CHRONOLOGY OF COASTAL PLAIN DEVELOPMENT DURING THE HOLOCENE IN WEST BELGIUM

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ABSTRACT

Borehole evidence, correlated by means of sedimentary environmental interpretation, linked with age dates from basal and intercalated peat layers yielded the chronology of the development of the coastal plain of West Belgium.

The sea level was close to at least - 18 m (NAP) at about 8400 B.P. and the formation of tidal flats started as from 8100 B.P. The rapid sea-level rise caused the deposition of only tidal sediments. At 7000 B.P., however, a first peat growth initiated although only restricted in valley-like depressions in the pre-Holocene surface. But between ca 6400 B.P. and 2200 B.P. the entire area was characterized by alternating peat growth and deposition of tidal sediments, reflecting a decrease in the rise of the sea level. Highly favourable conditions for peat formation prevailed between ca 5200 B.P. and 2200 B.P. resulting in an apparent continuous peat accumulation for nearly 3500 and 2200 14-C years in respectively the landward and seaward part of the area. After ca 2000 B.P. drastic changes in the environmental conditions resulted again in the formation of only tidal deposits.

Key-words: Holocene, coastal plain development, sea-level rise, radiocarbon dates, peat, tidal flats.

RESUME

CHRONOLOGIE DE L'EVOLUTION DE LA PLANE MARITIME DE L'OUEST DE LA BELGIQUE DURANT L'HOLOCENE

De nombreux sondages dont les correlations sont établies grâce à l'interprétation de l'environnement sédimentaire et à des datations radiocarbone de la tourbe de base et des tourbes intercalaires permettent de retracer l'évolution de la plaine maritime de l'Ouest de la Belgique.

Le niveau de la mer était proche de -18 m NAP à environ 8400 B.P. et la formation des wadden débute à environ 8100 B.P. La montée rapide du niveau marin provoque uniquement le dépôt de sédiments intertidaux. Cependant, à 7000 B.P., une première formation de tourbe apparaît mais restreinte dans des dépressions de la surface pré-Holocène. Mais entre environ 6000 B.P. et 2200 B.P., la région entière est caractérisée par une alternance tourbe, sédiments intertidaux reflétant un ralentissement de la remontée du niveau marin. Des conditions très favorables à la formation de tourbe existent entre environ 5200 B.P. et 2200 B.P. conduisant à une accumulation, apparemment continue, de tourbe pendant près de 3500 et 2200 années radiocarbone dans, respectivement, la partie continentale et la partie marine de la région. Après environ 2000 B.P. des changements drastiques des conditions environnementales entraînent de nouveau uniquement la formation de dépôts intertidaux.

Mots-clés: Holocene, évolution de la plaine maritime, montée du niveau marin, datations radiocarbone, tourbe, wadden.

1 - INTRODUCTION

The coastal plain of Belgium is situated along the very southern part of the North Sea. It is protected from the low macrotidal sea by dunes and dikes, and one small river, the IJzer, is crossing it (fig. 1).

Only the western part of the plain bears a thick Holocene sequence in which significant events of coastal development are recorded. In the framework of the systematic mapping of it, a series of new C-14 dates became available, which were recently presented in detail as an IGCP 200 contribution (Baeteman & Van Strijdonck, 1989).

With the present paper, it is not yet the aim to produce a chronology of sea-level changes on base of the C-14 dates on peat, because it is more important to first understand the synchronicity of changes in the coastal plain as well as to unravel the factors controlling the spatial variability of coastal response.

The reconstruction of coastal development is based on hand- and power-driven boreholes, the latter yielding suitable and sufficient material for age determination on peat. Unlike the current Dutch and former Belgian way of subdividing coastal deposits, peat layers are not used as base for a chrono-or lithostratigraphy. But because of the occurrence of a wide range of sedimentary sub-environments and facies changes, sedimentary environmental interpretation is applied for

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correlating the boreholes, although here the details are not presented. Only such a method reveals the geometry or spatial distribution of the different sedimentary units, which then can be interpreted in a lithogenetic classification. The chronology of the peat layers linking the lithogenetic classification reveals the general sequence of events and ultimately the interpretation of the Holocene coastal development.

