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NOTE ON THE PRESENCE OF PRE-WEICHSELIAN LOESS DEPOSITS ALONG THE ALBERT CANAL NEAR KESSELT AND VROENHOVEN (BELGIAN LIMBOURG)[1]

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ABSTRACT

Mees R. P. R. & E. P. M. Meijs 1983 Note on the presence of pre-Weichselian loess deposits along the Albert Canal near Kesselt and Vroenhoven (Belgian Limbourg) – Geol. Mijnbouw 63: 007-011.

Loess sections along the Albert Canal and in Kesselt (Belgium) are described. The presence of pre-Weichselian loess is demonstrated. This is done on the basis of the occurence of the Rocourt tuff near Vroenhoven and on differences in the heavy mineral composition of the various loess deposits (fraction 30-63 μm). Besides the Rocourt Paleosol (Eemian interglacial), two other interglacial paleosols have been observed.

INTRODUCTION

In a few Belgian and Dutch loess profiles pre-Weichselian loess occurs beneath the Weichselian loess deposits. These pre-Weichselian loess deposits are normally influenced by strong interglacial soil-formation, which in general is attributed to the Eemian interglacial (Rocourt paleosol; see e.g. HAESAERTS ET AL., 1981). Loess profiles containing pre-Weichselian loess that is not influenced by interglacial soil-formation are rare.

During a routine survey along the Albert Canal in the summer of 1982 we discovered a loess section, in which a thick packet of pre-Weichselian loess was likely present. This loess section was exposed by construction works along the Albert Canal. Another profile was surveyed in the Nelissen brickyard in Kesselt and yet another one, at a later stage along the Albert Canal near Vroenhoven (Figs 1, 2, 3, 4 and 5).

METHODS

Field methods

In the field attention was given to paleosols, periglacial phenomena and sedimentological characteristics. The presence of calcium carbonate and manganese compounds was demonstrated by the use of a 5% HCL-solution and a 15% H_2O_2-solution, respectively. Samples were taken for heavy mineral analysis and for micromorphological investigation.

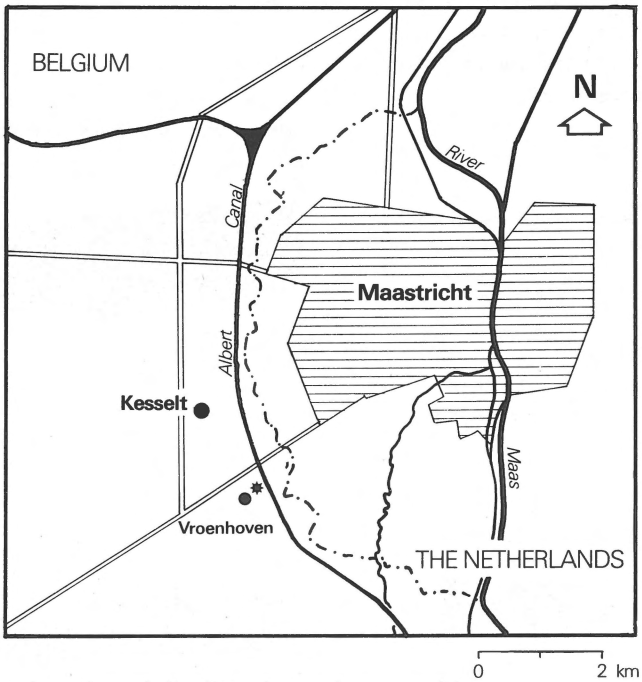

Fig. 1
Location of the loess profile along the Albert Canal near Vroenhoven.

