

## AN OUTCROP OF THE LATE GLACIAL LAACHER SEE ASH NEAR KIRF (RHINELAND-PALATINATE)<sup>1</sup>

G. JUNGBLUT<sup>2</sup>, P. A. RIEZEBOS<sup>3</sup> & R. T. SLOTBOOM<sup>3</sup>

### ABSTRACT

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Heavy mineral and palynological investigations of slope-covering materials near Kirf (Rhineland-Palatinate) reveal the presence of the Allerød Laacher See ash. This ash is characterized by the brown amphibole-pyroxene-sphene association, that was described earlier from peat bogs of the Semois valley (Belgium) and from several maars in the western Eifel (Germany).

### INTRODUCTION

A small tributary of the Leuk Bach, rising in the village of Kirf, has locally incised the western valley slope of the Leuk down to a depth of about 3 m (Fig. 1). In this way slope-covering material has been exposed. At the site a calcareous sinter bed, approximately 50 cm thick, has been found which occasionally has some peat at its base (Fig. 3). This travertine bed overlies a heavy clay which contains fragments of the underlying consolidated rock (Mittler Muschelkalk) and is covered by slope debris.

The preservation of a travertine bed on a slope between weathered bed rock and slope debris is interesting from a geomorphological point of view and provides an opportunity to study the environmental conditions of formation of such an accumulation.

Preliminary investigations including heavy-mineral, pollen, and C14 analyses showed that in the sinter bed there are fresh volcanic mineral particles that were supplied during the Allerød.

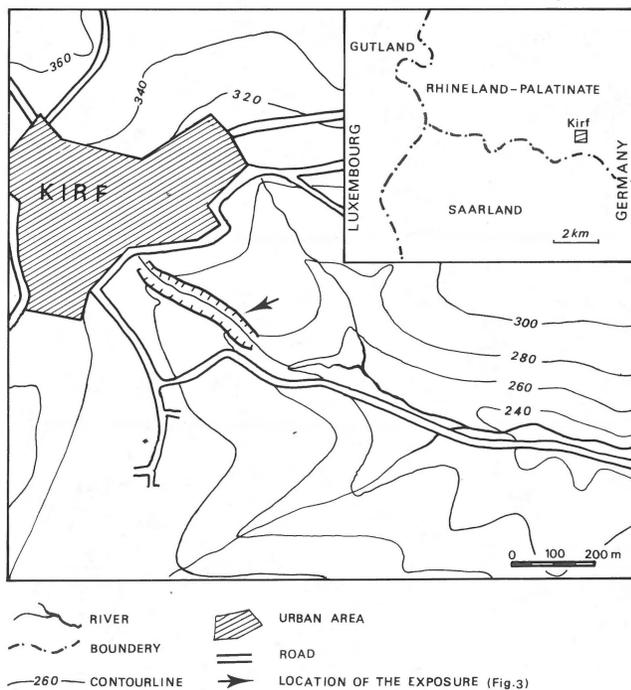


Fig. 1  
Map showing the location of the section (see arrow) near Kirf.

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<sup>2</sup>Lehrgebiet Allgemeine und Historische Geologie der Rheinisch-Westfälischen Technischen Hochschule, Aachen, W. Germany.

<sup>3</sup>Fysisch Geografisch en Bodemkundig Laboratorium, Universiteit van Amsterdam, The Netherlands.

## RESULTS

The heavy mineral spectra (50-250  $\mu\text{m}$ ) from bulk samples of the three lithological units show different mineral assemblages (Table I). The compositional differences are in particular emphasized by their association, within the inves-