2 - STRATIGRAPHY
OF THE HOLOCENE COASTAL DEPOSITS

The coastal deposits represent the major infilling of the area under marginal-marine, freshwater and terrestrial conditions during the Holocene. The deposits reach their greatest thickness of about 30 m in the seaward region and wedge out toward the Pleistocene hinterland.

These unconsolidated coastal deposits are characterized by lateral zonation. In the seaward region, only marginal-marine and brackish clastic sediments are present overlying a basal peat layer in some places. In the central part of the plain, the deposits consist in general of an alternation of brackish sediments and peat layers. Toward the Pleistocene hinterland, the deposits are formed by only a basal peat layer overlain by a cover of clastic brackish sediments, while at the very border of the outermost Pleistocene area, the cover of brackish-marine sediments forms the entire Holocene sequence.

Such lateral zonation, which is typical for the coastal plains of the Southern North Sea, led to the elaboration of a lithological classification of coastal deposits based on the vertical succession and lateral interfingering of clastic sediments and peat (Barckhausen et al., 1977, Streif, 1978 & Baeteman, 1981b).

The classification consists of complexes and sequences (fig. 2). In the seaward region the deposits belong to the clastic complex bearing one sequence, viz. the clastic sequence, possibly underlain by the basal peat layer, represented as organic basal sequence. In the central part of the plain, labelled as transition zone, the deposits, characterised by clastic sediments and intercalated peat layers, are grouped into the interfingering complex with the following sequences as further subdivision: lower clastic, splitting up, upper clastic and possibly organic basal sequence. The cross-sections (fig. 5, 6 & 7) clearly demonstrate the occurrence of the splitting up sequence in the central part of the plain, while toward the south, this sequence only consists of one peat layer which moreover finally merges with the basal peat. The seaward region, on the other hand, is characterized by less, and especially thinner peat layers.

The organic basal sequence on the one hand and the splitting up sequence, bearing one or more peat layers, on the other hand, provide the opportunity of reconstructing the chronology of the coastal development.

3 - BASAL PEAT

The term basal peat indicates the peat layer occurring at the base of the coastal Holocene sequence. Former researchers were always troubled by doubts wether basal peat is occurring or not in the Belgian coastal plain (Baeteman, 1983). In fact its stratigraphical position and chronology was not well understood. Basal peat was assumed to be of only Preboreal or Boreal age and it ought to occur at great depths. It should be mentioned that only very few and moreover very surficial data were available at the time these conclusions were put forward. Besides, the basal peat very often has been confused with the uppermost intercalated peat layer (see below) in the areas close to the landward border of the plain. In these locations basal peat can reach a thickness up to 1.5 m and it is indeed occurring at about the same altitude as the uppermost intercalated peat layer. However, from its stratigraphical position, viz. at the base of the Holocene sequence, the peat layer must be regarded as basal peat.

The basal peat shows different facies. Except for the areas close to the Pleistocene hinterland, it is mostly restricted to a humic soil horizon in the top of the Pleistocene sediments.

However, the basal peat is completely absent in a very narrow zone adjacent to the outcropping Pleistocene deposits which are at a too high elevation for the development of it (fig. 3). The same situation is occurring in the southwestern part of the plain.

But in well delimited zones the basal peat is absent due to erosional incisions. The incisions are observed even far inland, and are the result of tidal channels which eroded several metres in the Pleistocene deposits. The basal peat is also lacking in the very seaward part where the Pleistocene deposits are almost completely eroded and in some locations incisions into the Eocene deposits are observed.