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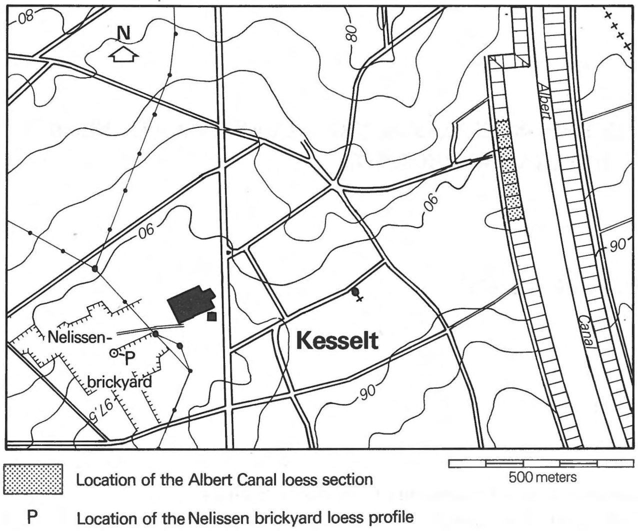
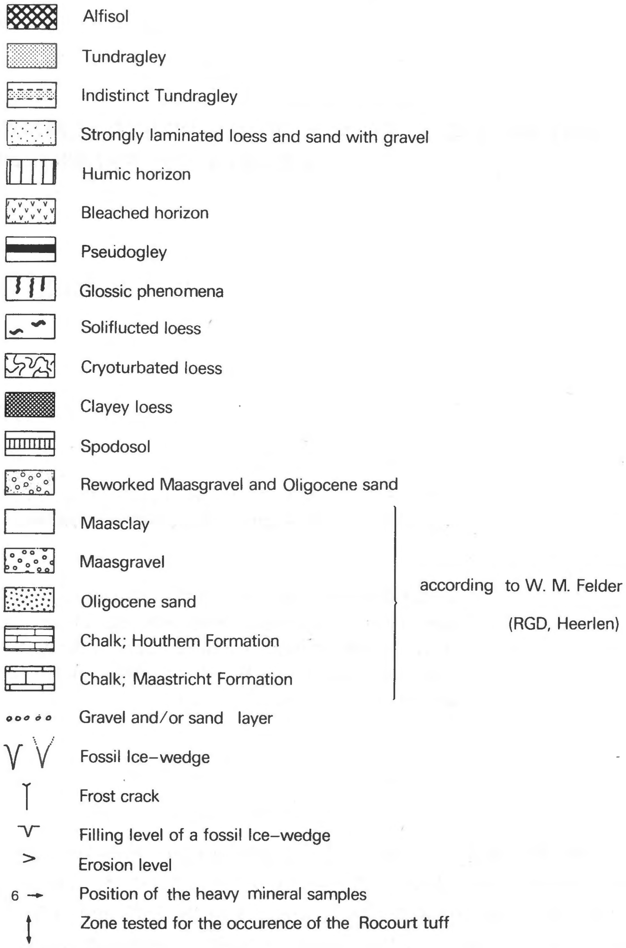


Fig. 2
Location of the loess section along the Albert Canal near Kesselt and the loess profile in the Nelissen brickyard in Kesselt.

Heavy mineral analysis

The position of the heavy mineral samples is marked in Figs 3, 4 and 5. The results of the analyses are recorded in Figs 6a, 6b and 7. The heavy and light minerals were separated as follows (MEIJS, in prep.):

- Break down aggregates with hot water (± 90°C).
- Sieve the sample through a 106 µm and a 63 µm sieve with water.
- Decant the fractions <30 µm and >30 µm (decantation time: 2 minutes).
- Dry the fractions 30-63 µm, 63-106 µm and >106 µm in an oven at 105°C.



