

The distribution of Cretaceous deposits on the Hautes Fagnes plateau (Belgium)

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Abstract

A new Cretaceous sand deposit of supposedly Campanian age and coastal origin is described from the southern flank of the Baraque Michel massif on the Hautes Fagnes plateau. Also presented is an updated distribution map of Cretaceous sand and flint accumulations on the plateau. The data show that during the Campanian the shoreline in High Belgium lay south of the Hautes Fagnes ridge and that it still moved further south during the Maastrichtian.

Introduction

A study of the planation surfaces on the Hautes Fagnes plateau (Demoulin, 1986a), which needed an analysis of their overlying correlative deposits, provided an opportunity to review the problem of Cretaceous remnants that are preserved in this region. It also led to the discovery of new observation points which provide more details on the modalities of the Cretaceous transgression onto the Ardennes massif. Accelerated sea-floor spreading rates are thought to have caused a considerable rise of global sea-level during the Late Cretaceous (Pitman, 1978) and thus a transgression of worldwide character submerged the northern margin of the Ardennes, while the main part of the Rhenish massif remained emerged (Ziegler, 1982). The sea transgressed from the NE.

The observations on the Hautes Fagnes plateau pertain, firstly to a sand deposit found on the south-

ern flank of the Baraque Michel massif. This deposit is overlain by a flint cover and seems to be of Campanian age. In addition the occurrence of a number of other flint deposits is discussed. They appear to be much more widespread on the Hautes Fagnes plateau than previously assumed.

The sand deposit of 'Trois Hêtres'

The sand deposit of 'Trois Hêtres' lies at 595 m altitude on the southern side of the Baraque Michel massif, approximately 3 km south of the Campanian sandy deposit at Baileu described by Bourguignon (1956). It is located on the flank of a minor ridge, whose summit is covered by flints. Two excavations, the first one in the basal sand body (B) and the other one in the flint-bearing beds (A) on the summit of the ridge, enabled to infer the following sequence (from top to bottom):

- (A)
1. peat: 20 cm.
 2. ochre loess: 50 cm.
 3. grey and black flints embedded in a whitish clay with elements up to 40 cm in the lower part: 110–140 cm.
 4. yellow-ochre silt with millimetre size fragments of flint: 80 cm.
 5. alternation of beds of sandy clay and gravelly sand: ochre, grey-brown near the base: 80 cm.
- (B)
5. (a) grey fine sand (5 YR 3/4): 20 cm.
(b) sandy-gravelly beds with angular quartzose grains, ochre at the top and turning greyer to the base (10 YR 3/1): 30 cm.
(c) grey-ochre sandy clay: 15 cm.
 6. grey gravelly sand (10 YR 4/2) with ochre beds and thin layers of plant debris. The gravel consists of angular quartz: 110 cm.
 7. grey-ochre sandy clay (10 YR 6/2): more than 120 cm.

Unfortunately, the base of the sand body could not be reached. The pebbles which are occasionally found at different levels in the sand are generally angular and consist of fibrous quartz, except for a few subrounded quartzites. Morphoscopic analyses of quartz grains reveal for grain sizes between 200 and 600 μm , 65 to 90% angular, 5 to 20% subrounded and 5 to 15% rounded grains. The heavy mineral association is very poor and exclusively composed of the ubiquitous zircon, tourmaline and rutile. As for the granulometric analyses, they show a bad sorting at various levels. Furthermore, above the lower clay, they become finer, from gravel to fine sand from bottom to top.

The sand of 'Trois Hêtres' is undoubtedly of Cretaceous age, and is very similar to the Campanian deposit at Baileu. Their clastic components are identical, except for the absence of glauconite at 'Trois Hêtres'. The presence of plant debris in both sections reinforces this similarity. At both localities a silty layer with scarce flint splinters is found between the sand and the flint-bearing beds. Therefore, it is likely that the 'Trois Hêtres' sand

deposit is also Campanian in age. The poor sorting of the sediment, the quite low roundness of most of its elements, and the presence of plant debris indicate a continental origin. Most probably the sand of 'Trois Hêtres' was deposited in a coastal i.e. lagoonal environment, near the mouth of a river. This interpretation implies a southern limit of the transgression during the Campanian to a position a little to the south of the actual Hautes Fagnes ridge. The 'Trois Hêtres' sand deposit is also very similar to the Troupa deposit further east on the Hautes Fagnes (Bourguignon, 1954). The Cretaceous age of the latter sequence was so far uncertain but is here supported.