The radiocarbon dates from the basal peat are indicated on profiles delineating the topography of the Pleistocene deposits (fig. 4 & 1). The altitudes are given in Belgian orndnance datum (TAW) where 0 m, corresponding to LLWS (Lowest low water spring), is 2.33 m below 0 m NAP and below 0 m NGF.

The deepest basal peat recorded, viz. - 16.97 m to -16.64 m (fig. 4, borehole Sh, profile 3), is observed in the seaward area in a pre-existing depression of the Pleisto-
Fig. 2: Schematic cross-section of the Holocene deposits with indication of the complexes and sequences (Redrawn from Baeteman & Van Strijdonck, 1989).

Fig. 3: Distribution map of the major areas where basal peat is occurring. Due to the high altitude of the Pleistocene subsurface, the basal peat is absent in a very narrow zone adjacent to the landward border of the plain as well as in the southwestern part. The absence in the seaward area and in the well delimited zones is the result of erosion (Redrawn from Baeteman & Van Strijdonck, 1989).

Fig. 4: Profiles demonstrating the relation of the age of the basal peat with the altitude of the Pleistocene subsurface. More details about the topography of the Pleistocene subsurface are shown in the cross-sections (Redrawn from Baeteman & Van Strijdonck, 1989).
cene subsurface and dated at $9940 \pm 110$ BP (base) and $8440 \pm 130$ BP (top). Still in the same depression in the seaward area, but on a higher level (-11.34 m, borehole AI), a date of $8250 \pm 95$ BP (mean) was obtained. In the landward extension of the same depression, the base of the basal peat (-15.60 m, borehole 0, profile 1 and 2) is dated at $8170 \pm 90$ BP. At about the same altitude the top of a basal peat (-15.17 m, borehole W, profile 4), although located in the seaward area, revealed a similar age $8170 \pm 100$ BP.

At one site in the very western part of the plain, the base of the basal peat observed at -13.71 m to -13.75 m is dated at $7620 \pm 90$ BP. Nearly half a metre below this peat, a humic to peaty sand is occurring, the top of which revealing also a Holocene age (9190 \pm 185 BP). It is quite probable that the lower peaty layer is younged by contamination from the basal peat and therefore is to be considered as Younger Dryas. However, only palynological investigation can be conclusive about that.

A second group of dates (table 1) was obtained from the area more landward where the Pleistocene subsurface is at an altitude between about 4 m and 5 m. The age of the basal peat from borehole 363 ranges in the same group, but the peat is occurring at a much greater depth. It should be remarked that here the whole of the peat layer was sampled and that the datation shows a large standard error.

A third group of dates (table 2) was obtained from the area almost adjacent to the landward border of the plain. In this area, where the top of the Pleistocene deposits is at an altitude between -2.5 m to +1 m, the basal peat is very well developed. In the very northeastern part of the plain (e.g. borehole No; fig. 1) a 2.5 m thick basal peat developed apparently continuously without being interrupted by brackish-marine sedimentation for about 3500 radiocarbon years.

The series of radiocarbon ages from the basal peat shows a rather consistent gradient in relation to the depth of the Pleistocene subsurface. The dates indicate that an unidirectional landward and upward shift of the coastal environment took place under the influence of a rapidly rising sea level. A situation which is very similar to all other coastal plains of the Southern North Sea (Streif, 1989, Shennan, 1989). However, when plotted on most of the current sea-level curves from the Southern North Sea lowlands (e.g. Shennan, 1989, Streif, 1989, van de Plassche, 1982), significant differences turn out. The Belgian data are systematically lying above the curve. Whether this reflects a different subsidence, consolidation or crustal effect, is still to be investigated.

The basal peat is directly covered by mudflat sediments in all the boreholes, except in location Sh and No (fig. 1), where lagoonal sediments (sensu Streif, 1971) of 1 m and 20 cm thick respectively, overlie the peat. From this information it can be assumed that sea level was close to at least -18 m (NAP) at about 8400 BP. The data also give evidence that tidal flats developed in the deepest parts of the plain as from about 8100 BP.