Legend for Figs 3, 4 and 5

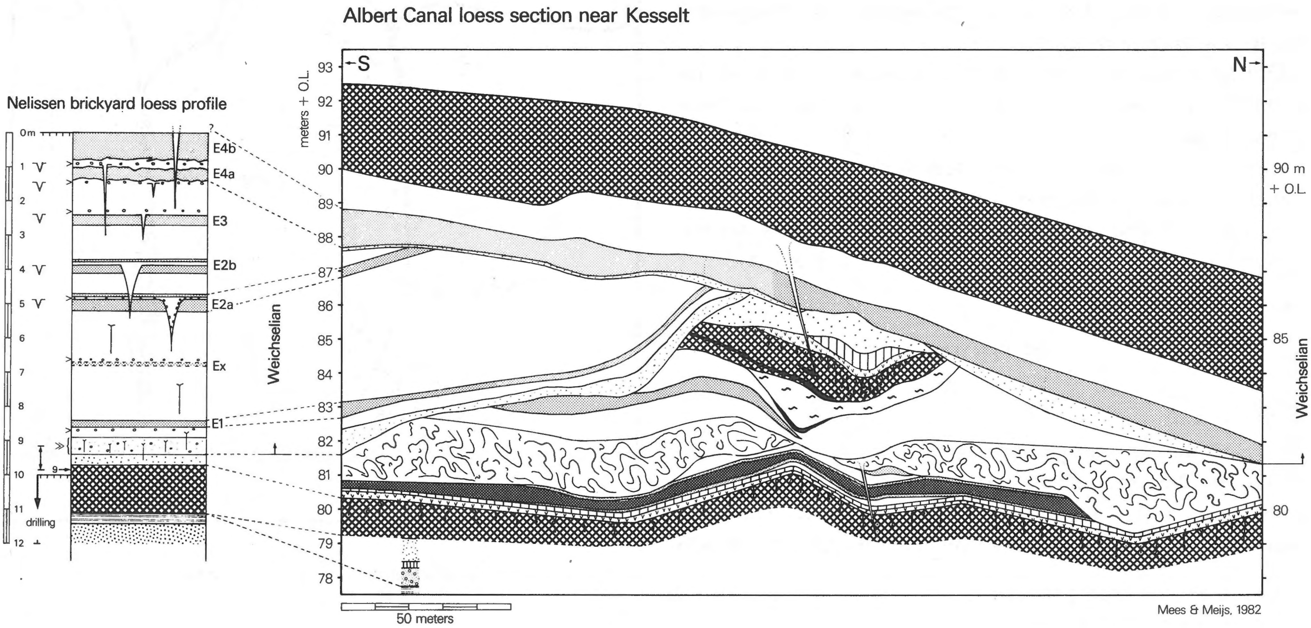


Fig. 3
The Albert Canal loess section near Kesselt and the Nelissen brickyard loess profile in Kesselt.

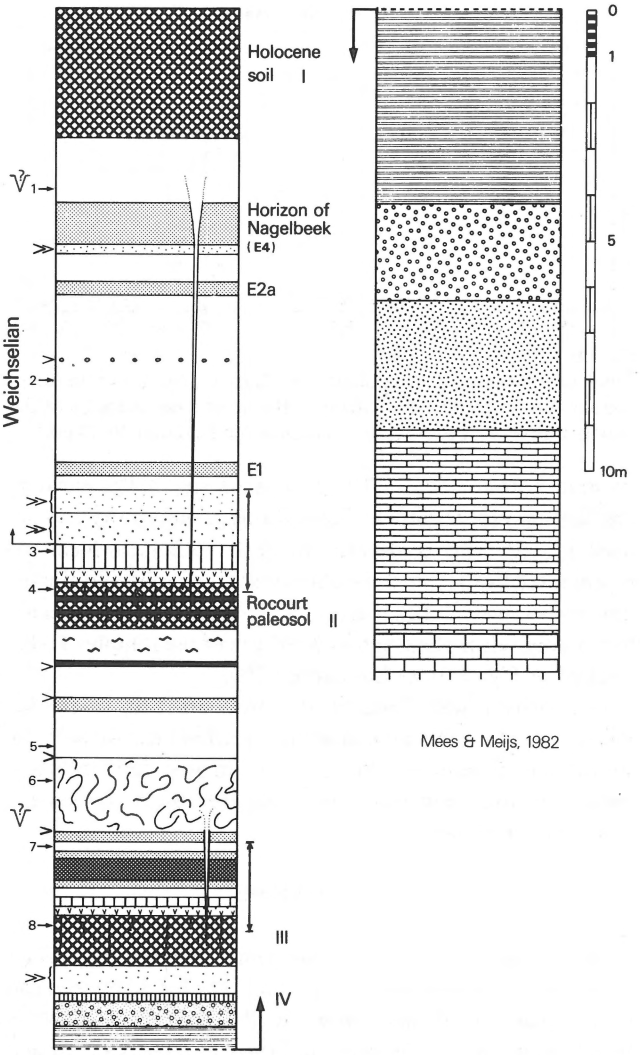


Fig. 4
Idealized profile of the Albert Canal section near Kesselt.