The flints of the Hautes Fagnes plateau

The most abundant Cretaceous deposits preserved on the Hautes Fagnes plateau, however, are the residual flint accumulations which are derived from the progressive dissolution of Maastrichtian chalk. They include various types. Some contain only small splinters; others contain boulders of more than 70 cm in diameter. They are made up either of brown or black and grey flints, and are more or less weathered depending on the deposit. Both types are generally not mixed. Their matrix varies; in some cases it is an ochre silty clay, in others a whitish clay.

The location of most residual flints on summits and ridges (always above 540 m) indicates the eluvial character of the deposits. This interpretation is supported by the angularity of the flints and the absence of mixing of both types. Several sections also prove that the investigated deposits are *in situ*.

The distribution map of flint deposits on the Hautes Fagnes plateau (fig. 1) shows the numerous accumulations that were known already for a long time (Dewalque, 1898; Renier, 1932). It is completed by the following deposits found by the author:

- The 'Trois Hêtres' flint deposit (above the sand) as described above. It was already observed by Renier (1925) but one has to notice its large extent on a minor ridge at 605–620 m.
- Scattered flints found in many places around the

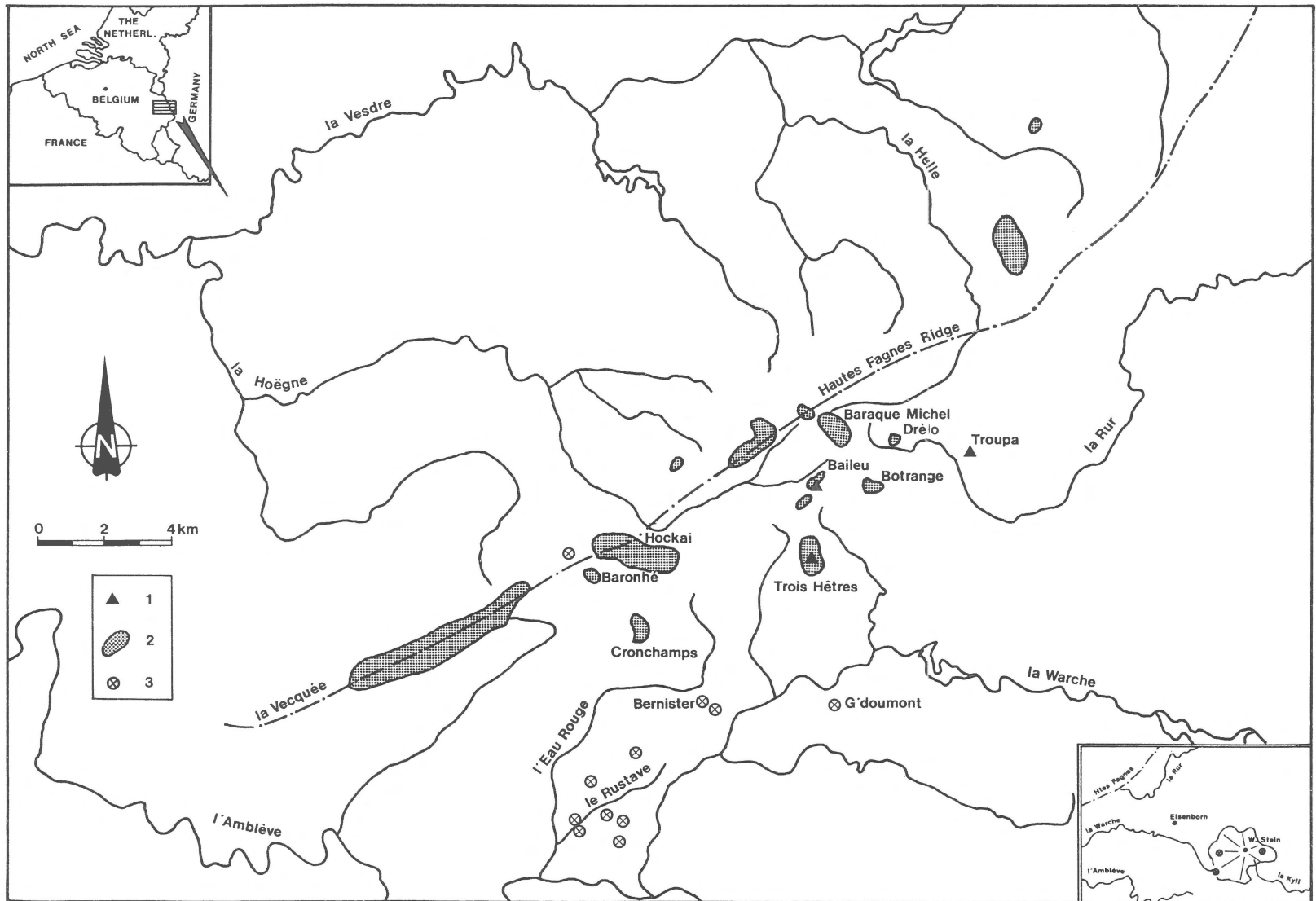


Fig. 1 Distribution map of Cretaceous sand and flints on the Hautes Fagnes plateau. 1. sand; 2. flint accumulation; 3. reworked flints.

Botrange summit, especially along the border of Dréloh and at 685 m altitude to the south and the south-west of Botrange.

- Another flint accumulation to the south-west of the Baileu deposit. It is preserved on the same NE-SW ridge at approximately 638 m.
- A remarkable flint deposit located at Baronhé on the Vecquée ridge, 2 km to the west of the well-known Hockai deposit. Situated at 555 m altitude, it is 2 m thick and shows numerous bulky black flints, some of them measuring 60 to 70 cm. They are embedded in an ochre clay. This flint accumulation rests directly on the Revinian (Cambrian) bedrock and seems to be preserved *in situ* in a SSE oriented, elongated depression which probably represents a slight undulation in the Cretaceous topography.