4 - INTERCALATED PEAT LAYERS

The tidal flats continued to develop until 7000 BP. As from then peat growth initiated, however only in very restricted zones. The oldest and deepest known intercalated peat layers are observed in valley-like depressions in the pre-Holocene surface as clearly demonstrated by the cross-sections (fig. 5 & 6) which form a more elaborated picture of the profiles 1 & 2 (fig. 1). The cross-sections delineate the entire Quaternary sequence in order to better understand the infilling and erosional processes during the Holocene. The Pleistocene deposits, however, are not differentiated yet. Anyhow it is clear that the topography of the subsurface, showing a substantial relief, influenced to a large extent the Holocene infilling.

From two depressions the lowest intercalated peat layer was dated 7030 \pm 85 BP and 7000 \pm 80 BP for the base and 6750 \pm 80 BP for the top (cross-section 2, fig. 6). Although the age of peat initiation is similar, both depressions bear a different history.

The depression in the central part of the plain is initially filled with sandflat sediments covering the basal peat. In the southernmost depression, the Holocene sequence lies directly on the Eocene clay. The sediments underlying the peat, however, are from fluvial origin. Besides, the borehole evidence from this particular area points to the existence of a significant fluvial system which eroded Pleistocene sequences 5 to 10 m thick. Some of the eroded zones are filled with a 9 m thick nearly continuous peat sequence covering Holocene fluvial sediments. Further research is needed to be decisive about the period(s) this fluvial system was active.

As from an altitude of about -3.5 m until about +3.0 m, the coastal sequence consists of an alternation of peat layers and tidal flat sediments, a sequence which is usually called the typical cyclic formation of coastal deposits. This alternation can not be regarded as a simple alternation of regressions and transgressions and
Fig. 5: Cross-section of the Quaternary sequence perpendicular to the present coastline indicating the basal and intercalated peat datings. The cross-section clearly shows the well developed uppermost intercalated peat in the central part of the plain merging with the basal peat in the east (Redrawn from Baeteman & Van Strijdonck, 1989).

Fig. 5: Coupe dans la séquence quaternaire, perpendiculaire à l'actuelle ligne de côte, indiquant les dates des tourbes basales et intercalaires. La coupe montre nettement le bon développement de la tourbe intercalaire supérieure dans la partie centrale de la plaine et sa jonction à la tourbe basale dans la partie est (redessinée d'après Baeteman et Van Strijdonck, 1989).
Fig. 6: Cross-section clearly showing the typical cyclic alternation of peat and clastic sediments in the central part of the plain as well as the deeper intercalated peat layers occurring in pre-Holocene valley-like depressions. Different phases of development of tidal channels are demonstrated, two of them eroded deeply the Pleistocene subsurface (Redrawn from Baeteman & Van Strijdonck, 1989).

Fig. 6: Coupe montrant nettement l'alternance cyclique, typique, de tourbe et de sédiments clastiques dans la partie centrale de la plaine ainsi que les tourbes intercalaires les plus profondes restreintes dans des dépressions de la surface pré-Holocène, comparables à des vallées. Différentes phases de développement des chenaux tidaux apparaissent, deux d'entre eux érodent profondément la surface pléistocène (redessinée d'après Baeteman et Van Strijdonck, 1989).
it is in no way synonymous with a fall and rise in sea level. It is true, the alternating clastic and biogenic layers can be used to infer sea-level movements, but they also reflect recent earth movements, climatic changes, coastal processes and changes in sediment origin and supply from drainage basins and the continental shelf (Tooley, 1982). It never can be repeated enough, as clearly stated by Streif (1982) and Kraft & Chrząstowski (1985), that the vertical changes of the sea level are only one component among a great variety of factors which influence the development of a retreating or prograding coastline.

