309

Palynological and geochemical data in peat sediments at the side of an old (Roman to/or Merovingian) paved road in the Hautes-Fagnes

MAURICE STREEL[1]

VIRGINIE RENSON [2]

FRANÇOIS DE VLEESCHOUWER [2]

Key Words: Palynology, geochemistry, peat, Holocene, Belgium, Roman, Merovingian, road

Citation: STREEL M., RENSON V. & DE VLEESCHOUWER F. (2006).- Palynological and geochemical data in peat sediments at the side of an old (Roman to/or Merovingian) paved road in the Hautes-Fagnes Carnets de Géologie / Notebooks on Geology, Brest, Article 200X/XX (CG200X_AXX)

Mots-Clefs : Palynologie, géochimie, tourbe, Holocène, Belgique, Romain, Mérovingien, route

Introduction

In 1768, a report to her Majesty Empress Marie-Thérèse of Austria, governing the Duchies of Limburg and Luxemburg, indicated that an old paved road, then covered by peat and vegetation, was linking the regions of Eupen and Sourbrodt (now in the Liège province area called *Hautes-Fagnes*, Eastern Belgium). At that time, a bad trail was winding across the region. The users of this trail were consequently obliged to pay toll fees to the Liege Principality. The paved road, after restoration, would have allowed a direct access between the duchies (fig. 1)

The paved road, traditionally known to the local inhabitants as the *"Pavé de Charlemagne"*, was never restored and its detailed layout has been forgotten until the early 1930 years when the abbot J. Bastin rediscovered and described (BASTIN, 1934) its remarkable structure between the sites of "Croix Mockel" and "Wez" (fig. 1).

The road was believed to have a Roman origin until several ^{14}C dates (CORBIAU, 1981) suggested a Merovingian age (between A.D. 460 and A.D. 885), at the "Croix Mockel" site. Pollen analyses performed in the Wez site (fig. 2) by DRICOT (1960), DALEMANS & STREEL (1986) and more recently by STREEL *et alii* (2005) have generated contradictory conclusions. DRICOT (1960) concluded that the pollen analysis of the peat below the road suggested an age considered to be too old, but supported the Roman age on the basis of one ^{14}C date. DALEMANS & STREEL (1986), introduced a new method of dating by pollen analysis of the peaty layers contaminated by mineral dust at the side of the road and proposed a Merovingian age. The last contribution was performed in a trench made perpendicular to, but at the side of the paved road, in a new site investigated by CORBIAU (2005) near the southern border of the Wez. Two profiles were studied (W A and W B) using geochemical (RENSON*et alii*, 2005) as well as palynological (STREEL *et alii* 2005) techniques on the same samples. Helped by several ^{14}C dates, they came to the conclusion that the road was built between A.D. 210-390 and A.D. 380-540, using calibration method Oxcal 3.8. These two dates were then recalibrated using calibration method Oxcal 3.10 to give an interval ranging from A.D.130-380 to A.D. 350-540. It was then decided to use the same techniques on a new core (W VI) taken at the site investigated by DALEMANS & STREEL (1986).

Impact of environment on the pollen rain

It is important to note the environmental differences prevailing when the road was built between the site of profiles W A and W B and the site of cores W IV and VI. *Alnus* (alder), reaches up to 50% of the total pollen sum in the lower part of W IV and W VI (figs. 4 and 5) while it shows smaller amounts and variations in profiles W A and W B.

However for dating purposes, the regional pollen rain is of the greatest importance as shown by DRICOT (1960) in his profile Ma IV. Taken in a non-wooded raised bog, regional pollen rain is assumed to be at a maxima. DRICOT (1960) identified 3 of the 4 maxima of *Fagus* (beech) pollen (fig. 3) recorded by PERSCH (1950) in another peat-bog some 10 km to the north. These dates however were interpolated without any ^{14}C control and therefore are of low reliability. The presence/absence or frequency of *Carpinus* (Hornbeam) is the only criteria for discriminating

between FI, FII and FIII. DRICOT (1960) calculated all the percentages on the sum of arboreal pollen (AP).

