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Palynological research of the Vosges Mountains (NE France): a historical overview*

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Abstract
After almost 85 years of palynological research, an impressive amount of pollen diagrams from the Vosges Mountains (NE France) is available. This paper presents an overview of these pollen diagrams and lists their main features and literature sources within a historical context. Furthermore, a short summary is provided on the natural and cultural context.

Kurzfassung
Palynologische Forschung in den Vogesen (NE Frankreich): ein historischer Überblick
Nach etwa 85 Jahren palynologischer Forschung in den Vogesen (NO-Frankreich) liegt eine beeindruckende Anzahl von Pollendiagrammen vor. Dieser Aufsatz gibt einen Überblick über diese Pollendiagramme, deren wichtigste Charakteristika und deren Literaturquellen innerhalb eines wissenschaftsgeschichtlichen Rahmens. Daneben wird eine kurze Zusammenfassung des natürlichen und kulturellen Kontextes gegeben.

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1 Introduction

The area of the Vosges Mountains of northeastern France (fig. 1) is one of the most intensively palynologically studied regions worldwide. The impressive amount of data allows a reconstruction of vegetation history and past vegetation patterns in great detail.
For the scientific audience, however, it is difficult to obtain a clear and complete overview of the available data, and many studies are easily overlooked. Overviews of palynological studies are far from complete: Visset et al. (1996) concentrate on the central Vosges, and Friedmann & Küster (1998) mention only 26 studied localities for the Vosges Mountains without displaying a map showing their locations.

In order to provide a more accurate picture of the available data, this paper presents an inventory of the palynological studies from the Vosges Mountains known to the present author, and places these within a historical framework and within the natural and cultural scenery.
In this text, pollen type names are displayed in capitals (e.g. Fagus) in order to make a clear distinction between pollen types and inferred plant taxa (Joosten & De Klerk 2002; De Klerk & Joosten 2007).

2 The Vosges Mountains: natural and cultural context

Geology and geomorphology

The development of the Vosges Mountains, its sister the Black Forest, and the Upper Rhine plain, has been described by Kessler (1914), Tricart (1963), Eggers (1964), Walter (1992), and Sell et al. (1998) (cf. fig. 2).
The cores of both mountain ranges consist of ancient granites and gneisses. A major orogeny seems to have occurred during the Precambrian, and levelling by erosion of these mountains during the Early Palaeozoic lasted until the Devonian period. Partly, the area was covered by a sea and marine sediments were deposited. The region was subject to renewed mountain building during the Carboniferous Variscan/Hercynian orogeny. After an almost complete levelling that took place until the end of the Permian, the area became covered with terrestrial sandstone ("Buntsandstein") in the early Triassic. During a phase of tectonic subsidence that lasted from the Muschelkalk period of the Middle Triassic to the Malm period of the late Jurassic, a sea covered the area and marine sediments were deposited which – after an uplift phase – were predominantly eroded during the Cretaceous and early Tertiary. In the Eocene and the Oligocene the subsidence of the Rhine rift valley started, whereas the Vosges Mountains and the Black Forest were subject to uplift: both mountain ranges now became separated. Whereas the mountains were

* Dedicated to Prof. Dr. C. R. "Roel" Janssen, the "Godfather" of the Utrecht palynological research of the Vosges Mountains

predominantly subject to erosion, in the Rhine rift valley predominantly alluvial sediments were deposited by rivers flowing from both mountain ranges, and by the Rhine. Marine sediments were deposited during periods when the sea had invaded the rift valley. Volcanism from e.g. the Kaiserstuhl Volcano mainly occurred during the Oligocene and Miocene.

As a consequence of this development, the present-day Vosges Mountains and Black Forest consist of a central area of granite and gneiss whereas most of the younger deposits have been eroded (cf. fig. 2). Sandstone still covers the northern parts of the mountain ranges that experienced less erosion than the southern parts. In the area northwest of the Vosges Mountains limestones have been preserved that cover the sandstone. A more complete set of strata is still present in the Upper Rhine plain.

Both the Vosges Mountains and the Black Forest have steep slopes directly adjacent to the Upper Rhine plain, whereas their opposite slopes decline more gently.

Both mountain ranges did not contain a closed icecap during the Quaternary ice ages, but numerous glaciers extended from the higher elevations into the valleys. The most prominent glacial landforms are the cirques ("Kare"), consisting of a basin with normally steep back-walls, and a low ridge at their fronts. Due to the differences between the gentle western slope and the steep eastern slope of the Vosges Mountains, glaciers were predominantly shorter on the latter, but had a higher relief-related dynamic and thus a higher erosional and landforming potential. Simultaneously, severe western winds blew much snow over the crest into the eastern basins which additionally contributed to cirque formation. Therefore, the cirques to the east of the crest are more prominently developed than those towards the west.

After the melting of the Weichselian ice, mostly lakes filled the cirques which later developed partly or completely into mires (Salomé 1974, Bick 1985, Sell et al. 1998). A comprehensive overview over the mires and mire types in the Vosges Mountains – being the most important palaeoecological archives – is provided by Bick (1985). Mires are prominently less frequent towards the east as the result of a diminishing precipitation in this direction (Janssen et al. 1974), whereas also the small size of the area east of the crest provided insufficient space for mires to occur extensively.

Depending on climate, geology and parent material, geomorphology, and actual vegetation, a variety of soil types occur in the Vosges Mountains, of which an overview is presented by Carbiener (1963) and Soucier (1971).

Climate

The climate of the Vosges Mountains is summarised by Zoller (1956), Rothé & Herrenschneider (1963), Eggers (1963, 1964), Janssen (1981), Stadelbauer (1992) and Sell et al. (1998).

Mean temperatures range between 9 °C at 400 m above sea level (asl.) and 4 °C at 1200 m asl. (fig. 2). Depending on elevation, mean winter temperatures range between -6 and -1 °C, and mean summer temperatures between 8 °C and 14 °C. Annually, there is a mean of 159 days of frost on the crests. The western windward slopes of the Vosges Mountains are characterised by an oceanic climate with 800-1000 mm precipitation annually, which increases to 2000 mm towards the crest. The precipitation falls predominantly as snow during the winter. In contrast, the eastern leeward slopes have a rather continental character with an annual precipitation below 500-600 mm.

Present-day vegetation

The present-day vegetation of the Vosges Mountains depends predominantly on elevation. Comprehensive overviews are presented by e.g. Issler (1942), Firbas et al. (1948), Zoller (1956), Claudel (1963), Ochsenbein (1963), Polge (1963), Frey (1964), Dion (1970), Janssen et al. (1974), Frankenberg (1979), Janssen (1981), Bick (1985), Sell et al. (1998), Bogenrieder (2001), and Hügin (2007).

In the west, calcareous soils prevail on the limestone deposits of the Muschelkalk and Keuper that cover the plains and hills below 400 m asl. Their natural forests include *Quercus robur*, *Ulmus carpinifolia*, *Carpinus betulus* and *Tilia cordata*, in less well-drained areas *Quercus robur* and *Fraxinus excelsior*. On rather dry acid soils also *Quercus petraea* and *Fagus sylvatica* occur. There are many agricultural fields.

The natural vegetation in the belt of Permian and Triassic sandstone between 400 and 600 m above sea level consists of submontane *Quercus petraea*-*Fagus sylvatica* forests and montane *Fagus*-*Abies* forests. Pine plantations occur since ca. AD 1820-1830 on many former heathlands.