The ambiguity of the meanings of transgression and regression has been thoroughly discussed by several authors, especially for the sake of interpreting sea-level related data and establishing regional correlations (Shennan, 1982a, 1982b, 1983, 1986, 1987; Shennan et al., 1983; Streif, 1979, 1982; Ludwig et al., 1981; Baeteman, 1981a, 1981b, 1987a; Tooley, 1982; Haggart, 1988). To avoid any further misinterpretation and inconsistencies in labelling the alternation of peat and clastic sediments, the terms transgressive and regressive overlaps are used as descriptive terms in which no process is implied (Streif, 1979, Shennan, 1982a, Tooley, 1982).

Until now, 4 different peat layers were observed, but not always regularly at the same altitude or with the same extension and thickness. However, the peat layer found at an altitude ranging between -2.5 m and -3.0 m shows a rather regular extension (fig. 5 & 6). It was sampled at four locations (table 3) revealing ages between 6400 and 6200 BP for the base and 6500 and 5550 BP for the top. This peat growth lasted between 380 and 220 radiocarbon years.

Comparing the dates of this intercalated peat, it seems that the peat growth occurred slightly earlier in the seaward than in the landward part of the plain, although the number of data is far too insufficient to be conclusive on that.

The uppermost peatlayer of the series of intercalated peats is the most extended and thickest one. It occurs throughout nearly the entire plain, even beyond the present shoreline. Its thickness almost reaches 1 m to nearly 2 m and generally it is situated between the altitudes of ca -0.5 m and +1 m. In the Belgian literature it is usually referred to as surface peat. The radiocarbon dates from this uppermost intercalated peat layer are compiled in table 4 and indicated on cross-sections 1, 2 & 4 (fig. 5, 6 & 7).

The radiocarbon dates from the top of the peat, there is some discrepancy between the present results and previously published radiocarbon dates (Baeteman, 1981a, 1985, 1987b, Baeteman & Verbruggen, 1979, Baeteman et al., 1981). The dates were grouped in two series: one ranging between 3000 and 3300 BP and the second one ranging between 2000 and 2300 BP. Therefore it was assumed that after a general halt of the peat growth at about 3200 BP, locally there was a resume until 2000 BP. However from the present results, it can be concluded that generally the peat growth stopped between 2700 and 2200 BP, while in the landward part of the plain it continued until 1900 to 1600 BP.

The very young age of 1185 ± 40 BP (borehole S) forms a striking exception, and the date is suspected to be younged by modern rootlet contamination. The top of the peat in location Or was sampled in two different boreholes at a distance of only few metres, and yet revealed a significant difference in age of nearly 500 radiocarbon years. Although not apparent, the top of the peat most probably has been eroded.

In certain zones of the seaward part of the plain, a very thin clay intercalation in the generally thick peat sequence is observed. The radiocarbon dates of the transgressive overlap(s) are shown on fig. 8. The dates from the transgressive overlap in borehole Np2 and regressive overlap in borehole Wo reveal similar ages. The age of the regressive overlap is supported by a sample taken from a regressive overlap in a temporary outcrop in Wulpen (Wu, fig. 1) giving an age of 3490 ± 60 BP. On the other hand in the northeastern zone of the surveyed area (location VI, fig. 1), a different sequence of this intercalated peat was observed. The peat layer, reaching

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### Table 4.

Radiocarbon dates from the uppermost intercalated peat.