The new core W VI (fig. 4) compared to the old core W IV (fig. 5)

The old core W IV was sampled at 2.5 cm intervals and macerated for pollen analysis, for record of ash weight/dry peat weight and for isolation of the first occurrence of small (1mm or less) fragments of quartzite in the calcined peat. The new core W VI was sampled every1 cm and treated like W IV. The same samples were analyzed by geochemistry for later comparison with the data observed in the profile W B.

In core W IV, the sudden decline of *Alnus* pollen percentage was explained by DALEMANS & STREEL (1986) as the result of the opening of the paved road through the wooded peat-bog along the Helle brook. The sudden decline is indeed associated in the core with an increase of ash content and with the first occurrence, in the calcined peat, of small (1mm or less) fragments of quartzite. It was also considered that the paved road was built there for the first time. In the new core W VI, the same decline of *Alnus* pollen percentage is obvious although more progressive due to a narrower sampling.

The abundance of *Alnus* pollens in this site along the Helle had to be taken into account when calculating the percentage of other tree species pollens provided by forests dominating the landscape outside the peat-bogs. Not only the *Alnus* pollens rain is locally more abundant than the regional pollen rain representing the surrounding forests, but also the density of *Alnus* wood may act as a shelter against that regional pollen rain. We have therefore recalculated in both cores the percentages of *Fagus* and *Carpinus* in the arboreal pollen sum less *Alnus* in order to reduce the importance of non-arboreal and local pollen rain. This was not done by DALEMANS & STREEL (1986) who had come to the conclusion that the *Fagus* maximum above the decline of *Alnus*, being less important than the maximum visible below the decline of *Alnus*, was corresponding to the FII of DRICOT (1960). The recalculation of DALEMANS & STREEL (1986) diagram however shows (fig. 5) that this *Fagus* maximum could alternatively correspond to the FI.

The *Fagus* maxima in the new core W VI, occurring immediately above the *Alnus* decline might therefore also correspond to the FI of DRICOT (1960), identified now as zone A (fig. 4). It would mean that the opening of the road through the *Alnus* wooded peat-bog might be Roman instead of Merovingian.

However the drastic increase of ash content (> 50 %) in dry peat is clearly above that *Fagus* maxima in both cores. Above the *Fagus* maxima in the new core W VI, identified now as zone B (fig. 4), a continuous occurrence of Filicales spores have been observed implying a superficial more mineralized peat. At the same level occur very abundant cenospheres. They are known as ash particles resulting from incomplete high-temperature combustion of peat (MILLER & JANSONIUS 1996, GRIFFIN & GOLDBERG, 1979)

The new core W VI (fig. 4 and 7) compared to the profile W B (fig. 6 and 7)

In figure 6 (a simplified diagram of the profil WB), the pollen percentages of *Fagus* and *Carpinus* were recalculated on the arboreal pollen sum only, to reduce the local importance of non arboreal pollen rain in the pollen diagram. This profile W B has been dated by five successive ^{14}C dates. The four lower dates, being very close, allowed recalibration using the wiggle-match dating program Bcal (figs 6 and 7). The maxima of *Fagus* were attributed to the FI based on their calibrated ^{14}C age interval of A.D. 86 – A.D. 258. The site W B was not situated in an *Alnus* wooded peat-bog and therefore the supposed man-made *Alnus* decline could not be observed. The ash content in dry peat increases suddenly between 79-80cm and 81-82cm *i.e.* between A.D. 131 and A.D. 540.

The drastic increase of silica content between 81 and 82 cm (between A.D. 152 and A.D. 540) in W B profile attests the presence of quartzite fragments linked to the building of the paved road and beginning of its use (fig. 7). This characteristic is also present in W VI although the Si increase in W VI is more progressive than in W B. Moreover, the appearance of Filicales is abrupt in W B while progressive in W VI. These discrepancies between W B and W VI profiles suggest either a difference in the accumulation rate of peat, or a difference in the record of quartzite fragments. Indeed, the deposition of quartzite fragments on a peat surface is completely chaotic. It is thus also possible to have a difference in the quantity but also in the grain size (small then large in W VI, while directly large in W B) of quartzite fragments, resulting in a difference in Si profiles. However, ^{14}C dating needs to be performed in W VI in order to clarify this point.

