maldegem borings, the limits of the Egem Member had been very well established, and vertical variations of the grain size distribution could be obtained from the results published by DE BREUCK et al. (1989) and from a few additional analyses (Fig. 4). In the section of Ursel-Maldegem, the Egem Member has a thickness of about 14 m. Two distinct sandy zones are observed, separated by a more clayey sequence of about 4 m thick. The upper sandy zone (3 m) is characterised by the presence of a sand fraction between 125 and 250 µm, building about 60 % of the sediment. In the lower one (7 m), the coarsest fraction is found between 125 and 50 µm (up to 90 % of the sample). The same is observed in the type section of the Egem Member, the Egem sandpit. In this outcrop, where the Egem Member has a thickness of about 20 m, one can also distinguish two sandy layers, the upper one coarser than the lower one (FOBE & GEETS 1986, STEURBAUT 1987. boring, so that we can conclude that the composition of the Egem Member in Ursel-Maldegem is largely the same as in its type locality.

In Sijsele, the upper 4 m of the Egem Member were also found to contain the coarsest sand and this part was the most interesting from hydrogeological viewpoint.

The grain size distribution of the sand between 42 and 60 m in Oostkamp is very well comparable to that the Egem Member, except for the presence of a fraction between 125 and 250 µm (Fig. 3). In most of the sections of the Egem sands, important amounts of sand coarser than 250 µm are only found in the upper meters, as it was the case in Ursel (Fig.). However, this fraction is the most important one in the overlying sands. Probably, it was washed out by the drilling mud and mixed up into the finer sands. This may

also explain the occurrence of sediment coarser than 250 µm in the Egem sands of Oostkamp. The material from the Oostkamp boring did not allow to distinguish more details in the vertical variations of the Egem Member.

No important thickness variations are recorded between Oostkamp and Ursel. In Oostkamp, the base of the Egem Member was not easy to recognise, but, considering the evolution of the grain size distribution, a thickness of about 15-18 m seems to represent an acceptable value. As was already mentioned, the thickness of the Egem Member numbers 14 m in Ursel-Maldegem and 20 m in Egem. In the Sijsele boring, the base of the Egem Member was not reached.

CONCLUSIONS.

The unusual thickness of the Vlierzele Member in Oostkamp may indicate that its deposition was preceded by important erosion, cutting out a deep gully. The situation can be comparable to the gully in which the Brussels Formation was deposited. The idea of a gully structure in the Vlierzele sands in the Brugge region was already suggested by MOSTAERT (1985) but he could not give data about its size. In the North Sea subcrop, erosional gullies, filled up with a sediment attributed to the Vlierzele Member were found by means of seismic investigation (HENRIET et al. 1988).

As the thickness of the Egem member is comparable to the values observed in northwestern Belgium, the Oostkamp gully did not cut very deep into this deposit. Only the Pittem and Merelbeke Members are lacking, corresponding to a loss of no more than 15 m. In Ursel-Maldegem, where the thickness of the Vlierzele Member was also considerable, the Pittem and Merelbeke Members were largely preserved. For this reasons, thickness variations of the different members between Oostkamp and Ursel-Maldegem have been represented in Figure 5 with the top of the Egem member as horizontal reference surface. It must be assumed that the unusual thickness of the Vlierzele Member is not only due to gully formation but also because of the development and preservation of build-up lenticular sand bodies.

The boring of Sijsele seems to be situated exactly between two such structures. Indications for an erosional hiatus at the base of the Vlierzele Member have already been mentioned. It is not sure whether the Aalterbrugge bed in Sijsele was deposited in an area of non-deposition during the development of the sand lenses or in a gully created by erosion. Anyhow, the difference in thickness of the Knesselare Formation between Sijsele and Ursel-Maldegem, and the absence of the Beernem Member in the latter locality, suggests that the Beernem Member was deposited in a depression between two sand bodies of the Vlierzele Member. GEETS & JACOBS (1977, Fig. 1), defined the Beernem Member as a local facies between Oedelem and Brugge, covering a large part of

the area between Ursel and Oostkamp. The Beernem Member can be considered as a facies of quiet depositional environment, standing in relationship to the Vlierzele member as does the calcareous facies of the Brussels Formation to its more siliceous deposits (HOUTHUYS & GULLENTOPS 1985).