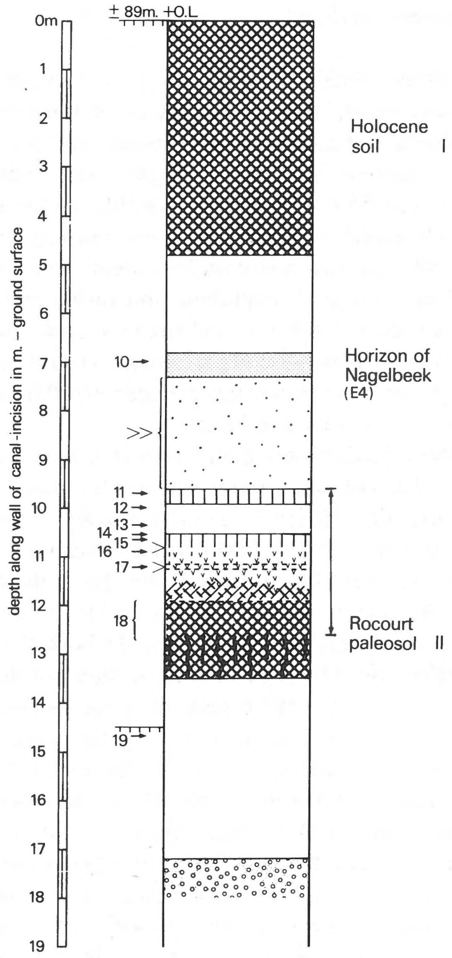


Fig. 5
Loess profile along the Albert Canal near Vroenhoven.

– Separate the heavy and light mineral sections with bromoform in a centrifuge (see JUVIGNÉ, 1979).
– Suck up the heavy mineral section with a micropipette.
– Drain the micropipette above a filter paper.

Per microscope slide 200 to 300 transparent heavy minerals were counted, using the ribbon-counting method described by VAN HARTEN (1965).

RESULTS

Field observations

In the loess section along the Albert Canal near Kesselt three interglacial paleosols have been distinguished beneath the Holocene soil with intermediate, more or less homogeneous loess deposits (Figs 3 and 4).

Paleosol II has developed into an Alfisol (SOIL SURVEY STAFF, 1975). Especially the B2t horizon has a platy structure and its colour is $8^1/_2$ YR $^5/_6$ (ANON., 1954). Clay cutans and scattered concretions of sesquioxides were macroscopically visible. Besides a few pseudogley horizons, which occur particularly in the delle-floor, also some glossic phenomena were observed (SOIL SURVEY STAFF, 1975). The latter are larger and more numerous in the delle-floor than on the delle-side. These glossic phenomena represent vertical tongues of greenish to white-greyish material in the B2t horizon and are formed by soil-degradation processes (e.g. pseudogley processes).

Paleosol III has also developed into an Alfisol. The B2t horizon has a platy structure and clay cutans were visible to the naked eye. The colour ranges from 10 YR $^5/_{6\text{-}8}$ to $7^1/_2$ YR $^5/_8$. Glossic phenomena were observed in the whole uncovered section. The great amount of charcoal pieces that are present in the bleached A2 horizon above this B2t horizon is striking. In the bleached zone above the B2t horizon of Paleosol II no charcoal was found.

Paleosol IV has developed into a Spodosol (SOIL SURVEY STAFF, 1975). Its colour is $8^1/_2$ YR $^5/_3$. This paleosol was only found over short distances in a few places.

Heavy mineral analysis

As LAUTRIDOU (1968), JUVIGNÉ (1978) and THIEME ET AL., (1981) have shown, there is a great difference between the heavy mineral composition of Weichselian and pre-Weichselian loess deposits in France, Belgium and Germany. In contrast to pre-Weichselian loess, Weichselian loess deposits have a high amphibole and garnet (but especially amphibole) content and a low zircon and rutile content. This is shown by the total percentage of amphibole and garnet and the ratio between amphibole + garnet and zircon + rutile. Figs 6a and 6b show the above mentioned percentages and ratios for some samples. From these results it is deduced that Paleosol II was formed in pre-Weichselian loess.