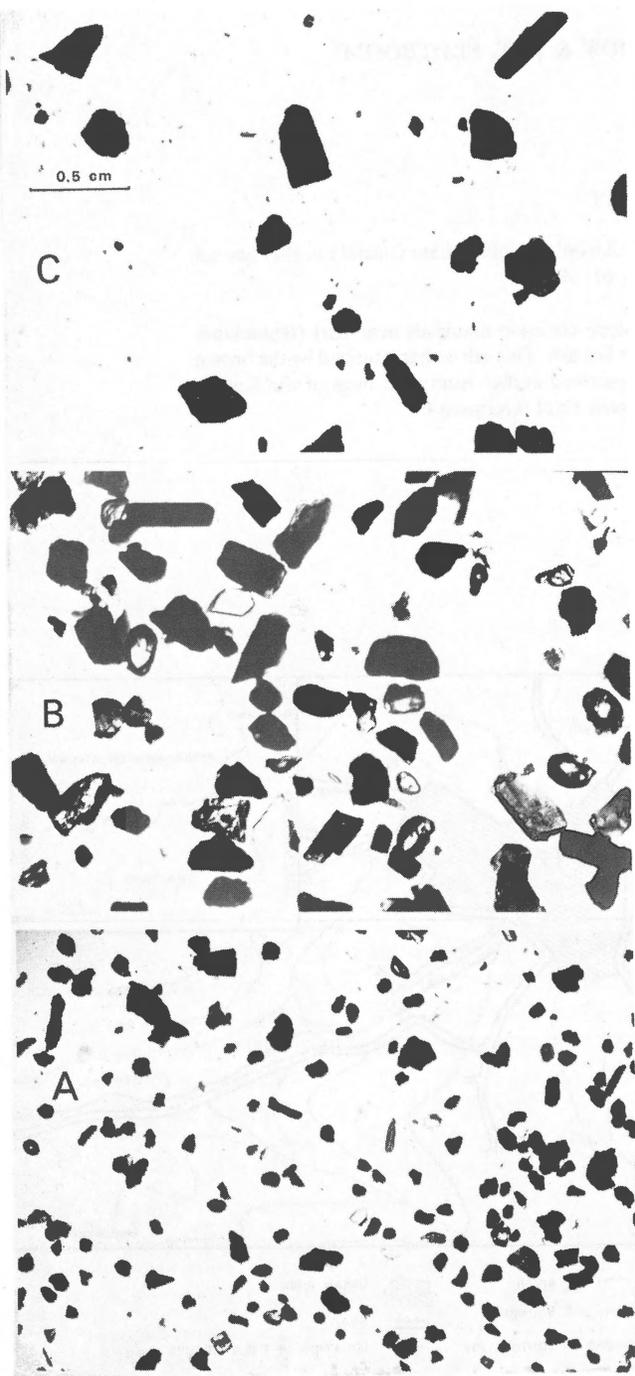


Fig. 2  
Over-all pictures of the heavy concentrates (50-250  $\mu\text{m}$ ) from the clay (A), the travertine (B) and the slope debris (C). Scale in C applies also for A and B.

Table I  
Heavy-mineral composition of the 50-250  $\mu\text{m}$  size-fraction as a function of the lithological units (analyst H. P. M. Stoltenberg)

TABEL 1

	Garnet group	Tourmaline group	Staurolite	Andalusite	Epidote group	Green Amphibole	Zircon	Rutile	Anatase	Brookite	Brown Amphibole	Clinopyroxene	Sphene	Apatite	Opaque
Slope debris	0.5	0.5	0.5	—	3.5	—	5.0	1.0	3.0	—	37.5	33.5	15.0	—	29.5
Calcareous sinter	—	—	—	—	—	—	—	—	—	—	40.5	44.5	12.5	2.5	2.0
Heavy clay with rock fragments	9.5	12.5	1.0	0.5	4.5	8.0	13.0	7.5	20.0	0.5	13.0	7.5	2.5	—	31.5

tigated size range, with clear grain-size distinctions of various mineral species (Fig. 2). The heavy mineral spectrum of the travertine exhibits a marked compositional similarity with those obtained from the Allerød ash layers described as distinct intercalations in peat bogs in southeastern Belgium (HULSHOF ET AL., 1968) and the western Eifel (JUNGERIUS ET AL., 1968). At the sampling site, however, no individual ash layer could be traced in the section. This might suggest that the ash fall occurred under highly turbulent conditions (spring?). A detailed examination of the calcareous sinter showed that the typical volcanic association is lacking in the basal part of the sinter and that the tephra appears only approximately 15 cm above the boundary with the underlying clay (black arrow in Fig. 3).

The palynological examination included the upper part of this heavy clay and the sinter bed. The clay, however, appeared to be devoid of pollen. The analysis was performed on two sites in the section in order to establish a possible hiatus between clay and travertine (Fig. 3). The left diagram shows that the peat was formed in the Bølling and continued in the Earlier Dryas. Radiocarbon dating of the middle part of the peat layer yielded an age of  $12,000 \pm 80$  BP (GrN-10616). In the upper part of the peat and in the basal part of the overlying travertine the first signs of a climate amelioration are perceptible from the decrease of *Gramineae-Cyperaceae*.