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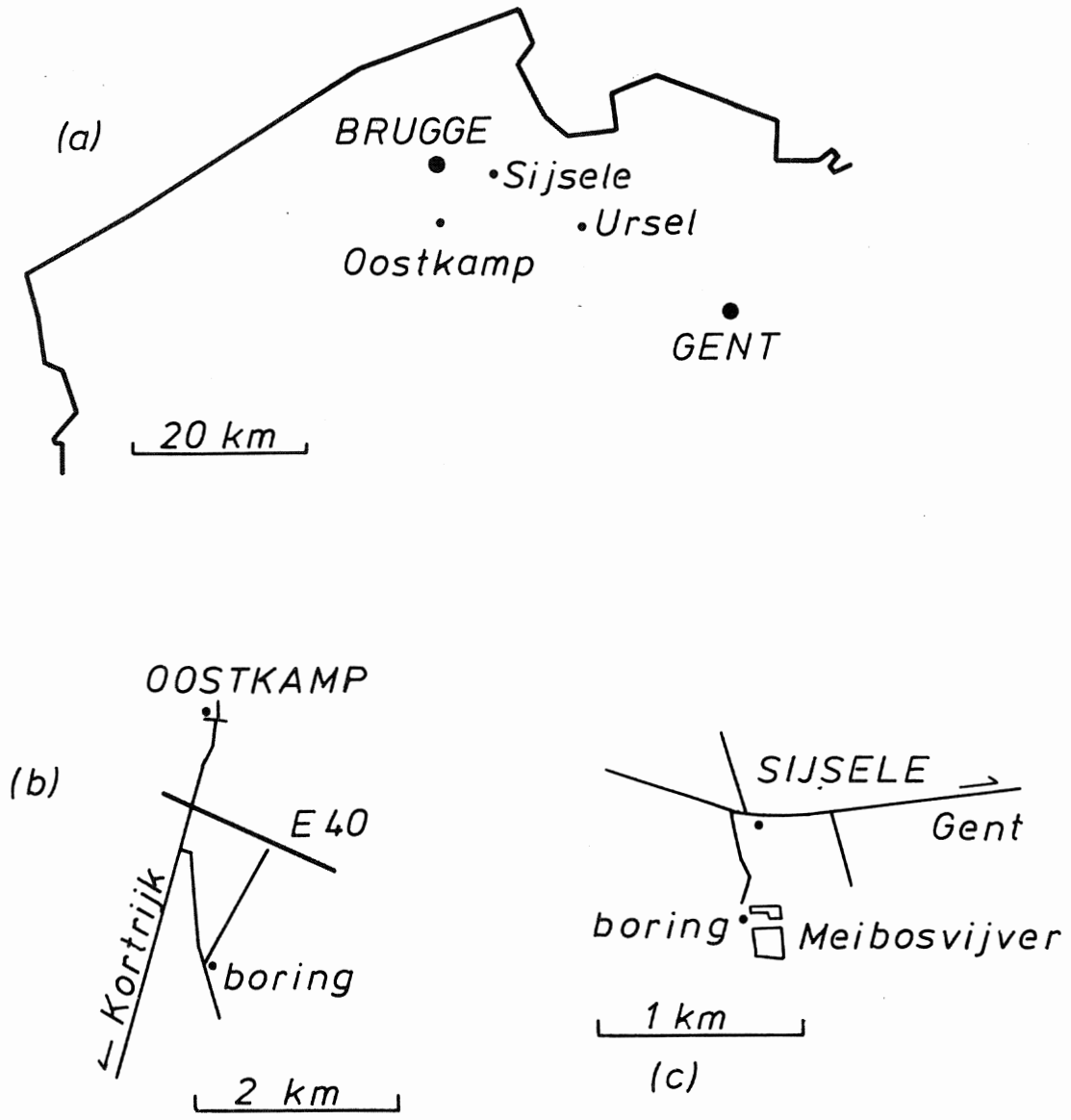

Figure 1. a) Localisation of the studied area.
b) Detailed localisation of the Oostkamp boring.
c) Detailed localisation of the Sijsele boring.