The loess profiles along the Albert Canal and in the Nelissen brickyard were also investigated for the occurence of the Rocourt tuff, which in Belgium lies just above the Rocourt paleosol (JUVIGNÉ, 1977). In the zones indicated in Figs 3, 4 and 5 samples were taken every 10 cm. From these samples only the fraction > 106 μm was tested for the presence of transparent volcanic heavy minerals. In both the Nelissen brickyard and the Albert Canal loess section near Kesselt the result is negative, but these minerals were found in a loess profile near Vroenhoven (see Fig. 5). In that particular loess profile only one Alfisol was found beneath the Holocene soil. Glossic tongues start from a level within this paleosol. This may mean that this B2t horizon represents more than one soil-formation period. The Rocourt tuff was discovered in the humic horizons (which contain numerous krotowines), above the B2t horizon (Fig. 7). The presence of enstatite and severely notched clinopyroxenes was established, which are both diagnostic for the Rocourt tuff (JUVIGNÉ in HAESAERTS ET AL., 1981). The mean transparent heavy mineral composition of the fraction > 106 μm of this tephra material is 13.8% basaltic hornblende, 76.7% clinopyroxene, 8.7% enstatite and 0.8% volcanic garnet. The volcanic garnet shows greyish, dark greyish and dark red-brownish colours, which are represented by the minerals schorlomite, melanite and almandite respectively[3]. The percentage of transparent volcanic heavy minerals in the fraction 30-63 μm of the samples 11-17, marked in Fig. 7, does not exceed 2%.

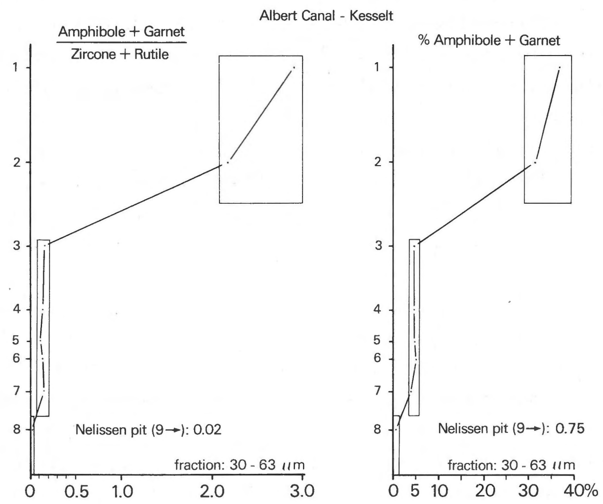


Fig. 6a
Total percentages of Amphibole + Garnet and ratio's between Amphibole + Garnet and Zircon + Rutile of some samples of the Albert Canal loess section and the Nelissen brickyard loess profile (fraction 30-63 μm).

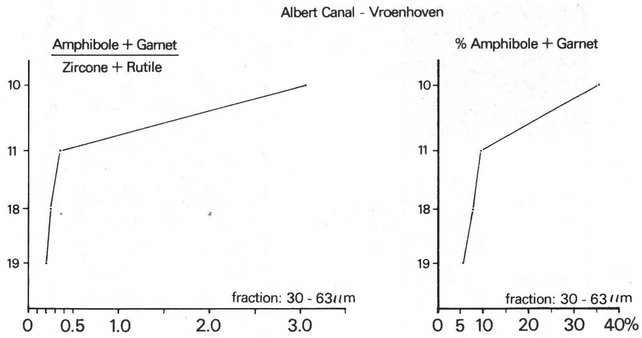


Fig. 6b
Total percentages of Amphibole + Garnet and ratio's between Amphibole + Garnet and Zircon + Rutile of some samples of the Albert Canal loess profile near Vroenhoven (fraction 30-63 μm).

The Alfisol just beneath the Rocourt tuff resembles Paleosol II of the Albert Canal loess section near Kesselt. Its stratigraphical position (FELDER ET AL., in prep.) and its heavy mineral composition (see figure 6b) are also in agreement with this correlation.

CONCLUSIONS

In the Albert Canal loess section near Kesselt at least three interglacial paleosols have been found. The loess between soil I and Paleosol II and between Paleosol II and IV is Weichselian and pre-Weichselian (probably Saalian) in age respectively.

