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PRELIMINARY NOTE ON PLEISTOCENE SEALEVEL FLUCTUATION IN THE SOUTHWESTERN PARTS OF THE NETHERLANDS

with 5 figures

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During Tertiary and Quaternary times the North Sea Basin was a region of continuous subsidence. During the Pleistocene the Low Countries were formed as a result of coalescence of deltas and alluvial fan-like sediments. In these clastic sediments we cannot hope to find marine terraces enabling us to date a high interglacial level of the sea, as was found in many other parts of the world.

This article deals with an attempt to use the depth of incisions of fossil river valleys and estuaries to date sealevel fluctuations. The southwestern part of the Netherlands (the Delta area), situated on the north flank of the Brabant Massive, belongs to a region which seems to have been one of the most stable parts of the Low Countries. In other parts of the country epirogenic movements over a wide area during the Plio-Pleistocene (van Voorthuyzen, 1954) and fault zones with horsts and grabens (Peel region) make it very difficult to date sealevel fluctuations, as tectonic up and down warping interfered too intensively with Pleistocene eustatism.

Eustatic changes of sealevel have played an important part in the Pleistocene history of the Low Countries. As baselevel is largely governed by sealevel, especially in a shallow sea, and as climate is one of the most important factors in baselevel fluctuations, it seems worthwhile to use the erosion and aggradation mechanism to try and trace sealevel fluctuations in the Netherlands.

During the last decade more data have become available about glacio-eustatic oscillations during the Tertiary and the Quaternary (Tanner et al., 1968).

We were so fortunate as to be able to study in the Delta area more than 9000 metres of core samples of borings, each from about 50 metres depth, as well as cuttings from many deeper borings from 200 to 300 metres, all made by the Service for the Deltaproject ("Deltadienst"), Section of Water Management and Hydrological Research. With these data we were able to reconstruct a north-south, estuarine system of channels and gullies in the Delta area with a depth of from 10 to 20 metres in the southern part, and 30 to 40 metres (maximum 48 m.) more northward (see figs. 1, 2, 3 and 5). Most of the borings are situated north of Noord-Beveland; south of this line the reconstruction is based on a considerably smaller number of borings and is therefore less detailed.

It seems very likely that the incision took place during the Upper-Pleistocene. The channel-fill deposits are rather complicated, but have not yet been studied in detail. A stratigraphic interpretation of each boring has been made in behalf of the "Deltadienst". Detailed palynological and sedimentary petrological research has not been started yet; the boring campaign is still in progress. The cores of each boring have been investigated litho-hydrologically and photographed by the above mentioned Section of the "Deltadienst" which makes it possible for the sedimentary structures to be studied in detail over a wide area.

We presume that the channel-system was formed during a marine transgression with the resulting scour during the Upper-Pleistocene (see fig. 1). Most probably it is the northern continuation of the Flemish Valley, a sort of draining system of an old Scheldt estuary (de Breuck and de Moor, 1962).

Another much older and much deeper system

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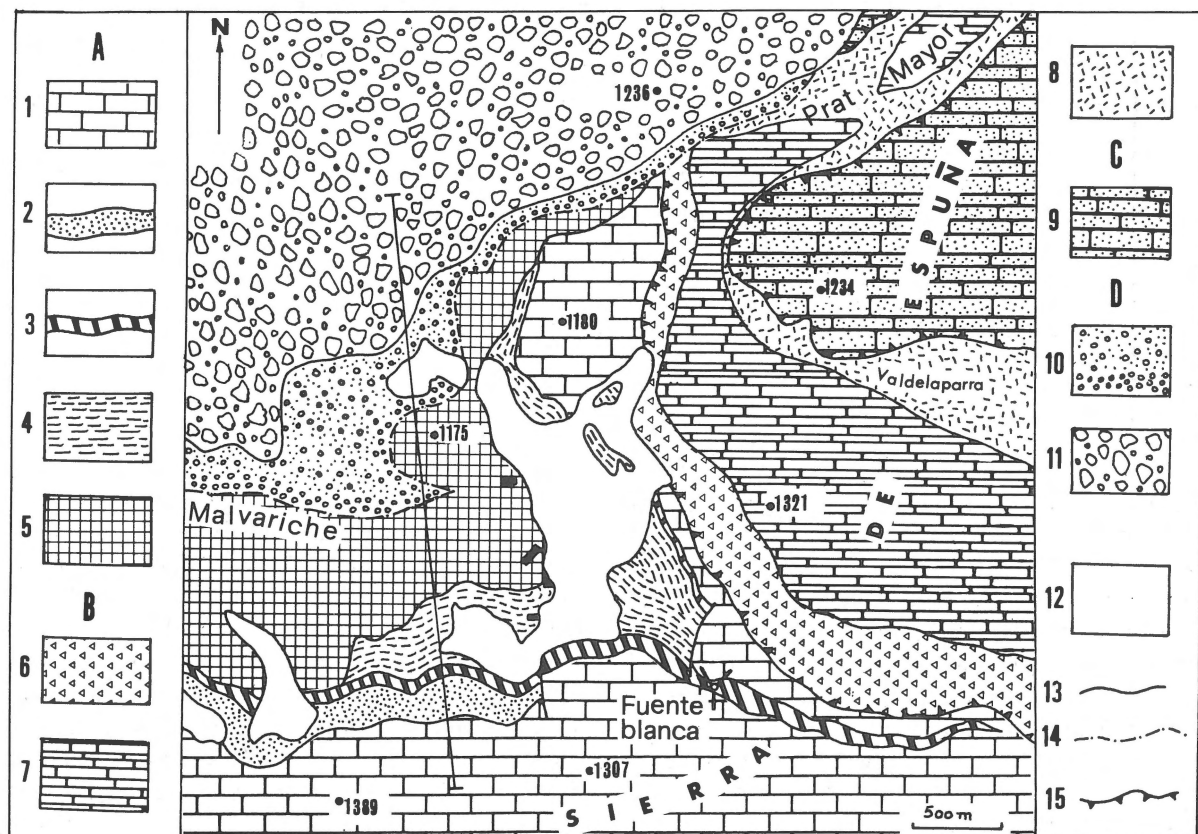


Fig. 1

Carte géologique schématique de la zone de la Fuente blanca.