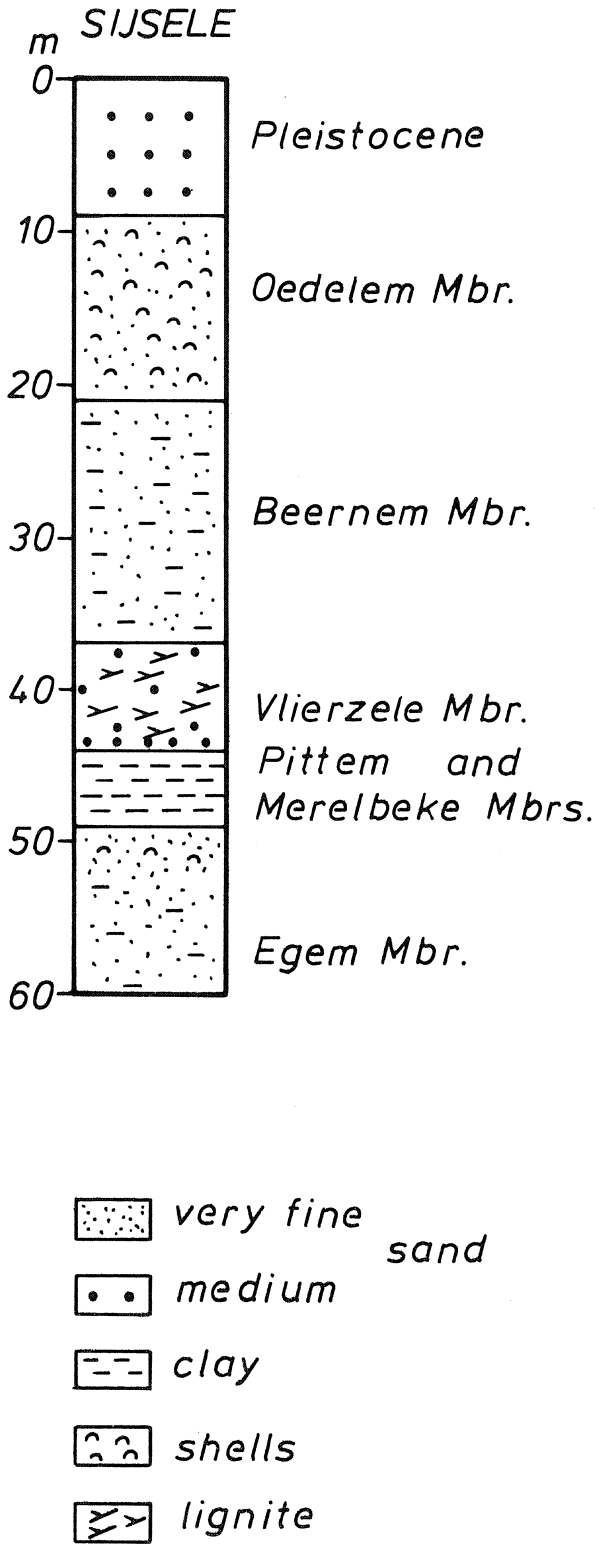

Figure 2.

Profile of the Sijsele boring.