Trace elements geochemistry shows significant increases in lead and zinc beginning at 70 cm in W B and at 29 cm in W VI. Lead isotopes analyses were performed on some samples presenting high concentrations of lead and zinc (between 70 cm and 94 cm in W B). These samples show isotopic ratios similar to isotopic ratio of lead-zinc ores located approximately 15-20 km to the north-northwest, in the Verviers synclinorium. Therefore, it is possible to suggest the hypothesis that the road could have been used to carry lead-zinc ores from Verviers-Aachen area through the Hautes-Fagnes, maybe with the south-southeastern destination of Trier, an important metal working centre at these times.

Acknowledgements

We wish to express our gratitude to F. Damblon (Brussels) and B. Owens (Nottingham????) for reviewing the paper

References

Bastin J. (1934). - La via Mansuerisca. *L'Antiquité classique*, Louvain-la-Neuve, vol. 3, p. 333-383.

Bollinne P., Streel M. (1998). - Topographie détaillée de la voie mérovingienne (la Via Mansuerisca ?), enfouie dans la fagne des Wés. *Hautes Fagnes*, Verviers, vol. 230, p. 45-52.

Corbiau M.-H. (1981). - La "Via Mansuerisca", étude archéologique du tracé et des structures. *Archaeologia Belgica*, Bruxelles, vol. 235, p. 5-31.

Corbiau M.-H. (2005). - Nouvelles recherches archéologiques pluridisciplinaires sur le parcours de la voie médiévale dite la *Via Mansuerisca* et découverte d'un véhicule dans la Fagne Rasquin, Waimes. *Archaeologia Mediaevalis*, *Chronique* vol. 28, p. 6-9.

Dalemans C. & Streel M. (1986). - La Via Mansuerisca, enfouie dans la fagne des Wez, est mérovingienne , pas romaine. *Hautes Fagnes*, Verviers, vol. 184, p. 93-102.

Dricot E.-M. (1960). - Recherches palynologiques sur le plateau des Hautes-Fagnes. *Bulletin de la Société Royale de Botanique de Belgique*, Meise, vol. 92/1-2, p. 157-196.

Fauchamps N. Al. (1950) - Chemins anciens, anciennes limites. *Hautes Fagnes*, Verviers, vol. 1, p. 18-22.

Griffin J.J. & Goldberg E.D. (1979). - Morphologies and origin of elemental carbon in the environment. *Science*, Washington, vol. 206, p. 563-565

Miller M.A. & Jansonius J. (1996). - « Linotolypidae » and cenospheres ; *In:* Jansonius J. & McGregor D.C. (ed.), Palynology: principles and applications.- American Association of Stratigraphic Palynologists Foundation, vol. 1, p. 357-359.

Persch F. (1950). - Zum postglazialen Wald- und Moorentwickelung im Hohen Venn. *Decheniana*, Bonn, vol. 104, p. 81-93.

Renson V., Fagel N., Nekrassoff S., Streel M., De Vleeschouwer F. (2005). - Pourquoi une route pavée (*via Mansuerisca* ?) au travers des tourbières? Enfin une hypothèse...qui tient la route. *Hautes Fagnes*, Verviers, vol. 258, p. 22-24.

Streel M., Renson V., Fagel N., Nekrassoff S., De Vleeschouwer F. (2005). - La route pavée au travers des tourbières de la fagne des Wez (via Mansuerisca ?) est-elle romaine ou mérovingienne ? La vérité est-elle ...à mi-chemin? *Hautes Fagnes*, Verviers, vol. 259, p. 20-25.