Montane *Abies*-*Fagus* forests dominate the western slopes up to ca. 1000 m asl. *Fagus* gains in importance towards higher elevations but is never the sole constituent of the tree layer. Incidentally, *Picea* plantations occur. The valleys are generally cultivated, whereas the hills are forested.

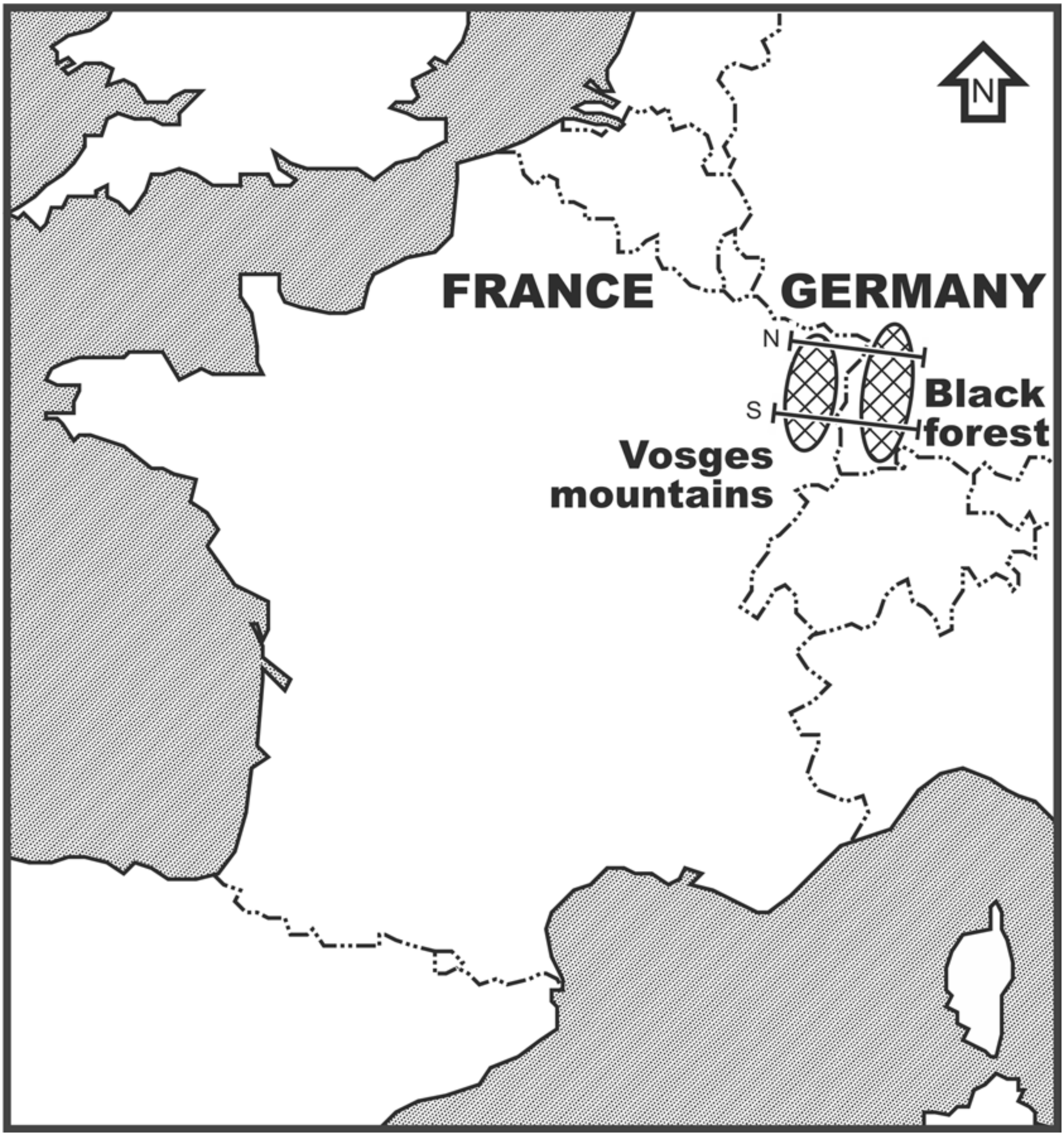

Figure 1. Location of the Vosges Mountains (NE France) and the Black Forest (SW Germany); N: northern cross-section, S: southern cross-section (cf. Fig. 2).

The area between 1000 and 1200 m asl. west of the crest includes mainly *Fagus*, with *Acer pseudoplatanus* and *Sorbus aucuparia. Abies* does not occur above 1100 m. The crest region itself contains a vegetation of shrublike *Fagus* stands ("Krummholz") and extensive subalpine meadows ("Hautes Chaumes") that are dominated by *Vaccinium myrtillus*, *V. vitis-idaea*, *Festuca rubra*, *Nardus stricta*, *Agrostis vulgaris*, *Calluna vulgaris*, *Potentilla erecta* and *Genista pilosa*. These chaumes are considered primarily natural vegetation types above the tree limit (that, thus, is somewhat lower than in the Black Forest). According to Frey (1964), De Valk (1981), Stadel-