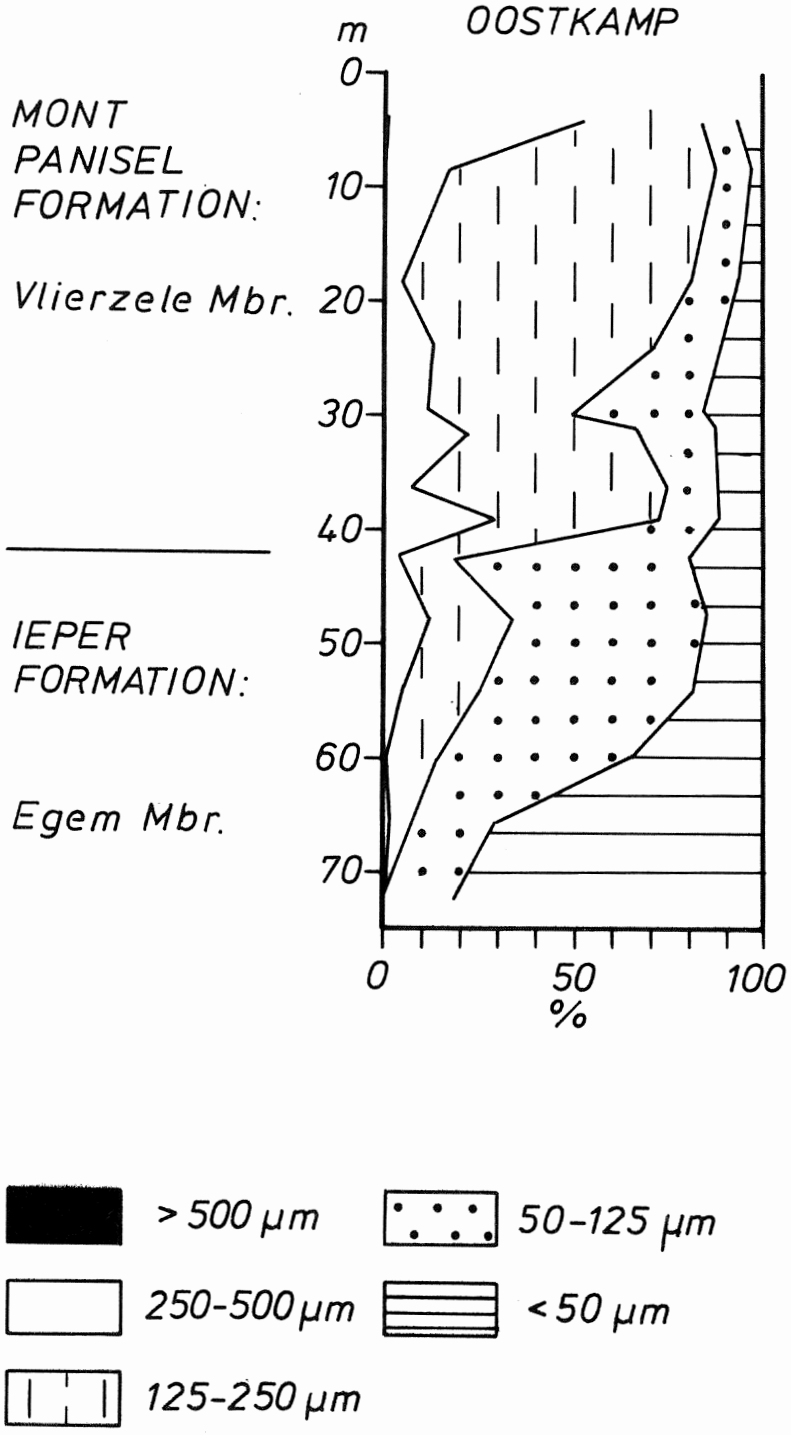

Figure 3. Grain size distribution and interpretation of the upper 72 m of the Oostkamp boring.