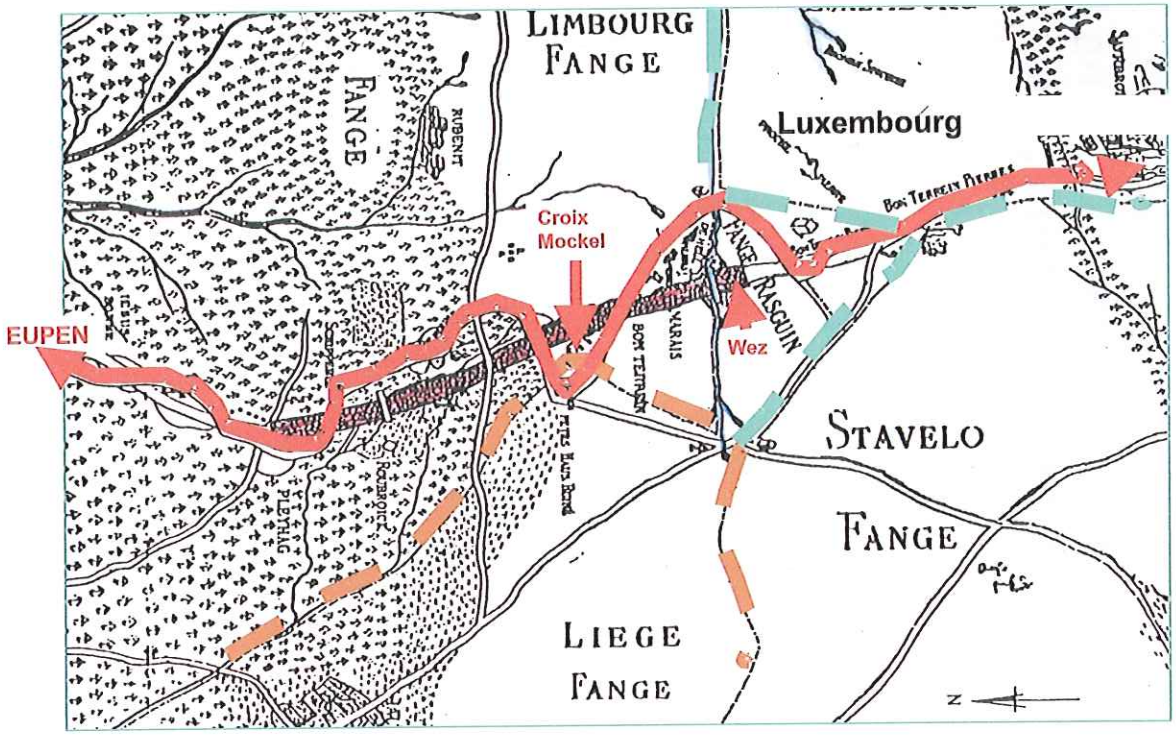

Fig. 1. Map drawn by Cornelius Leurs in 1778 (after FAUCHAMPS, 1950). Dotted lines: boundaries between the four Duchies and Principalities which were meeting in the Hautes-Fagnes. The toll fees were to be paid at the site named here "Croix Mockel".