- Close to the preceding one, a small deposit at 540 m on the northern side of the ridge. This one has been somewhat reworked.
- Lastly, further south, several excavations showed that the Cronchamps flint deposit at 530–535 m is also *in situ* (Demoulin, 1986b).

To the south of the Eau Rouge and Warche valleys, the sparse flints that can be found are always part of more recent deposits, for instance at Bernister and G'doumont. In the Rustave valley, Renier (1901) and Ozer (1967) have also recognized a number of Quaternary deposits with flints. These occurrences, however, certainly came from the Baraque Michel massif through the Warche's tributaries. A much more significant observation was made by Altmeyer (1982), who found flints on the Weisser Stein massif. Löhnertz (1978) has also observed some flints in the terraces of the upper Kyll and Richter (1962) noted them in the bed of several streams that flow down the Weisser Stein. Unfortunately, I could not confirm these observations, which are of the utmost importance for the delineation of the Cretaceous transgression on the Ardennes massif, especially in determining its southern limit.

The observations described nevertheless permit me to conclude that the Cretaceous shoreline, which was already situated south of the Hautes Fagnes ridge in Campanian time, moved further south during the Maastrichtian. The absence of

Cretaceous sediments to the south of the Baraque Michel massif is caused by the severe Palaeogene erosion in this region (Demoulin, 1986a). In this sense, the flints observed on the Weisser Stein massif, apart from implying the submersion of a much more important part of the Ardennes-Eifel under the Cretaceous sea, also bear witness to the preservation on this summit of remnants of the Cretaceous topography which were spared by the later downcutting of Palaeogene planation surfaces.

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