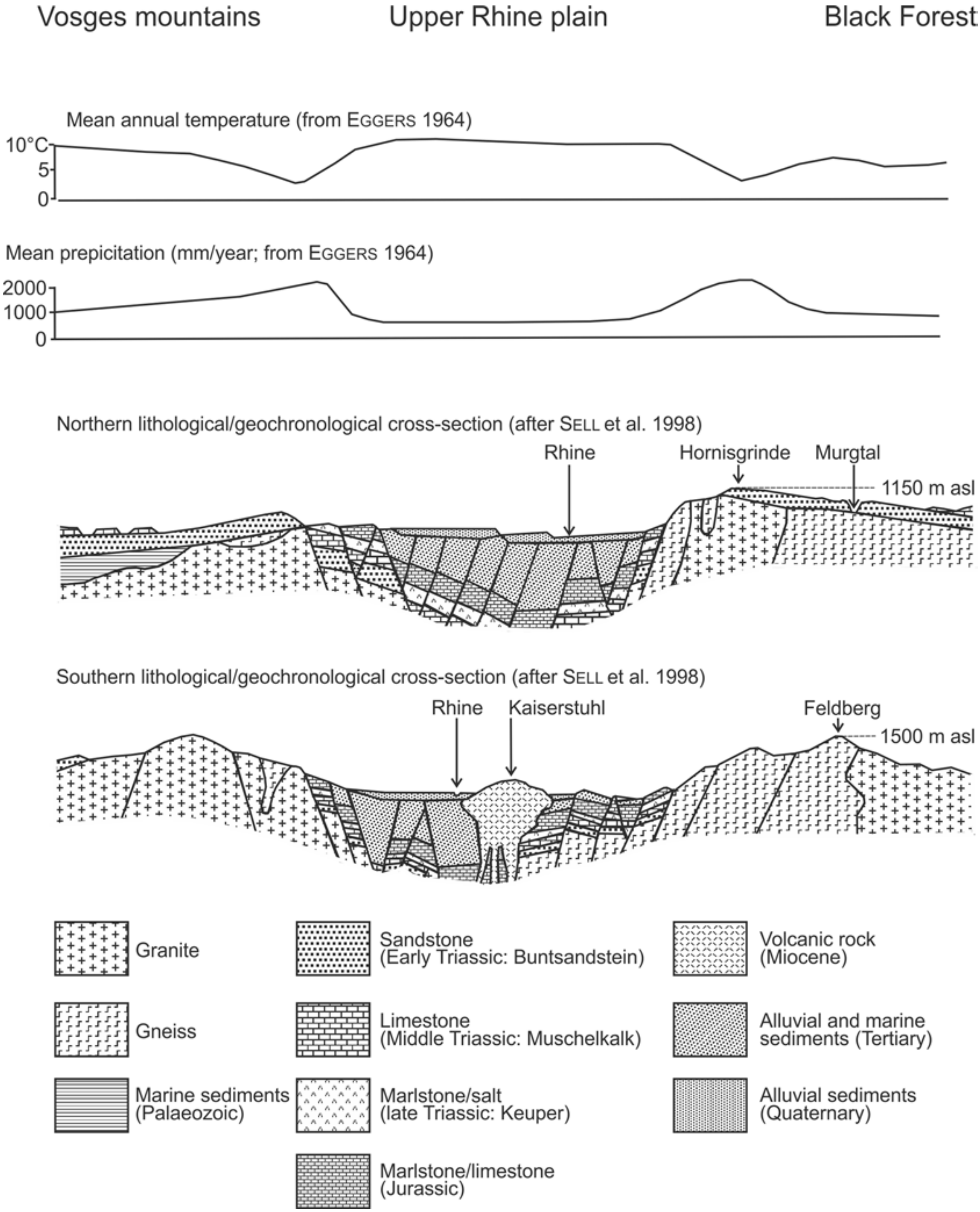

Figure 2. Mean annual temperature, mean precipitation, and lithology/geochronology along transects through the Vosges Mountains, Upper Rhine plain and the Black forest.

bauer (1992) and Vergne (2004), grazing since the Medieval enlarged and modified the chaumes considerably. Goepp (2007), in contrast, assumes that the chaumes are completely secondary and result from deforestation since the late Neolithic. East of the crest, the altitude rapidly declines to 500 m within ca. 3 km distance. Although the forest types resemble those on the western slopes, they are distinctly less developed due to the small size of the area. Many cirques and gorges disturb the "general" slope morphology and have their own typical vegetation. In gorges *Ulmus scabra*, *Tilia cordata*, *Fraxinus excelsior* and *Acer pseudoplatanus* are abundant. Below 500-600 m *Carpinus*, *Juglans*, *Castanea* and *Quercus robur* occur.

A narrow area of Permian sandstone and Triassic limestone along the Upper Rhine plain include *Fagus-Quercus petrea-Pinus* and species-rich *Quercus pubescens* forests respectively. The Upper Rhine plain itself is largely cultivated.

In the Vosges Mountains, agriculture is mainly restricted to the valleys at elevations below ca. 600 m, and only incidentally occurs at greater heights.

The mires carry typical intrazonal vegetation types independent of altitude.

Cultural history

Various stone arrowheads, axes, knives and grindstones scattered across the Vosges Mountains show visits of hunters at higher elevations during the Stone and Metal Ages (Kutsch 1937, Leser et al. 1983, Ehretsmann 1993, Goepp 2007). Additionally, various religious monuments are known that date from the Bronze and Iron Ages (Kutsch 1937, Frey 1964), which show a deep respect of prehistoric humans for the mountains. In Celtic and Roman times some roads crossed the mountain valleys and may also have reached higher elevations (Kutsch 1937, Polge 1963, Stadelbauer 1992). There are indications that first mining activities, predominantly for silver and gold, took place during the Celtic and Roman periods in the surroundings of e.g. St. Dié, Sainte-Marie-aux-Mines, and Château-Lambert (Geyer 1995). The details of these early mining operations are still unknown, but is seems unlikely that long-lasting self-supporting habitation had occurred.

It took considerable time until humans occupied the Vosges Mountains permanently. From the Neolithic to the Migration period, settlements were restricted to the absolute margins of the mountains (Frey 1964, Stadelbauer 1992). After the foundations of monasteries in the Early Medieval (Eggers 1964, Frey 1964, Stadelbauer 1992, Matter 1995, Goepp 2007), the higher elevations became gradually economically more important, and human activities and settlements expanded upwards (Eggers 1964, Stadelbauer 1992). The higher elevations of the mountain range became important for grazing, and many meadows came into existence that – extending from the natural chaumes – enlarged the open vegetation types (Frey 1964). After the Medieval, mining and forestry became more important (Leser 1981, Leser et al. 1983, Barth 1988, Stadelbauer 1992, Geyer 1995, Garnier 2000). Many mines were already exhausted at the end of the 16th century, after which mining activities remained more or less restricted to the southern Vosges (Geyer 1995).

Some economic revival occurred during the 17th and 18th century under the centralised French authorities, and the industrialisation in the 19th centuries resulted in a population increase especially in the valleys (Eggers 1964, Frey 1964, Stadelbauer 1992). Currently production has lost in importance, and industry and agriculture have a predominantly relict character (Polge 1963, Eggers 1964, Frey 1964, Stadelbauer 1992). Many abandoned settlements show that in previous times the population has been larger that at present (Stadelbauer 1992).

3 Vegetation history since the Weichselian Lateglacial

In order to compare the various pollen diagrams from the Vosges Mountains and to characterise their time-ranges, it is necessary to construct a palynostratigraphic reference. A good principle is to identify a sequence of vegetation phases that can be easily recognized in the various pollen diagrams as specific and similar pollen zones (cf. Janssen et al. 1974, Janssen & Törnqvist 1991).

From the large amount of palynological data of the Vosges Mountains, such a palynostratigraphy can easily be constructed, and a theoretical pollen diagram that illustrates the general vegetation development since the Weichselian Lateglacial was pubished by Guillet et al. (1976) and Janssen (1979) (fig. 3). It must be stressed that this "model" pollen sequence has merely illustrative value, since actual pollen diagrams differ greatly between study sites from various landscape units and vegetation types. Furthermore, the gradual upward migration of vegetation along the mountain slopes resulted in an asynchronous initiation of similar vegetation types at different altitudes (cf. Janssen et al. 1974).

For the latter half of the Holocene, especially pollen types of plants that grow at lower altitudes (of which the pollen is dispersed upward by orographic lift) are useful for a palynostratigraphic division, since their trends are synchronously reflected in pollen diagrams from sites at higher elevations, e.g. the pollen types produced by *Quercus*, *Alnus*, *Carpinus*, *Juglans*, *Castanea*, cultivated crops and agricultural herbs (Janssen & Janssen-Kettliz 1972, Janssen et al. 1974, Janssen 1979, De Klerk & Hölzer 2009/2010). However, for the Lateglacial and first half of the Holocene such an approach is not tenable because the present-day vegetation belts had not yet developed and since it is unknown how the vegetation types of that time were actually distributed, it is unknown which pollen types were blown-in from lower elevations (Janssen et al. 1974).

The chronology of the various vegetation phases (cf. fig. 3) can be inferred from the various radiocarbon dates that are available for many palynologicaly analysed sections, whereas for the Weichselian Lateglacial also the Laacher See Tephra (LST) can be used as an important marker for dating and correlation of various sections (cf. Walter-Simmonnet et al. 2008).

The synthetic pollen diagram of fig. 3 displays mainly high values of pollen attributable to herbs during the Weichselian Lateglacial. Some fluctuations are discernable that represent changes in vegetation types during various climatic phases.