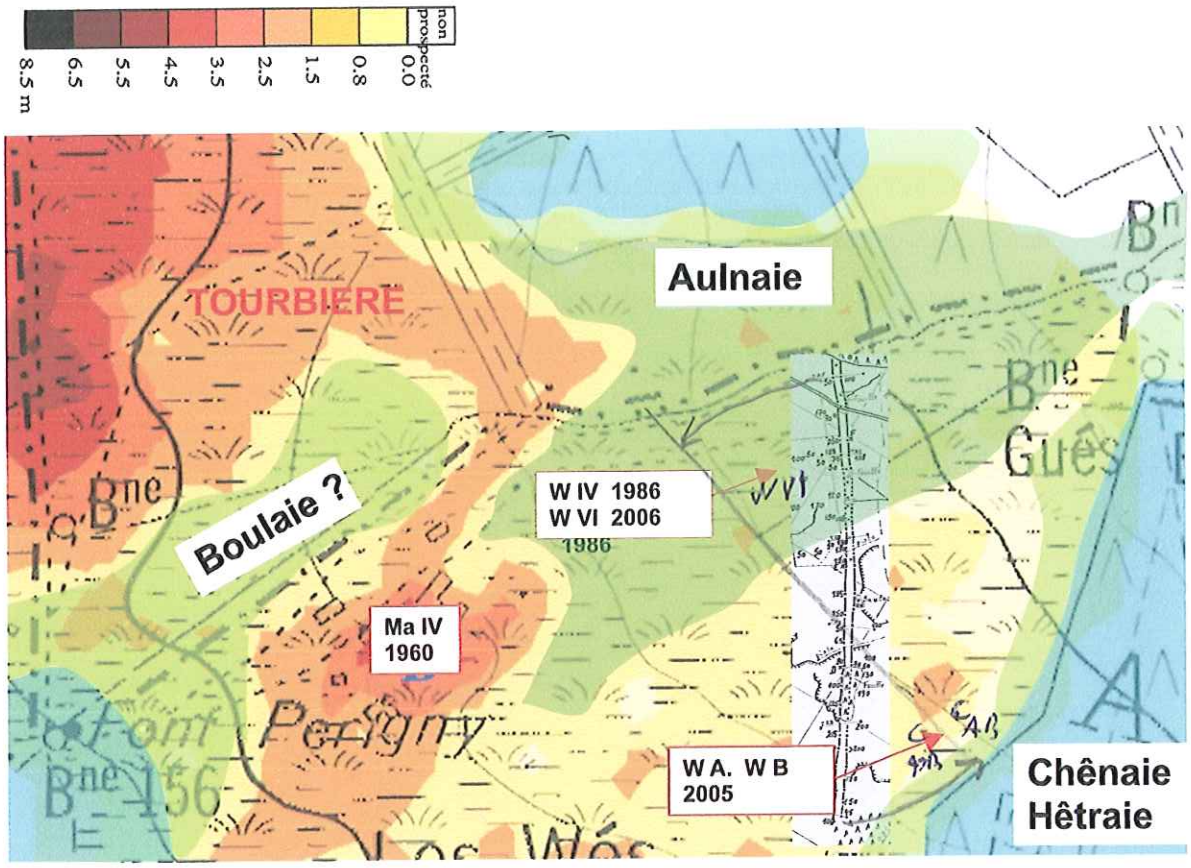

Fig. 2. The site "*Les Wés*" or "*Wez*" on the right side of the small brook "*Helle*". Grey shaded area: layout of the paved road (Bollinne & Streel, 1998). Other colours: hypothetical vegetation cover before the road building, based on the soil characteristics and on pollen data. "*Aulnaie*", "*Boulaie*", "*Chênaie*", and "*Hêtraie*" are woods dominated respectively by *Alnus*, *Betula*, *Quercus* and *Fagus*. Investigated sites are reported (see text for details).