The presence of the Rocourt tuff just above Paleosol II, in combination with the heavy mineral analysis mentioned above, proves that Paleosol II actually is the Rocourt paleosol.

In a future publication the first author will present a micromorphological analysis of thin sections from paleosols in the Albert Canal loess section.

AKCNOWLEDGEMENTS

We thank W. M. Felder (State Geological Survey, Dept. Heerlen) for his permission to use some data of his survey of the Albert Canal section between Kanne and Lanaken (Belgium) and for pleasant cooperation and discussion.

3 However, these minerals closely resemble some members of the spinel group (i.e. pleonaste and picotite). Consequently the optical determination of the volcanic garnets mentioned above has to be checked by x-ray diffraction analysis.

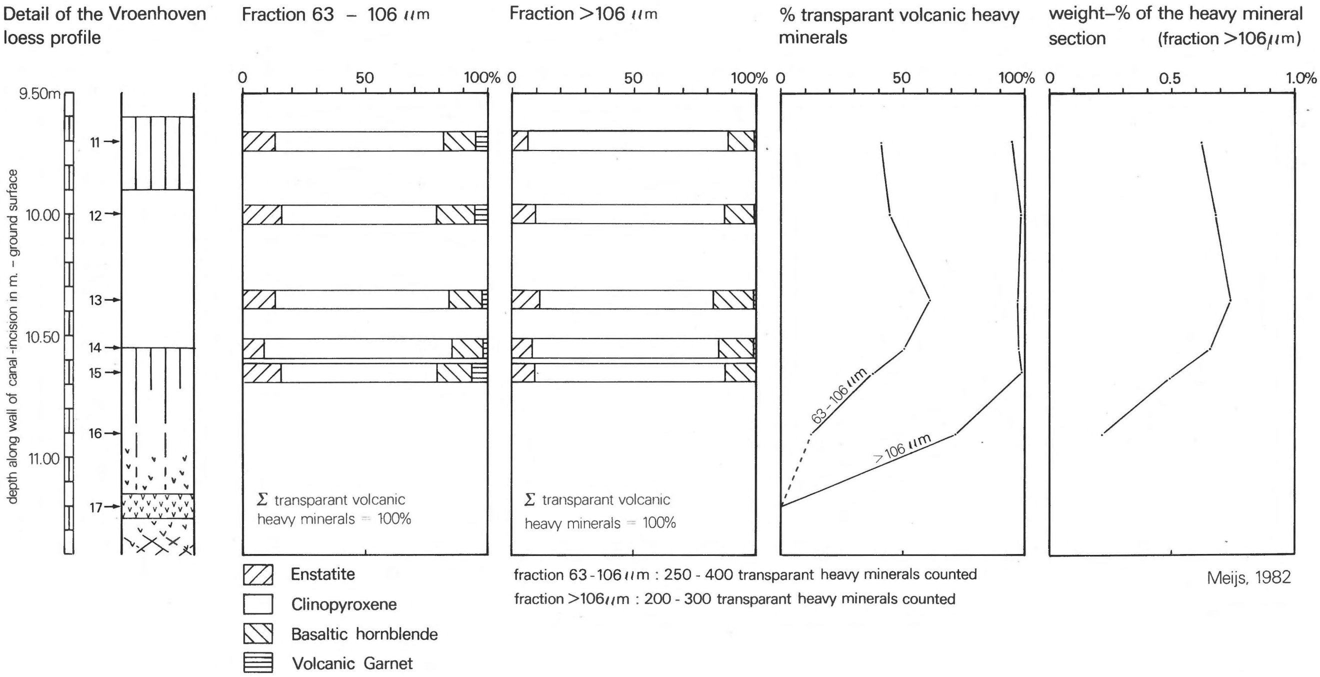


Fig. 7
Position of the Rocourt tuff in the Albert Canal loess profile near Vroenhoven. Percentages of the transparent volcanic heavy minerals in the fractions 63-106 μm and > 106 μm. Percentages of the transparent volcanic heavy minerals in relation to all counted transparent heavy minerals. Weight percentages of the heavy mineral sections in relation to the light mineral sections in the fraction > 106 μm.

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