During the early Holocene, predominantly *Betula*/*Pinus* forests existed which were later invaded by *Corylus*. This resulted in a distinct Betula/Pinus zone and a Corylus zone in the early Holocene sections of the various pollen diagrams. Probably populations of other deciduous tree species expanded gradually during this time-frame, including *Quercus*, *Ulmus*, *Tilia* and *Fraxinus*. The Corylus zone in many pollen diagrams thus grades into the overlying Corylus/Quercus/Tilia/Ulmus/Fraxinus zone. Although these pollen types show a clear succession in many pollen diagrams (cf. fig. 3), the related vegetation changes were strongly asynchronous at various altitudes and in different landscape regions (Visset et al. 1996). It is thus not practicable to identify more palynostratigraphic zones than a general Corylus/Quercus/Tilia/Ulmus/Fraxinus zone.

The transition to the subsequent Fagus/Abies zone is clearly visible in most pollen diagrams. This transition occurred rapidly within only few centuries (Visset et al. 1996) and was classically assumed to correspond to the transition from a warm and moist climate phase to a colder and drier phase (Hatt 1937, Firbas et al. 1948, Guillet et al. 1976). Increasing anthropogenic impact on the landscape resulted in an increasing deposition of pollen types attributable to cultivated plant taxa (fig. 3).

Whereas *Carpinus* seems to have expanded gradually during the time-frame of the Fagus/Abies zone, the introduction of *Juglans* and *Castanea* in the lower regions during the Roman period (Janssen & Janssen-Kettlitz 1972, Visset et al. 1996) resulted in an easy recognizable and largely synchronous pollen zone boundary that defines the base of the Fagus/Abies/Carpinus/Castanea/Juglans zone. If the temporal resolution of the pollen diagrams is sufficiently high, a further differentiation within this zone is possible by identification of forest regeneration phases during the Migration period, by increased cultivation after the foundation of the monasteries in the early Medieval, and by cultivation phases of specific plant taxa (e.g. *Cannabis*).

After an intensive deforestation during the post-Medieval at the higher altitudes for fuel, constructions of buildings, paper production, and industrial purposes (Polge 1963, Eggers 1964, Stadelbauer 1992, Sell et al. 1998, Garnier 2000), reforestation after ca. 1830/1840 consisted of the plantation of predominantly *Pinus* and *Picea* (cf. Polge 1963, Guillet 1971a, Guillet et al. 1976, Kalis 1984a/b, Sell et al. 1998) which is clearly reflected in most pollen diagrams as a zone with high values of *Pinus* and *Picea* pollen.There is a long-debated question whether *Picea* in the Vosges Mountains occurs naturally, or has been introduced during the plantations after 1830/1840 (cf. Strohmeyer, 1913, Bartsch & Bartsch 1929, Oberdorfer 1937, Firbas et al. 1948, Zoller 1956, Ochsenbein 1963, Polge 1963, Bogenrieder 2001, De Klerk & Hölzer 2009/2010). The studies by Kalis (1984a/b), Kalis et al. (2006) and Edelman (1985) demonstrated unambiguously that *Picea* has been present since several millennia, probably predominantly on mires. However, it seems that the natural *Picea* populations had a considerably lower pollen production than the planted specimens and their descendants (De Klerk & Hölzer 2009/2010).

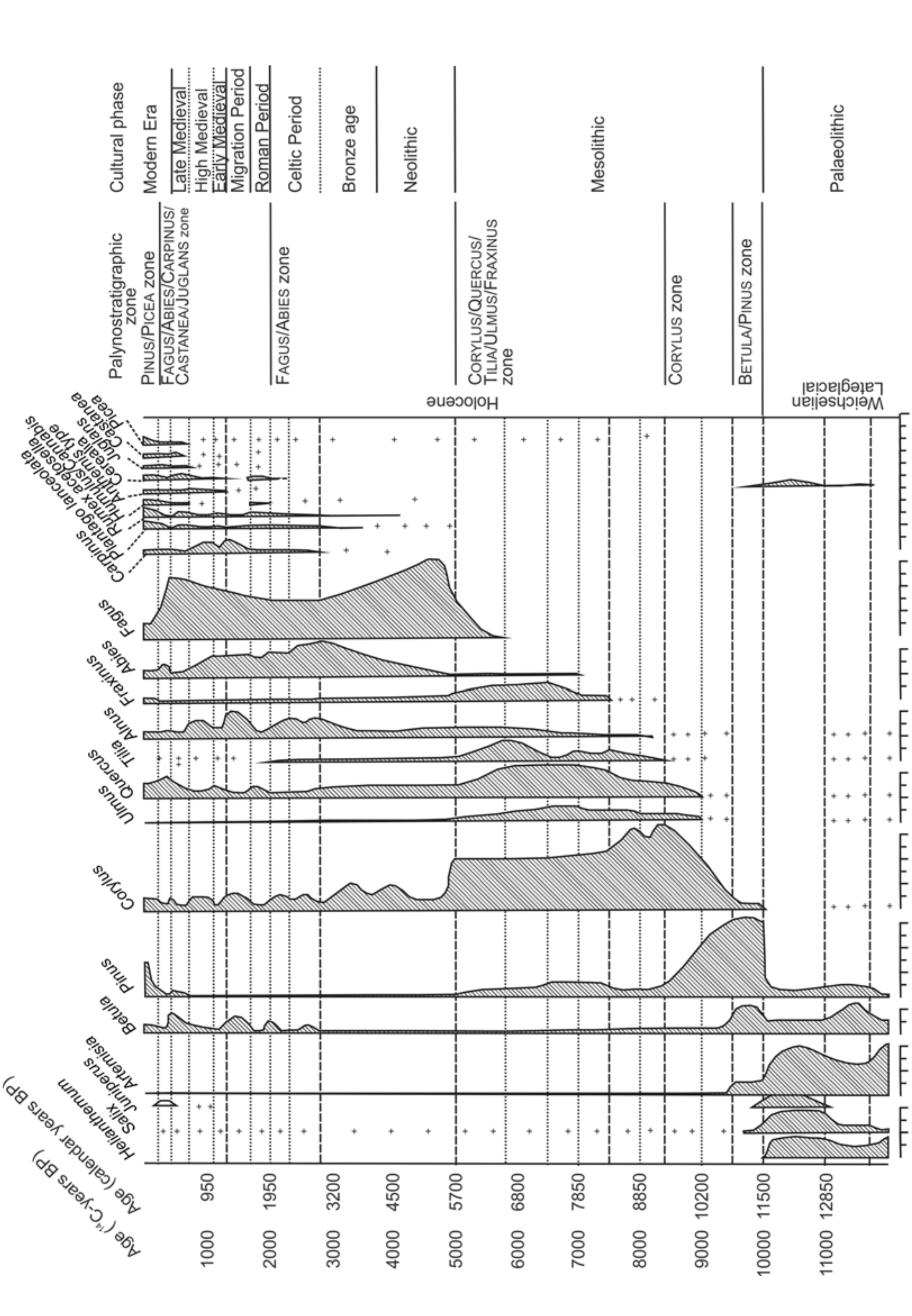

Figure 3. Theoretical pollen diagram of the Vosges Mountains and the inferable palynostratigraphic zones; modified after Guillet et al. (1976) and Janssen (1979).