<table>
<thead>
<tr>
<th>borehole</th>
<th>top (y B.P.)</th>
<th>IRPA lab nr</th>
<th>base (y B.P.)</th>
<th>IRPA lab nr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wo</td>
<td>2710 ± 60</td>
<td>IRPA 561</td>
<td>4970 ± 70</td>
<td>IRPA 560</td>
</tr>
<tr>
<td>V i</td>
<td>5160 ± 70</td>
<td>IRPA 559</td>
<td>5160 ± 70</td>
<td>IRPA 562</td>
</tr>
<tr>
<td>S</td>
<td>1185 ± 40</td>
<td>IRPA 558</td>
<td>4920 ± 55</td>
<td>IRPA 848</td>
</tr>
<tr>
<td>Or</td>
<td>2230 ± 40</td>
<td>IRPA 834</td>
<td>5130 ± 70</td>
<td>IRPA 532</td>
</tr>
<tr>
<td>O</td>
<td>2690 ± 45</td>
<td>IRPA 671</td>
<td>4750 ± 70</td>
<td>IRPA 868</td>
</tr>
<tr>
<td>3 Gr</td>
<td>2220 ± 55</td>
<td>IRPA 612</td>
<td>5220 ± 70</td>
<td>IRPA 531</td>
</tr>
<tr>
<td>Np 2</td>
<td>2230 ± 87</td>
<td>IRPA 613</td>
<td>4220 ± 65</td>
<td>IRPA 726</td>
</tr>
<tr>
<td>J</td>
<td>1610 ± 55</td>
<td>IRPA 834</td>
<td>5360 ± 70</td>
<td>IRPA 538</td>
</tr>
<tr>
<td>Sh</td>
<td>1870 ± 55</td>
<td>IRPA 834</td>
<td>4540 ± 65</td>
<td>IRPA 682</td>
</tr>
<tr>
<td>W a</td>
<td>1610 ± 55</td>
<td>IRPA 834</td>
<td>5125 ± 55</td>
<td>IRPA 846</td>
</tr>
<tr>
<td>W    1</td>
<td>2580 ± 60</td>
<td>IRPA 834</td>
<td>4700 ± 70</td>
<td>IRPA 865</td>
</tr>
<tr>
<td>V I</td>
<td>2230 ± 40</td>
<td>IRPA 834</td>
<td>4860 ± 70</td>
<td>IRPA 518</td>
</tr>
<tr>
<td>Sp 2</td>
<td>2230 ± 40</td>
<td>IRPA 834</td>
<td>4830 ± 70</td>
<td>IRPA 564</td>
</tr>
</tbody>
</table>

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### Table 3.

Radiocarbon dates from the intercalated peat occurring at an altitude between -3.0 m and -2.5 m.

<table>
<thead>
<tr>
<th>borehole</th>
<th>lab nr</th>
<th>y B.P.</th>
<th>altitude (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wo</td>
<td>IRPA 561</td>
<td>6420 ± 80</td>
<td>-2.73 to -2.77 (base)</td>
</tr>
<tr>
<td>Wo</td>
<td>IRPA 559</td>
<td>6200 ± 80</td>
<td>-2.63 to -2.67 (top)</td>
</tr>
<tr>
<td>Wo</td>
<td>IRPA 558</td>
<td>6160 ± 80</td>
<td>-2.63 (wood at top)</td>
</tr>
<tr>
<td>S</td>
<td>IRPA 834</td>
<td>5850 ± 55</td>
<td>-2.14 to -2.19 (top)</td>
</tr>
<tr>
<td>S</td>
<td>IRPA 871</td>
<td>6375 ± 60</td>
<td>-2.51 to -2.65 (base)</td>
</tr>
<tr>
<td>Or</td>
<td>IRPA 831</td>
<td>6190 ± 65</td>
<td>-3.33 to -3.38 (base)</td>
</tr>
<tr>
<td>Or</td>
<td>IRPA 612</td>
<td>5810 ± 75</td>
<td>-2.95 to -3.01 (top)</td>
</tr>
<tr>
<td>D</td>
<td>IRPA 613</td>
<td>5550 ± 75</td>
<td>-2.54 to -2.59 (top)</td>
</tr>
</tbody>
</table>
Fig. 7: Cross-section in the seaward part of the plain where less intercalated peat layers are found. In the eastern part the erosion by a tidal channel, seriously modifying the Eocene and Pleistocene topography, is demonstrated (Redrawn from Baeteman & Van Strijdonck, 1989).