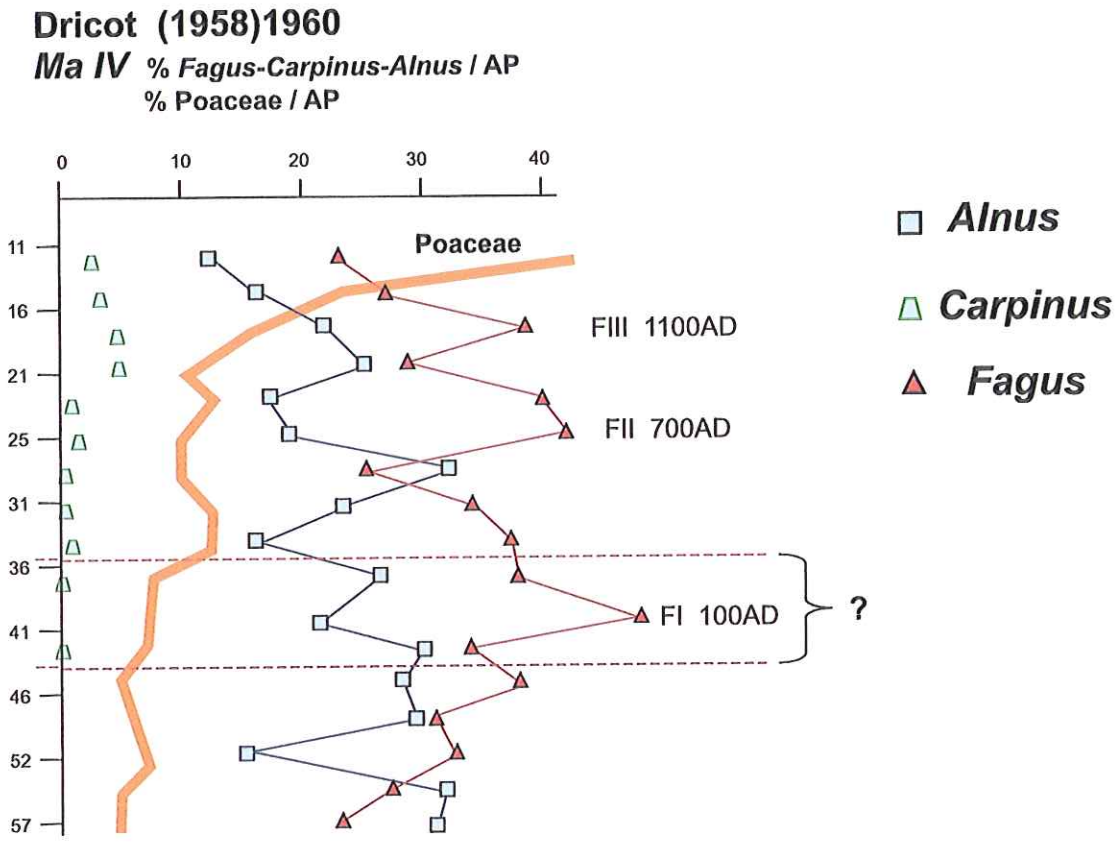

Fig. 3. Simplified 5 cm interval pollen diagram Ma IV (DRICOT, 1960) with percentages calculated on arboreal pollen sum (AP). Dates of maxima of *Fagus* pollens based on the pollen analysis of another peat bog, 10 km to the north (PERSCH, 1950). The "**?**" indicates a possible equivalent of core W VI as explained in text.

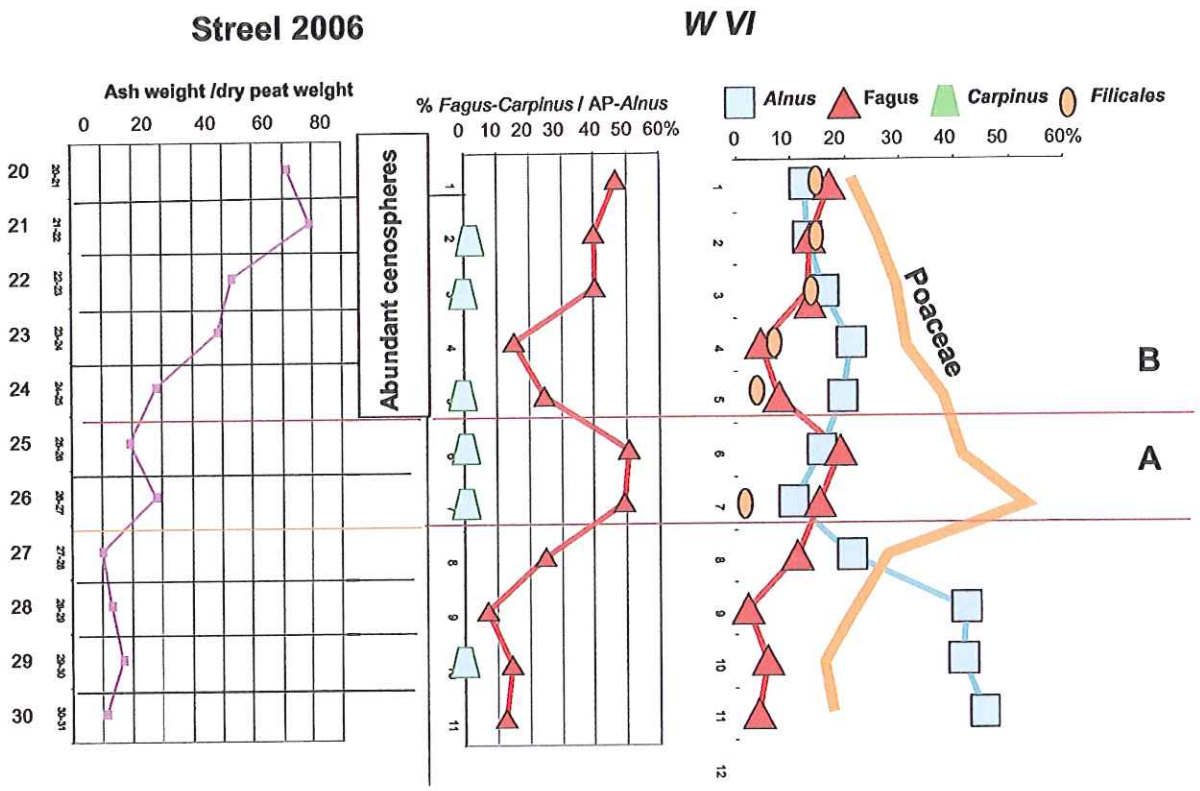

Fig. 4. On the right: simplified pollen diagram of core W VI (percentage calculated on total pollen sum). On the left: percentages of ash in dry peat, and levels with abundant cenospheres. In the middle: percentages of *Fagus* and *Carpinus* recalculated on arboreal pollen sum less *Alnus* in order to reduce the importance of non-arboreal and local pollen rain.