4 Palynological research in the Vosges Mountains: a historical overview

Figs. 4 and 5 and table 1 show the palynologically analysed sites from the Vosges Mountains known to the present author.
The first palynological analyses from the area originate from the Champ-du-Feu mire and were published around 85 years ago (Dubois & Hatt 1930a). In a publication of the same year, Dubois & Hatt (1930b) also refer to investigations of the Tourbière de la Maxe and of Sutt (Soutte), however without presenting the pollen diagrams. Seven years later three further papers appeared (Dubois & Dubois 1937, Hatt 1937, Oberdorfer 1937). In those early days, palynological research focussed on forest history, and pollen diagrams displayed only few pollen types attributable to trees and incidentally some types attributable to herbs. The sample interval was generally large, resulting in a low temporal resolution. Exceptions are the diagrams from the Ohnenheim and Urbis sites by Oberdorfer (1937), which partly have a resolution of 2-5 cm. Although the value of these early pollen diagrams seems somewhat restricted compared to the present-day scientific standard, they provide valuable information on phases of mire development.
In the 1940-ies, six mires were studied by a research group headed by Franz Firbas, of which the results were published after World War II (Firbas et al. 1948). This research represents a major breakthrough in the development of palynological science: a considerable amount of pollen types, including types produced by herbaceous plant taxa, was presented with a high temporal resolution. The pollen curves were displayed as single curves next to each-other in contrast to the general use at that time of crossing and overlapping lines. This resulted in a clear picture of regional vegetation development since the Weichselian Lateglacial. For the first time, Firbas used his concepts of pollen zones which he shortly afterwards described elaborately in his books on the forest development north of the Alps (Firbas 1949, 1952). Detailed descriptions of sediment/sedentate layers and their macrofossil content provide additionally valuable data on local mire development. In this sense, the publication of Firbas et al. (1948) was probably the most advanced palynological study of its time.
From the nineteenfifties, no publications on the vegetation history in the Vosges Mountains are known to the present author. In the following decades various palynological studies appeared. The work of Lemée (1963) provides many scientific statements that are, however, hardly supported by his pollen diagrams. Dresch et al. (1966) present four pollen diagrams from the Grand Ballon region that allow a good reconstruction of the Holocene vegetation history. The study of Teunissen & Schoonen (1973) presents a high-resolution pollen diagram covering the Weichselian Lateglacial. Durand & Guillet (1966) – although presenting relative coarse pollen diagrams – bring the research of vegetation history of the Vosges Mountains to a higher level by introducing the use of radiocarbon dates. Other research by Guillet (1968, 1970, 1971a/b) concentrates on the development of terrestrial soils. Due to differences in pollen preservation processes, it is difficult to directly compare pollen diagrams of soils with those of peat (cf. Munaut 1967, Havinga 1974, Andersen 1986), but, on the other hand, soil profiles provide valuable information on local vegetation history of dry soils that cannot be inferred from the regional pollen deposition in the centres of large wetlands.
In 1966, an interdisciplinary study group ("Werkgroep Vogezen") from Utrecht University started a long-term palynological research project in order to study vegetation history at different altitudes and indifferent landscape units (Janssen 1974, Janssen et al. 1985). The research concentrated on a ca. 70 km long and 30-40 km wide belt across the mountains, yet also some sites further to the north have been investigated. Under the motto "The present is the key to the past", the project also included the study of present-day vegetation in order to better understand and interpret fossil pollen sequences. An important tool was the analysis of palynological surface samples from various vegetation types on a micro- (small typical areas) and a macro-scale (the various vegetation types of the complete mountain range) (Janssen et al. 1974, Tamboer-Van den Heuvel & Janssen 1976, Janssen 1981, De Valk 1981, Edelman 1985, Kalis 1985). Also geomorphology and other abiotic landforming parameter were taken into account (Salomé 1968, 1970, 1973, 1974, Salomé & Weiss 1970). Three major PhD studies dealt with the present-day and past vegetation of the Kastelberg area (De Valk 1981), the Goutte Loiselot mire (Edelman 1985) and the Foret de la Bresse (Kalis 1985), whereas a fourth PhD-thesis described in great detail actual mire vegetation (Bick 1985). Apart from these, a large variety of smaller publications appeared (table 1). Also a number of MSc-theses from Utrecht University deal with the vegetation history of the Vosges

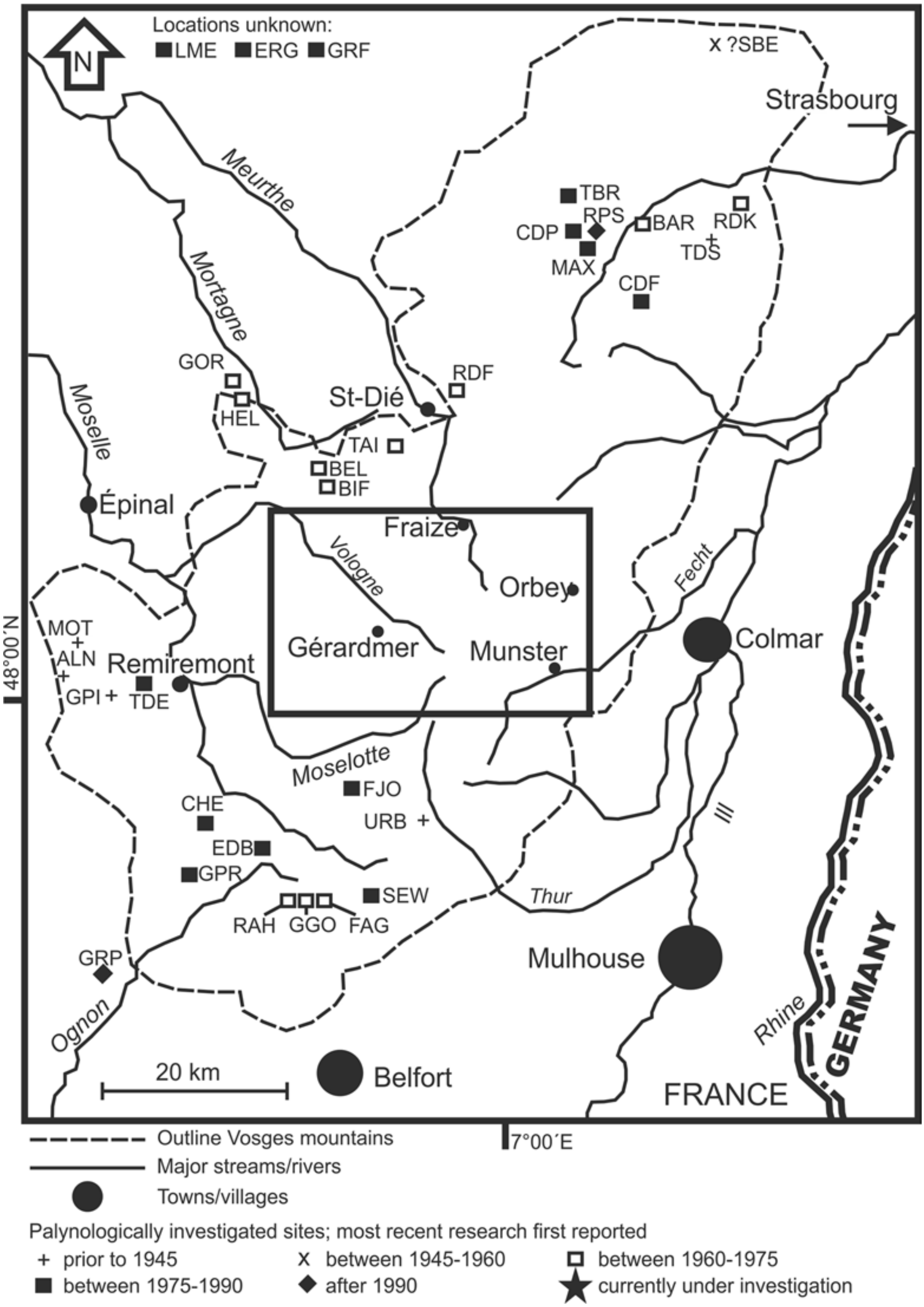

Figure 4. Location of palynologically analysed sites in the Vosges Mountains; indicated is the area of Figure 5. Site code see tab. 1 (p. 29 ff.).