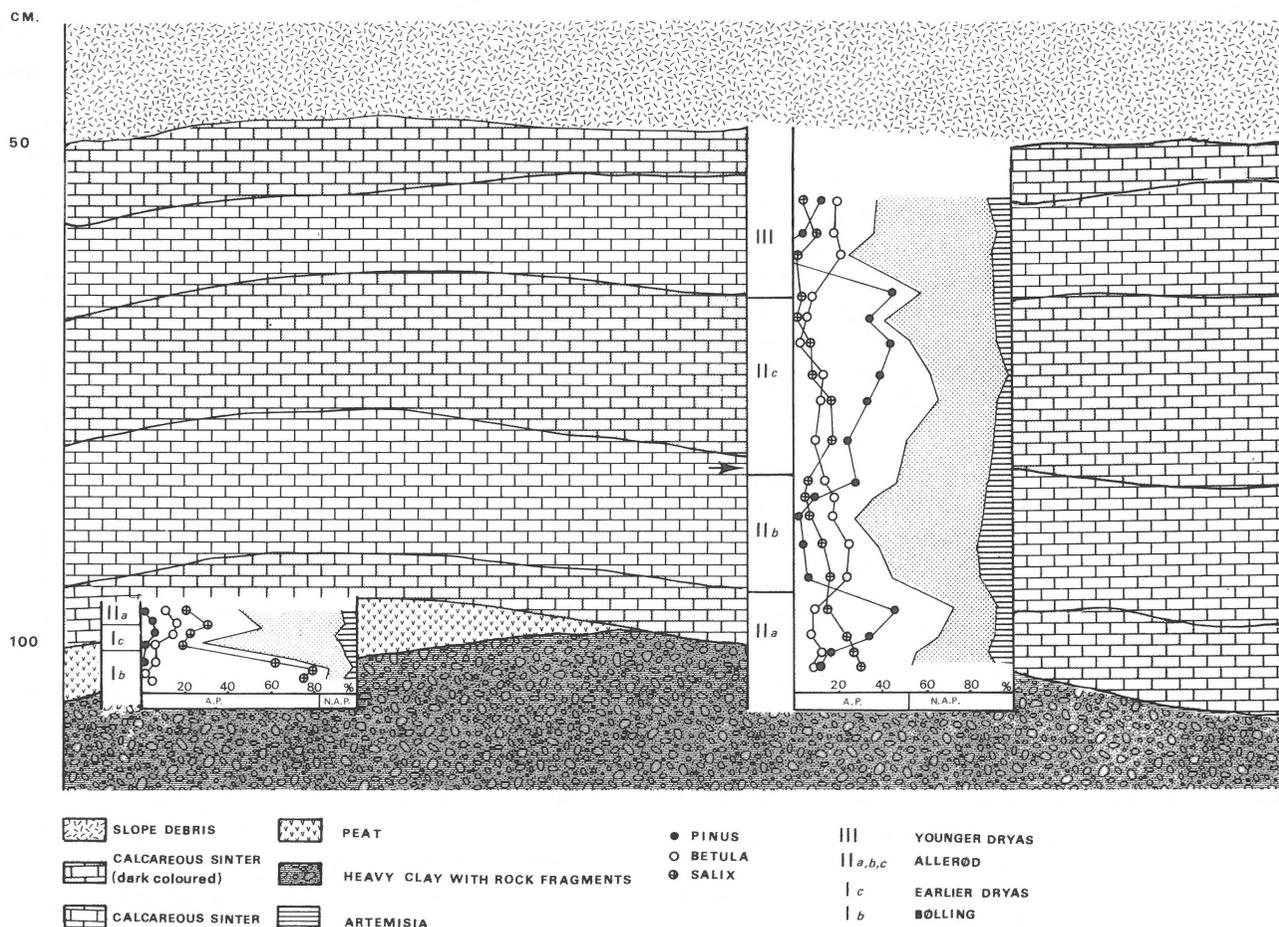


Fig. 3

Schematic representation of the section with the pollen diagrams. Arrow indicates the level at which the tephra appears. A 3 cm thick sample for radiocarbon dating (GrN 10616:  $12,000 \pm 80$  BP) was collected exactly from the middle of the peat layer.

The basal part of the other diagram shows the beginning of this amelioration too. Going upwards, this diagram suggests that the development of the sinter bed is connected with the warming-up of the Allerød. But the travertine deposition continued also during the Younger Dryas. This indicates that its formation is not exclusively confined to the relatively warmest periods. In the upper part of the sinter no pollen has been found. The pollen diagram clearly testifies that the volcanic ash appeared as a component of the sinter in the last part of the Allerød.

## DISCUSSION

Comparison of the heavy mineral composition and the position in the palynological record of the examined ash with the same features of the megascopic, individual ash layers in the Semois valley and the western Eifel maars, leaves little doubt that we are dealing with an airborne tephra deposited from the same ash cloud. The volcanic minerals observed in

the underlying clay must be considered as relicts of older tephra.

On the basis of numerous investigations three depositional lobes, supplied by the Laacher See eruption in the Allerød are presently distinguished: a northeastern lobe of about 800 km, a southern one of about 600 km, and a southwestern one of about 100 km (VAN DER BOOGAARD ET AL., 1980). However, from the occurrence of a megascopic ash layer near Arlon (HULSHOF ET AL., 1968) at a distance of circa 150 km from the Laacher See, the geographical position of the present ash, and the establishment of volcanic minerals in local colluvial deposits as far as Châlons s.m. and Nancy (northern France) – see table I in JUNGERIUS & RIEZEBOS (1976) – it may be inferred that the southwestern lobe extends over a somewhat larger area.

The earlier noticed discrepancy in the clinopyroxene-amphibole ratio between the eastern/southern and western Allerød ashes (HULSHOF ET AL., 1968) is confirmed by the present findings. In the type section of the Laacher See deposits near Plaidt, FRECHEN (1962) recorded, going upwards in the section, a decrease of this ratio (see also table 1 in

HULSHOF ET AL., 1968). SCHMINCKE (1977) reported an opposite trend in his type sections. Hence, VAN DER BOGAARD ET AL. (1980) considered the use of this ratio for the correlation of distant ash falls with type sections near the volcano of limited value.

The variation in this ratio, however, shown by the eastern, southern and western ashes is remarkable. For the time being it leads to a simple model holding that during the late Allerød eruption, just at the moment that the more mafic tephra were produced, the prevailing surface winds must have veered from SW to NE directions, probably in relation with the passage of a cold front and the subsequent formation of a high, northeast of the Eifel region.

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