Fig. 7: Coupe de plaine dans la partie proche de la mer où se trouvent moins de couches de tourbe intercalaire. Dans la partie orientale, l'érosion par un chenal de marée modifie sérieusement la topographie éocène et pléistocène (redessinée d'après Baeteman et Van Strijdonck, 1989).
response of the coastal processes in the gradual development or abrupt change of the depositional environments producing the infill of the plain. Therefore it is necessary to know the development of these environments as well in a lateral as in a vertical sense. The within-area-correlation can then be established by means of the lithogenetic classification system matching with the general sequence of events. Such a system only contributes to the understanding of the history of infill, rather then an imposed static stratigraphy. The linkage of the lithogenetic classification system with the age dates of the several peat layers ultimately provides the opportunity of reconstructing the chronology of the coastal development.

Besides the rate of the sea-level rise, the topography of the pre-Holocene surface influenced to a large extent the infilling of the plain.

From the time-depth data of the termination of the basal peat, it can be concluded that the sea level was close to at least -18 m (NAP) at about 8400 B.P. Since 8100 B.P. tidal flats start to develop in the lowest lying parts of the area. Only clastic sediments were deposited, reflecting the rapid rising sea level. At 7000 B.P. a first peat growth initiated, although only in restricted areas, such as the valley-like depressions in the pre-Holocene surface.

Since 6400 B.P., however, general peat growth is observed over nearly the entire plain, reflecting the decrease in the rise of the sea level. This peat layer represents the onset of what is usually called the typical cyclic formation of coastal deposits where peat repeatedly came into being alternating with the deposition of tidal flat sediments. At the beginning of the period of cyclic formation, tidal flat sediments were deposited far landward. The alternation of peat and sediments is not always that regular, because while peat was accumulating in certain parts of the area, tidal flats continued to develop in others contemporaneously. Moreover the initiation, resp. termination of a peat accumulation differs laterally. Hence it is alway critical to put forward general periods of peat growth. But between ca 5200 B.P. and 2200 B.P. ideal conditions for peat growth prevailed as nearly the entire plain was characterized by it. This peat growth represents a significant time span in the infill of the plain as it lasted nearly 3500 and 2200 14C years in respectively the landward and seaward part of the area. The cyclic formation with the intercalated peat layers generally came to an end in the time interval of 2700 - 2200 B.P., and in more landward areas, between 1900 and 1600 B.P.

The uppermost peat layer is covered by tidal flat deposits representing a significant change in the development of the infill of the plain. The depositional conditions must have changed drastically as the tidal channels renewed their activity and new ones originated, causing severe erosion of the depositional sequence even far landward.

REFERENCES


Ontstaan en Flandrian sea-level changes in the Analysis and interpretation of Cyclic BAETEMAN, C. 1987b
BAETEMAN, C., CLEVERINGA, P. HAGGART, B.A., 1988 -
BAETEMAN, C. LUDWIG, G., MULLER, H. KRAFT,
SHENNAN, I., SHENNAN, I., TOOLEY, M.J.,
Belgian environments during the Holocene in the Western coastal so-called Belgium.
Prof. In: 2000 ning mapping units. of dates on peat from the Holocene coastal deposits in West Belgium.
Het wood Y1amse kust, uitgave Gemeentekrediet, sequences.
BAETEMAN, C. (ed.): Quaternary sea level investigations from Later
marine sedimentation in the North Holocene changes and climate.
SHENNAN, I., & CHR1.ASTOWSKJ, N.J., Blackwell 1982a -Mapping
of Flandrian and Late Devensian sea-level changes and crustal movements in England and Wales. In: Smith, D.E.
SHENNAN, L, 1986 - Flandrian sea-level changes in the Fenland. II:
SHENNAN, L TOOLEY, M.J., DAVIS, M.J. & HAGGART, B.A.,
STREIF, H., 1971 - The results of stratigraphical and facial investigations in the coastal Holocene of Wottzen/Ostfriesland, Germany. Geol. Föreningen i Stockholm Förhandlingar, 94, 2, 281-299.