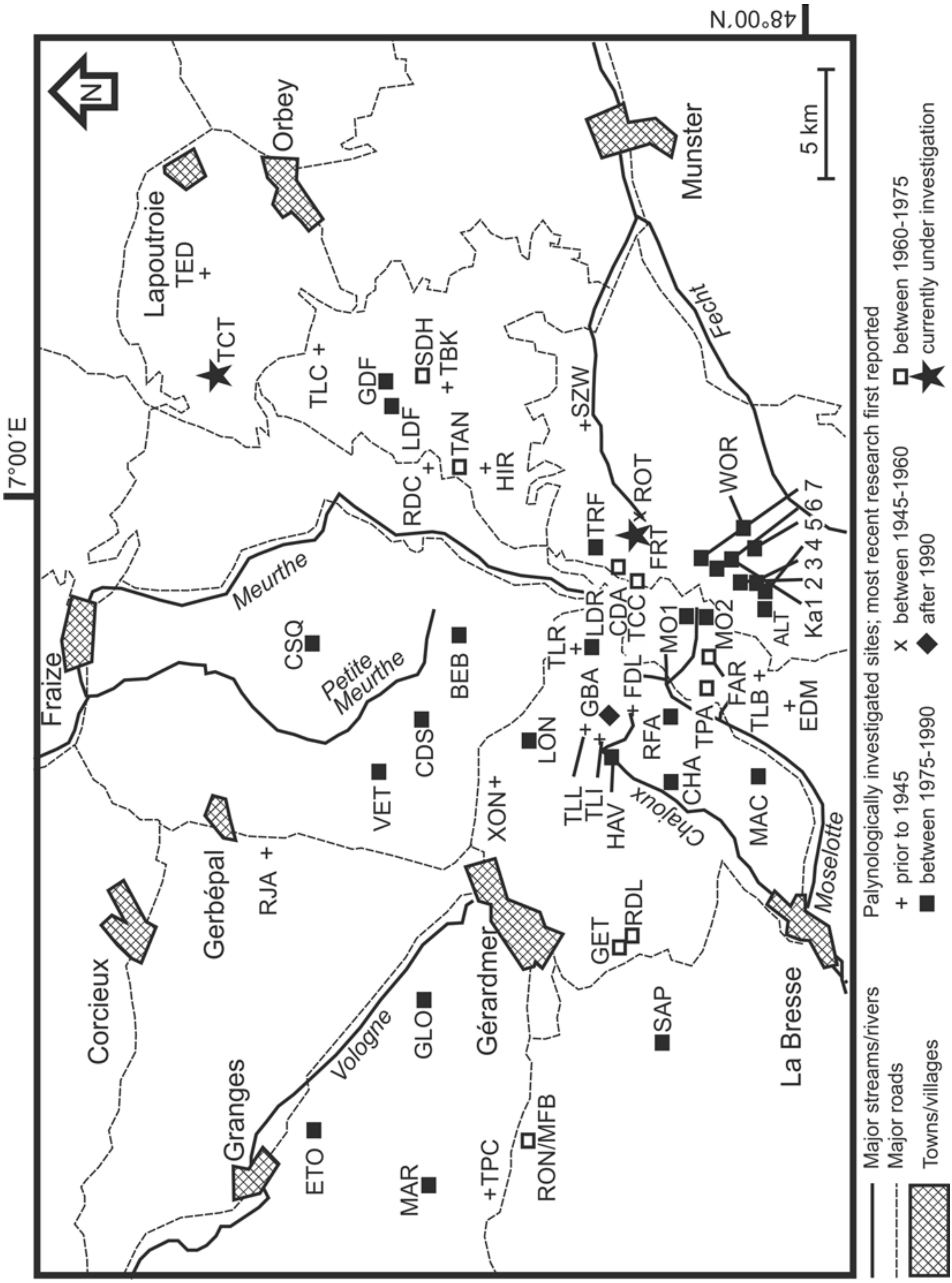

Figure 5. Palynologically analysed sites in the Central Vosges Mountains. Site code see tab. 1 (p. 29 ff.).

Mountains (table 1, cf. Janssen & Punt 1998), but these data are not yet widely available to the scientific audience. A summary of the results of the "Werkgroep Vogezen" was published by Visset et al. (1996). After his retirement, C. R. Janssen (pers. com.) started preparing a book on the work of the research group which will provide access to many currently still unpublished pollen diagrams. After the study of the Vosges Mountains, the aim was to continue similar research in other mountain belts, including the Mont-du-Forez, Sierra Cabrera Baja and Galicia, and the Serra da Estrela (Janssen & Punt 1998).

Apart from the work of the Utrecht research group, a number of other studies were carried out during the nineteenseventies and -eighties that concentrated on various regions of the Vosges Mountains, e.g. Darmois-Theobald et al. (1976), Schloss (1979), and Darmois-Theobald & Denèfle (1981). The study of Woillard (1975) concentrated on the Pleistocene and provides valuable information on the vegetation history since the late Saalian, including the well-known "Grande Pile" site (cf. Woillard 1978, De Beaulieu & Reille 1992).

Hardly any studies appeared in the nineties (cf. table 1). From the first 14 years of the 21th century, the studies of Sudhaus (2005) and Kalis et al. (2006) are noteworthy. The paper of Walter-Simmonet et al. (2008) shows the occurrence of several tephra layers in the Vosges Mountains that may be useful for dating and correlation of sites in the future. Charcoal investigations from former fire sites ("Kohlenmeiler") provide additional information on the species-composition of forests and on forestry since the Medieval (e.g. Nölken 2005). Research in progress by the University of Innsbruck concentrates on a site in the northern part of the Vosges Mountains (J. N. Haas, pers. com.).

Research from a team at the Staatliches Museum für Naturkunde Karlsruhe started in 2006 and deals with the Tourbière Chaume Thiriet and the Cirque de Frankenthal. These studies focus on high resolution pollen analysis of the last 1000-2000 years in combination with geochemistry and macrofossil analysis, and on the identification of short-distance variation in local mire vegetation and peatland development (De Klerk & Hölzer 2009/2010).

5 Concluding remarks

A total of over 180 pollen diagrams exist from around 90 sites in the Vosges Mountains, which are the result of palynological research since 1930. Thus, an extremely detailed dataset exists on the vegetation history of this mountain range, although not all studies are currently easily accessible. Most studies up to now deal with the reconstruction of vegetation history of single sites, with only few trying to place this vegetation history in a regional context. Especially the work by the Utrecht group under supervision of C. R. Janssen provided data on vegetation and on vegetation history in a large spatial context. Building on the available data, future studies could focus on special research questions beyond the frame of vegetation history in general.

Acknowledgments

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References

Andersen, S. T. (1986): Palaeoecological studies of terrestrial soils. – In: Berglund, B. E. (ed.): Handbook of Holocene Palaeoecology and Palaeohydrology: 165-177; Chichester (Wiley).