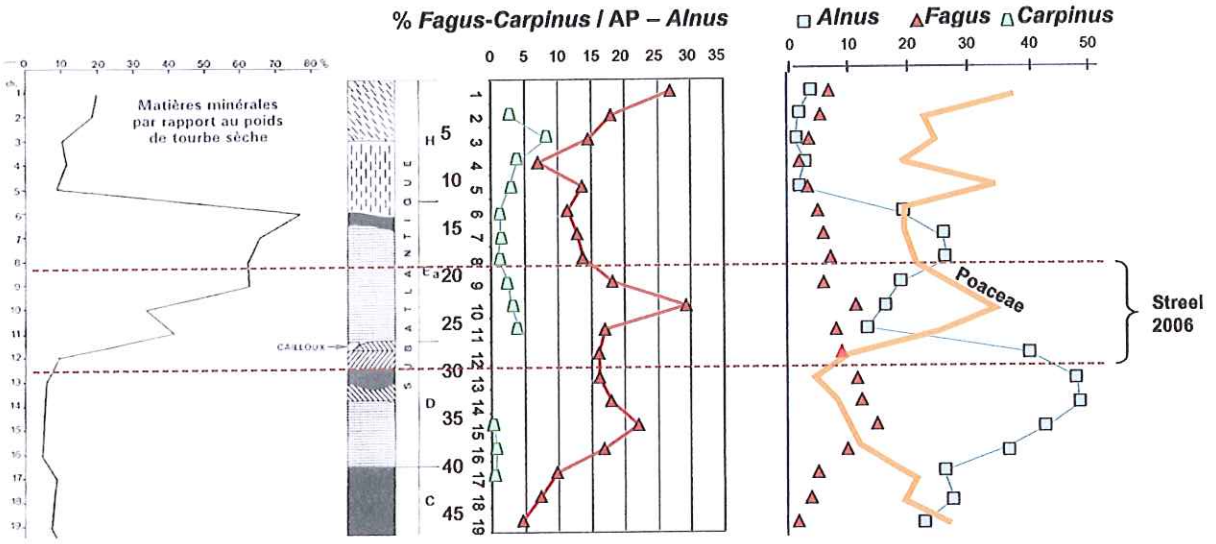

Fig. 5. On the right: simplified pollen diagram of core W IV (after DALEMANS & STREEL, 1986) (percentage calculated on total pollen sum). On the left: percentages of ash in dry peat. In the middle: percentages of *Fagus* and *Carpinus* recalculated on arboreal pollen sum less *Alnus* in order to reduce the importance of non-arboreal and local pollen rain.

