CHRONOLOGY OF THE PERIMARINE FLUVIATILE DEPOSITIONAL PHASES AT MOLENAARSGRAAF[1]

– Some preliminary results from a case study in the Alblasserwaard (province of Zuid-Holland, The Netherlands) –

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INTRODUCTION

The Holocene sea-level rise has made itself strongly felt in the Western Netherlands, not only in the depositional development of the marine-influenced area proper, but in the region of the lower courses of the main rivers as well. This fluvial environment has been designated 'perimarine' for that reason (HAGEMAN, 1969). Here, the Holocene sedimentary succession shows a cyclic alternation of clastic fluviatile beds and organic layers, which resembles lithostratigraphically the sedimentary succession, as known from the coastal area proper. There, the cyclic alternation of marine deposits and peat layers reflects alternating transgressional and regressional phases.

It is postulated that the evolution in the perimarine area has been induced by the effects of marine transgressions and regressions and hence that the two sedimentary successions (perimarine-fluviatile and marine) are chronologically correlative; thus, for each of the marine (Calais/Dunkerque) transgressional phases an equivalent perimarine fluviatile sedimentation phase has been named (HAGEMAN, 1969). A detailed chronological equivalence, however, has never been proven, and the results to be discussed here seriously question the assumed synchrony.

INVESTIGATIONS

The present note deals with some preliminary chronostratigraphical results of a detailed geological/palaeo-ecological study in the perimarine river area. This research project started in 1976 in order to provide a palaeogeographical context for the various prehistoric occupation phases found at the Hazendonk, a Late Pleistocene/early Holocene fossil river dune which just pierces through the overlying perimarine cover. This project has been highly stimulated by Dr. Louwe Kooijmans, who supervised the archeological excavations at the Hazendonk (LOUWE KOOIJMANS, 1974, 1976). The Hazendonk is situated near Molenaarsgraaf in the Alblasserwaard region (province of Zuid-Holland, see Fig. 1); the Alblasserwaard is part of the stratotype area of the Holocene perimarine fluviatile deposits (ZAGWIJN & VAN STAALDUINEN, 1975). In an area of 4 km^2 around the Hazendonk hundreds of handborings have revealed the lithostratigraphic succession. Apart from the basal Pleistocene fluviatile Kreftenheye Formation and the superficial Alblasserwaard inundation clay bed, the succession shows an alternation of four major clastic fluviatile beds (cl 1 – cl 4) and intercalated peat beds. A standard section was selected for C-14 dating and palaeobotanical analysis of the complete 10 m thick succession. As is generally the case for dating marine deposits, the C-14 dates from the standard section presented herewith, all regard the bottom and top of peat layers intercalated in between the fluviatile (clay)deposits. Possible chronological hiatuses therefore, e.g. between the end of sedimentation of a clastic unit and the beginning of subsequent peat growth (the actual C-14 dated event), are not registered. In other words, not the periods of fluviatile sedimentation, but the periods of non-peat-formation are dated; it is assumed, however, that no significant periods of non-deposition occurred.

Fig. 1
Location of study area.

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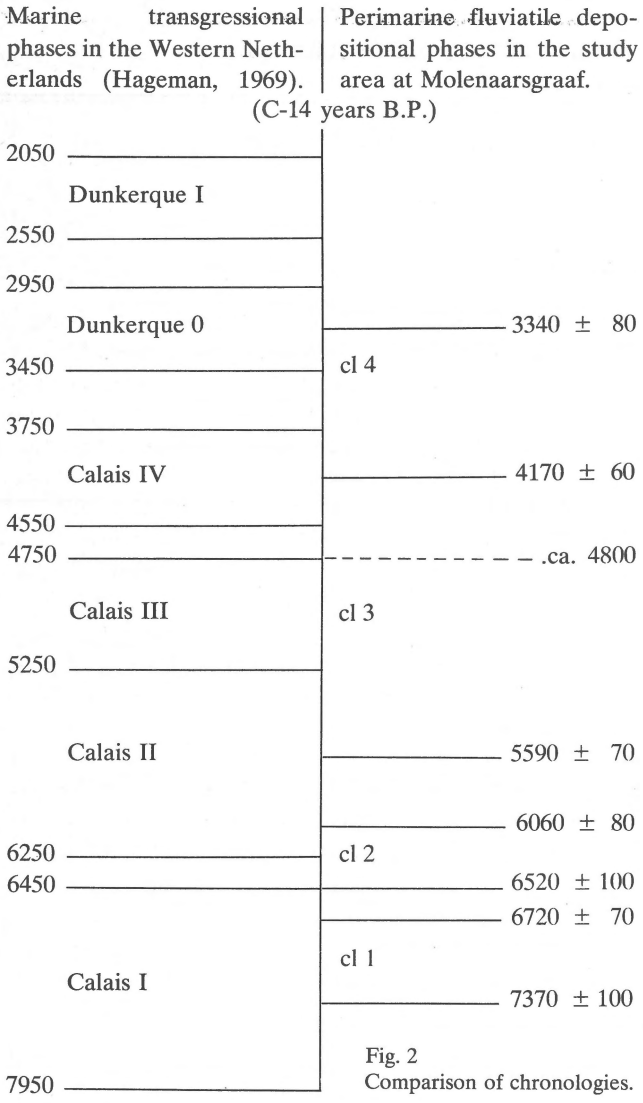

Fig. 2
Comparison of chronologies.

RESULTS

In figure 2 the dating results are compared to the chronostratigraphy of the marine Holocene in the Western Netherlands as presented by HAGEMAN (1969). No C-14 dating is available yet for the top of bed cl 3; its age has been inferred from general time/depth relations. The date of 5590 ± 70 B.P. at the base of bed cl 3 concerns the top of a peat layer which is overlain by a clayey gyttja, in turn passing over into clay. As we assume local diachrony for this particular boundary between peat and gyttja, this date may only have local significance.

From figure 2 it is apparent that there is no clear chronological equivalence of the fluviatile depositional phases at Molenaarsgraaf and the marine transgressional phases as discerned by Hageman. Notably the older phases compare unfavourably; for example, the sedimentation of bed cl 2 seems to have taken place for a large part during the marine regression-interval between Calais I and Calais II.

CONCLUSIONS

Although the limited number of data do not yet allow a full explanation of the discrepancies observed, the following remarks are considered of importance.

Firstly, a comparison of the standard section with the scheme of Hageman is considered meaningful, because from the distributional pattern of the various perimarine fluviatile deposits in the study area there is no reason to suspect a purely local significance of the ages obtained.

Secondly, the generally poor correlation between the two chronologies may be due to the fact that Hageman's scheme is of a rather general nature. It has not been based, as have comparable schemes for the Northern Netherlands (ROELEVELD, 1974; GRIEDE, 1978), on a quantitative analysis of the available radiocarbon dates, and it neglects fluctuations which are considered of minor importance to the depositional history in the coastal area. However, a more detailed scheme for the Western Netherlands coastal area, which possibly might show better correlations, is not yet available.

Thirdly the most important observation to be made from figure 2 is that the younger perimarine fluviatile depositional phases show a closer relation in time to the marine transgressional phases than the older ones. This may be explained by an increasing control of the rising sea-level over the sedimentation basin-inward, so along the lowest river courses.

Finally, although the general rise of the water-level in the perimarine river area is certainly caused by the general sea-level rise, one should consider the possibility that the perimarine fluviatile depositional phases are not at all determined by the marine transgressional phases, but that both are determined only by a common (e.g. climatic) effect, which might affect the distinct areas at different moments, or even by different controlling effects.

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