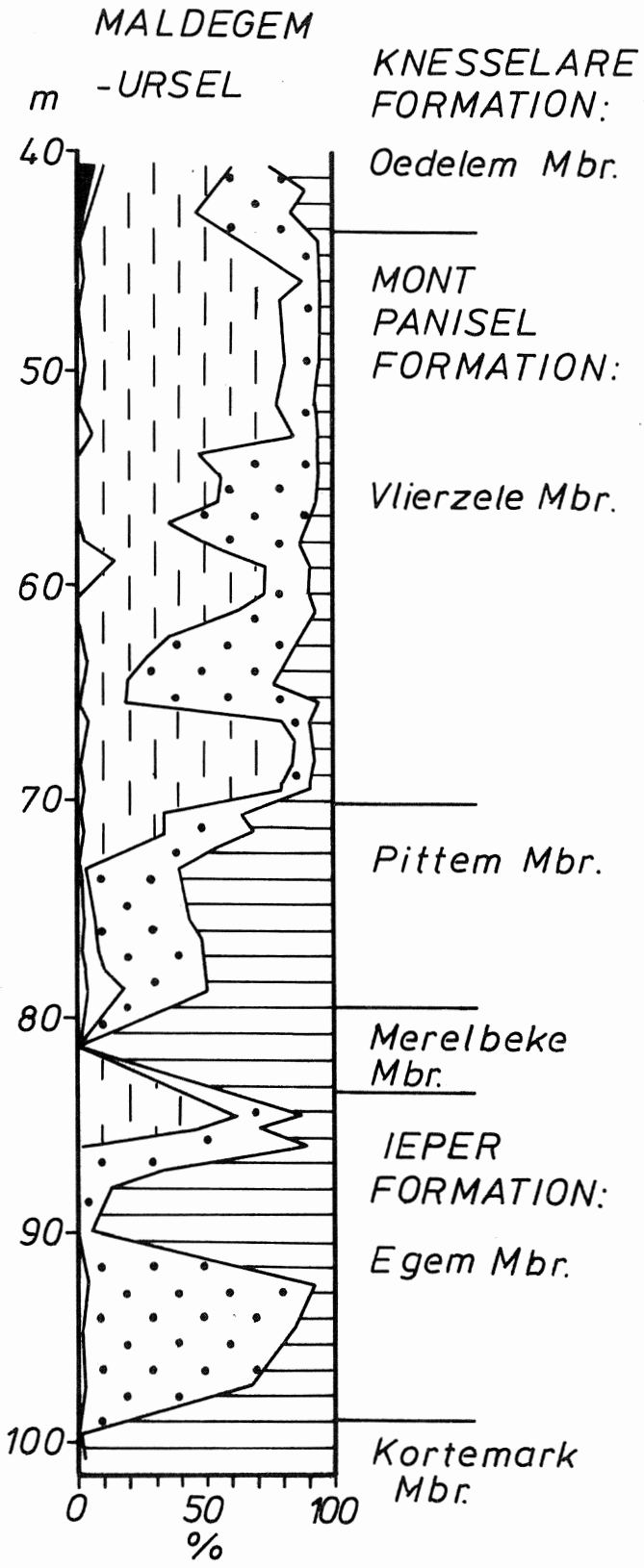

Figure 4.

Grain size distribution of the Ursel -Maldegem borings (section between 40 and 79.3 m in Maldegem and between 79.3 and 102 m in Ursel).

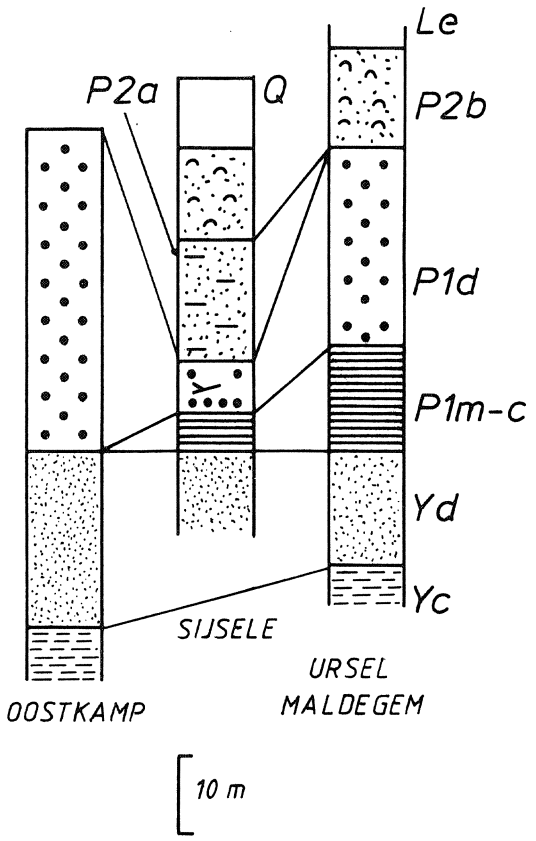

Figure 5. Correlation between the Oostkamp, Sijsele and Ursel-Maldegem borings. The top of the Egem Member is considered as reference surface.

Q = Pleistocene
Le = Lede Formation
P2b = Oedelem Member
P2a = Beernem Member
P1d = Vlierzele Member
P1m-c = Merelbeke and Pittem Members
Yd = Egem Member
Yc = Vlaanderen Member.