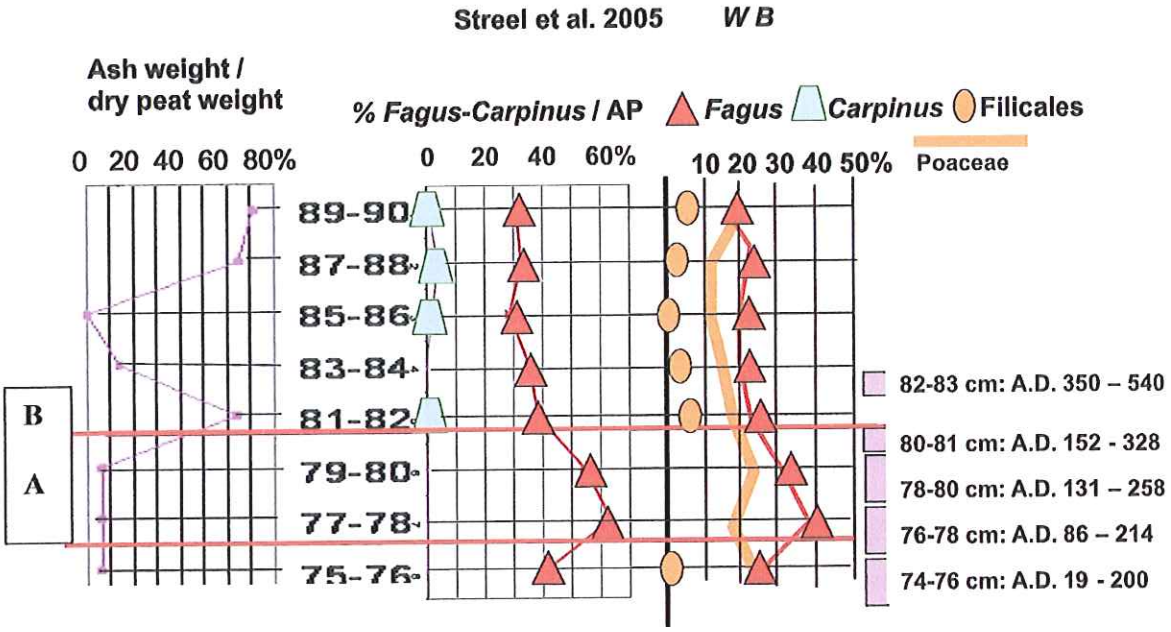

Fig 6. On the right: simplified pollen diagram of profile W B (STREEL *et alii*, 2005) (percentage calculated on total pollen sum). On the left: percentage of ash in dry peat and calibrated ^{14}C intervals. In the middle: percentages of *Fagus* and *Carpinus* recalculated on arboreal pollen sum in order to reduce the importance of non-arboreal pollen rain. Note that the samples in profile W B are measured from the base of the peat layer.

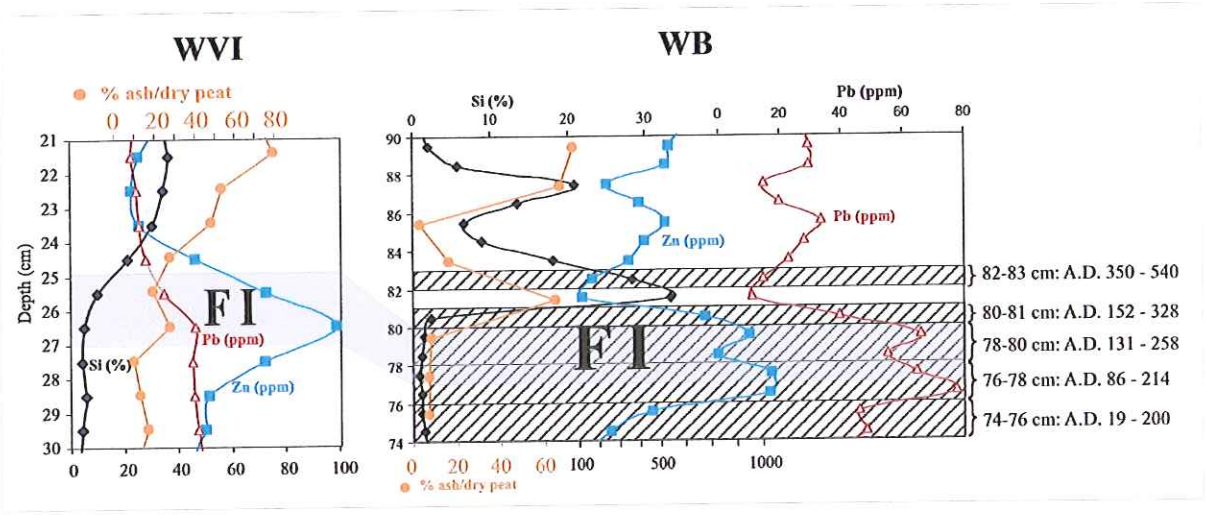

Fig. 7. Comparison of geochemical data in new core W VI and profile W B (RENSON *et alii*, 2005) in the case the correlation by the maxima of *Fagus* F I is confirmed.

Addendum

Pollen diagram of core W VI. Percentages of all pollens and spores (except *Sphagnum*) on the total sum. Curves of pollens from *Carpinus*, Cerealia, *Plantago*, *Calluna*, other Ericaceae and spores of *Polypodium* and *Pteridium* are 5x exaggerated.