Barth, A. (1988): Prolégomène à l'histoire des mines de la vallée de Munster. – Annuaire de la Société d'histoire du Val et de la Ville de Munster **42**: 27-35.

Bartsch, J. & Bartsch, M. (1929): Buche, Tanne und Fichte im Südschwarzwald und in den Südvogesen. – Verhandlungen des Botanischen Vereins der Provinz Brandenburg **71**: 131-142.

Bick, H. (1985): Die Moorvegetation der zentralen Hochvogesen. – Dissertationes Botanicae **91**: 1-288.

Bick, H., Edelman, H. J., Janssen, C. R., Kalis, A. J., van der Knaap, W. O. & van Leeuwen, J. F. N. (1988): Moor-Exkursion mire excursion veenekskursie Vogesen Vosges Vogezen. – 82 pp; Utrecht (Laboratory of Palaeobotany and Palynology).

Bogenrieder, A. (2001): Schwarzwald und Vogesen – ein vegetationskundlicher Vergleich. – Mitteilungen des Badischen Landesvereins für Naturkunde und Naturschutz **N.F. 17**: 745-792.

Bunnik, F. P. M. (1978): Een pollenanalytisch onderzoek van twee venen in de noordelijke Vogezen (Champ du Feu, Col de Prayé). – 24 pp; Utrecht (MSc-thesis Utrecht University).

Carbiener, R. (1963): Les sols du Massif du Hohneck leurs rapports avec le tapis végétal. – In: Le Hohneck. Aspects physiques biologiques et humains: 103-154; Strasbourg (L'association Philomathique d'Alsace et de Lorraine).

Claudel, F. (1963): Les forêts du versant oriental. – In: Le Hohneck. Aspects physiques biologiques et humains: 379-382; Strasbourg (L'association Philomathique d'Alsace et de Lorraine).

Darmois-Théobald, M. & Denèfle, M. (1981): Observations sur la végétation Holocène des Vosges Méridionales et de leur piémont Haut-Saônois (France). – Annales Scientifiques de l'Université de Franche Comté-Besançon – Géologie **3**, 4ème Serie: 3-12.

Darmois-Théobald, M., Denèfle, M. & Menillet, F. (1976): Tourbières de moyenne altitude de la Forêt de Haute-Meurthe (Vosges, France). – Bulletin de l'Association Française pour l'Étude du Quaternaire **1976-2**: 99-107.

De Beaulieu, J.-L. & Reille, M. (1992): The last climatic cycle at La Grande Pile (Vosges, France): a new pollen profile. – Quaternary Science Reviews **11**: 431-438.

De Klerk, P. & Hölzer, A. (2009/2010): Hochauflösende Pollendiagramme vom Tourbière Chaume Thiriet (Südvogesen, NO Frankreich) zeigen kleinräumige Muster im Pollenniederschlag während der letzten 2000 Jahre. – Annales scientifiques de la réserve de biosphère transfrontalière Vosges du Nord-Pfälzerwald / Wissenschaftliches Jahrbuch des grenzüberschreitenden Biosphärenreservates Pfälzerwald-Vosges du Nord **15**: 288-304.

De Klerk, P. & Joosten, H. (2007): The difference between pollen types and plant taxa: a plea for clarity and scientific freedem. – Eiszeitalter und Gegenwart/ Quaternary Science Journal **56**: 162-171.

De Valk, E. J. (1974): Enkele palynologische opmerkingen over de boomgrens in de Vogezen. – In: Vogezen Symposion 1974. Geomorfologisch, bodemkundig, vegetatiekundig en palaeobotanisch onderzoek van de Centrale Vogezen: 54-61; Utrecht (Utrecht University).

De Valk, E. J. (1979): Pollenanalytical contributions towards Late-Holocene history of the subalpine plant communities of the Kastelberg (Vosges, France). – In: Wilmanns, O. & Tüxen, R. (eds.): Werden und Vergehen von Pflanzengesellschaften (Rinteln, 20.-23. März 1978). – Berichte der Internationalen Symposien der Internationalen Vereinigung für Vegetationskunde: 269-284; Vaduz (Cramer).

De Valk, E. J. (1981): Late Holocene and present vegetation of the Kastelberg (Vosges, France). – 294 pp. Utrecht (PhD-thesis, Utrecht University).

Dion, J. (1970): Les forêts de la France du nord-est. – Revue Géographique de l'Est **12**: 155-277.

Dresch, J., Elhai, H. & Denefle-Labiole, M. (1966): Analyse pollinique de quatre tourbières du Ballon d'Alsace (Vosges, France). – Compte Rendu des Séances de la Société de Biogéographie **376**: 78-89.

Dubois, G. & Dubois, C. (1937): Note sur les affleurements tourbeux de la Route des Crêtes au nord de la Schlucht (Vosges). – Bulletin du Service de la Carte Géologique d'Alsace et de Lorraine **4**: 80-82.

Dubois, G. & Hatt, J.-P. (1930a): La Tourbière du Champ-du-Feu. – Bulletin de la Société Géologique de France **30**: 1027-1041.

Dubois, G. & Hatt, J.-P. (1930b): Tourbières et modifications forestières postglaciaires des Vosges moyennes. – Comptes Rendus hebdomadaires des Séances de l'Academie des Sciences **191**: 674-675.

Durand, G. L. & Guillet, B. (1966): Datation de la tourbière du Beillard par la méthode du ^{14}C. – Comptes rendus des séances de l'Académie des Sciences **262**, Série D Sciences naturelles: 28-31.

Edelman, H. J. (1985): Late Glacial and Holocene vegetation development of La Goutte Loiselot (Vosges, France). – 197 pp. Utrecht (PhD-thesis, Utrecht University).

Eggers, H. (1964): Schwarzwald und Vogesen – ein vergleichender Überblick – 144 pp; Braunschweig (Westermann).

Ehretsmann, M. (1993): Découvertes archéologiques récentes de matériel lithique sur les Hautes Vosges. – Annuaire de la Société d'histoire du Val et de la Ville de Munster **47**: 11-20.

Firbas, F. (1949): Spät- und nacheiszeitliche Waldgeschichte Mitteleuropas nördlich der Alpen. Erster Band: Allgemeine Waldgeschichte. – 480 pp; Jena (Fischer).

Firbas, F. (1952): Spät- und nacheiszeitliche Waldgeschichte Mitteleuropas nördlich der Alpen. Zweiter Band: Waldgeschichte der einzelnen Landschaften. – 256 pp; Jena (Fischer).

Firbas, F., Grünig, G., Weischedel, I. & Worzel, G. (1948): Beiträge zur spät- und nacheiszeitlichen Vegetationsgeschichte der Vogesen. – Bibliotheca Botanica **121**: 1-76.

Frankenberg, P. (1979): Schwarzwald und Vogesen, ein pflanzengeographisch-floristischer Vergleich. – Arbeiten zur rheinischen Landeskunde **47**: 1-44.

Frey, C. (1964): Vergleichende Betrachtungen zur Kulturgeographie von Vogesen und Schwarzwald. – Regio Basiliensis **5**: 45-62.

Friedmann, A. & Küster, H. (1998): Verzeichnis pollenanalytisch untersuchter Moore und Seen im südlichen Oberrheintiefland, im Schwarzwald und in den Vogesen. – Freiburger Geographische Hefte **54**: 175-189.