A. Unité du Morron de Totana (d'après J. Paquet, 1967-'69)

1: Jurassique; 2: Crétacé; 3: Yprésien; 4: Lutétien inférieur; 5: Lutétien moyen et supérieur;

B. Unité de Prat Mayor

6: Dolomies liasiques; 7: Jurassique calcaire; 8: Eocène inférieur et moyen;

C. Unité de Perona; 9: Jurassique;

D. Post-nappe

10: Eocène supérieur; 11: Oligocène inférieur.

13: contact stratigraphique normal; 14: transgressif; 15: contact normal.

gaises de la Sierra de Espuña. J'ai souligné (J. Paquet, 1966, p. 949, lignes 18 et suiv.) l'apparente continuité de la série éocène dans l'unité du Morron de Totana, la transgression auversienne prenant néanmoins en oblique trois unités tectoniques différentes. Les niveaux observés par J.J. Hermes et B. Kuhry, situés à la base des horizons transgressifs, peuvent très bien renfermer des *Nummulites* non remaniées du type *perforatus*. C'est d'ailleurs dans ce niveau que M.L. Hottinger pense placer le "Biarritzien" grâce à la présence d'*Orbitolites* et d'*Alvéolines*. Sur les niveaux conglomératiques à microfaune auversienne, viennent les calcaires pria-

boniens à *Nummulites chavannesi* et *N. fabianii*.

Il est donc très probable que le hiatus sédimentaire, provoqué par la mise en place des unités malaguides, est très bref voire indistinct.

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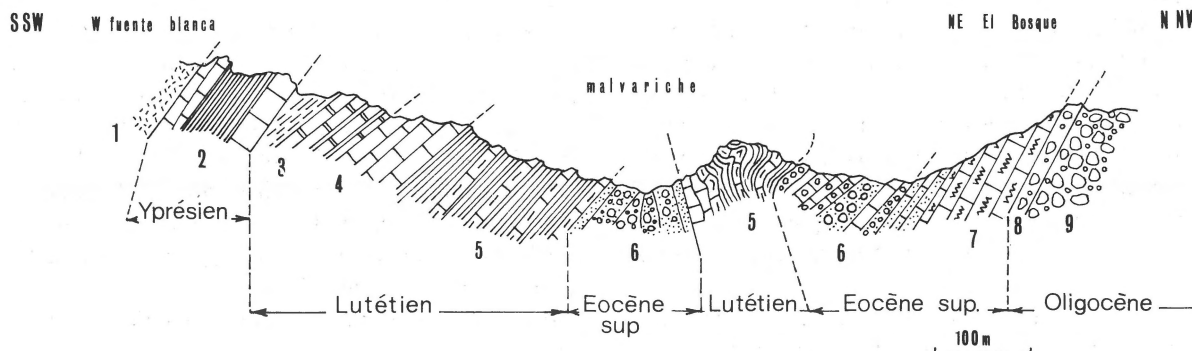


Fig. 2

Coupe du front nord de la Sierra de Espuña, au niveau de la partie haute de Malvariche (d'après J. Paquet, 1967-69)

1. marnes blanches du Crétacé supérieur; 2: calcaires à *Alvéolines* yprésiens et marnes puis calcaires du Lutétien inférieur; 3 et 4: calcaires du Lutétien inférieur; 5: marnes et calcaires à grandes *Nummulites* du Lutétien moyen à supérieur; 6: base conglomératique de l'Eocène supérieur (Auversien); 7: calcaires priaboniens; 8: calcaires conglomératiques et 9: conglomérats de l'Oligocène inférieur.

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REPLY

by J.J. HERMES and B. KUHR to

“Transgressivité de l'Eocène supérieur dans les Malaguides de la Sierra de Espuña (Cordillères bétiques, sud est de l'Espagne)
Mise au point.” by Jacques Paquet.

In our note criticized by Paquet we have attempted to show that at one particular locality a gradual transition exists between a rock unit characterized by the occurrence of large *Nummulites* (Paquet's Lutetien) and one with abundant conspicuously rounded white quartz pebbles (Paquet's Auversien).

The transitional character of the boundary between the rock units as defined by Paquet is in our

opinion incompatible with the order of events assumed by Paquet:

3. deposition of the “Auversien”
2. emplacement of tectonic units of the Sierra Espuña
1. deposition of “Lutetien”

When highly important conclusions are drawn concerning major tectonic events in a mountain

chain, the observations on which these conclusions are based should be unambiguous. We doubt Paquet's interpretation of the relation between rock units at one particular locality. Due to lack of time we have not been able to verify the additional arguments advanced by Paquet in previous papers, arguments which he has repeated in the above note. Some of these arguments involve the interpretation of the entire Sierra Espuña and verification would require a long time.

There is, however, reasonable doubt concerning the time at which a major tectonic event in the Betic

Cordilleras took place.

It is possible that a post-emplacement transgression in the sense of Paquet took place within the Eocene and thus not far, stratigraphically, above or below the horizon indicated by Paquet. It is however also possible that this event took place at a much later date, as assumed in previous literature on the subject.

As stated before, this problem has to be investigated. This investigation could be most efficiently made by Paquet himself, in view of his extensive knowledge of the area concerned and the problems involved.