Garnier, E. (2000): ‚The coveted tree': the industrial threat to the Vosges forests in the 16th and 18th centuries. – In: Agnoletti, M. & Anderson, S. (eds): Forest history: international studies on Socio-economic and forest ecosystem change. – Report no. 2 of the IUFRO Task Force on environmental change: 37-47. (CABI Publishing/International Union of Forestry Research Organizations (IUFRO)).

Gevelaar, A. J. (1982): Palynologie van de Marais de la Max, noordelijke Vogezen. – Utrecht (MSc-thesis, Utrecht University).

Geyer, M. (1995): Historische Bergbaureviere in den Vogesen. – Jahresberichte und Mitteilungen des Oberrheinischen Geologischen Vereines NF **77**: 247-264.

Goepp, S. (2007): Origine, histoire et dynamique des Hautes-Chaumes du massif vosgien. – 286 pp; Strasbourg (PhD-thesis, Louis Pasteur University).

Guillet, B. (1968): Essai de détermination de l'age de deux podzols Vosgiens par la palynologie. – Oecologia Plantarum **3**: 101-119.

Guillet, B. (1970): Étude palynologique des podzols. I. – La podzolisation sur alluvions anciennes en Lorraine. – Pollen et Spores **12**: 45-69.

Guillet, B. (1971a): Étude palynologique des podzols. II. La podzolisation sur les versants secs gréseux des basses-Vosges. – Pollen et Spores **13**: 233-254.

Guillet, B. (1971b): Étude palynologique des podzols: III. – La podzolisation sur granite dans les Vosges hercyniennes de l'étage montagnard. Comparaison avec la podzolisation dans les basses Vosges grèseuses et sur le plateau Lorrain. – Pollen et Spores **13**: 421-446.

Guillet, B., Janssen, C. R., Kalis, A. J. & De Valk, E. J. (1976): La végétation pendant le Post-Glaciaire dans l'Est de la France. – In: Guilaine, J. (ed.): La Préhistoire francaise, 2: civilisations néolithiques et protohistoriques: 82-87; Paris (Edition C.N.R.S.).

Hatt, J.-P. (1937): Contribution a l'analyse pollinique des tourbières du nord-est de la France. – Bulletin du Service de la Carte Géologique d'Alsace et de Lorraine **4**: 1-79.

Havinga, A. J. (1974): Problems in the interpretation of pollen diagrams of mineral soils. – Geologie en Mijnbouw **53**: 449-453.

Hügin, G. (2007): Schwarzwald und Vogesen – ein Florenvergleich (Farn- und Samenpflanzen). – Mitteilungen des Badischen Landesvereins für Naturkunde und Naturschutz N.F. **20**: 1-103.

Issler, E. (1942): Vegetationskunde der Vogesen. – Pflanzensoziologie **5**: 1-192.

Janssen, C. R. (1974): Overzicht van het palaeobotanisch onderzoek in de Vogezen en enkele opmerkingen over de synchroniteit van pollen zones. – In: Vogezen Symposion 1974. Geomorfologisch, bodemkundig, vegetatiekundig en palaeobotanisch onderzoek van de Centrale Vogezen: 37-47; Utrecht (Utrecht University).

Janssen, C. R. (1979): Pollen-Assoziation als Ausdruck der Vegetation. – In: Wilmanns, O. & Tüxen, R. (eds.): Werden und Vergehen von Pflanzengesellschaften (Rinteln, 20.-23. März 1978). – Berichte der Internationalen Symposien der Internationalen Vereinigung für Vegetationskunde; 253-261; Vaduz (Cramer).

Janssen, C. R. (1981): Contemporary pollen assemblages from the Vosges (France). – Review of Palaeobotany and Palynology **33**: 183-313.

Janssen, C. R. & Braber, F. I. (1987): The present and past grassland vegetation of the Chajoux and Moselotte valeys (Vosges, France). 2. Dynamic aspects and origin of grassland vegetation in the Chajoux valley, interpreted from the contrast between regional and local pollen deposition of dominant pollen types and the distribution of pollen indicators in pollen diagrams. – Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen **C90**: 115-138.

Janssen, C. R., Braber, F. I., Bunnik, F. P. M., Delibrias, G., Kalis, A. J. & Mook, W. G. (1985): The significance of chronology in the ecological interpretation of pollen assemblages of contrasting sites in the Vosges. – Ecologia Mediterranea **11**: 39-43.

Janssen, C. R., Cup-Uiterwijk, M. J. J., Edelman, H. J., Mekel-Te Riele, J. & Pals, J. P. (1975): Ecologic and paleoecologic studies in the Feigne d'Artimont (Vosges, France). – Vegetatio **30**: 165-178.

Janssen, C. R. & Janssen-Kettlitz, E. L. (1972): A post-Atlantic pollen sequence from the Tourbière du Tanet (Vosges, France). – Pollen et Spores **14**: 65-77.

Janssen, C. R., Kalis, A. J., Tamboer-Van den Heuvel, G. & De Valk, E. J. (1974): Palynological and paleoecological investigations in the Vosges (France): a research project. – Geologie en Mijnbouw **53**: 406-414.

Janssen, C. R. & Punt, W. (1998): Fourty years pollen morphology and terrestrial quaternary palaeobotany and palynology 1959-1998. – LPP Contributions Series **11**: 1-68.

Janssen, C. R. & Salomé, A. I. (1974): Voorlopige resultaten van een onderzoek in Le Ronfaing, Cleuriedal (Vogezen). – Berichten Fysisch Geografische Afdeling **8**: 21-24.

Janssen, C. R. & Törnqvist, T. E. (1991): The role of scale in the biostratigraphy and chronostratigraphy of the Holocene Series in The Netherlands. – The Holocene **1**: 112-120.

Joosten, H. & De Klerk, P. (2002): What's in a name? Some thoughts on pollen classification, identification, and nomenclature in Quaternary palynology. – Review of Palaeobotany and Palynology **122**: 29-45.

Kalis, A. J. (1984a): Forèt de la Bresse (Vogezen), vegetatiekundige en pollenanalytische onderzoekingen naar de bosgeschiedenis van een Centraal-Europees middelgebergte. – 349 pp; Utrecht (PhD-thesis, Utrecht University).

Kalis, A. J. (1984b): L'indigénat de l'epicéa dans les Hautes Vosges. – Revue de Paléobiologie Volume Spécial: 103-115.

Kalis, A. J. (1985): Un miroir éloigné: les défrichements anthropogènes dans les zones de basse altitude, réfléchis dans des diagrammes polliniques montagnards. – In: Renault-Miskovsky, J., Bui-Thi-Mai & Girard, M. (eds.): Palynologie Archéologique. – Actes des journées du 25-26-27 janvier 1984; 195-211.

Kalis, A. J. (2014): La Forêt de La Bresse à travers les temps onze mille ans d'histoire de la végétation d'une haute Vallée des Vosges. – In: Rothiot, J.-P. & Husson, J.-P. (eds.): La Bresse et ses Vallées. Mémoires et histoire de la montagne; 45-60. La Bresse (Fédération des Sociétes Savantes des Vosges).

Kalis, A. J., Van der Knaap, W. O., Schweizer, A. & Urz, R. (2006): A three thousand year succession of plant communities on a valley bottom in the Vosges Mountains, NE France, reconstructed from fossil pollen, plant macrofossils, and modern phytosociological communities. – Vegetation History and Archaeobotany **15**: 377-390.

Kauffmann, E. (1994): L'approche des successions végétales par la palynologie: exemple de la tourbière du Frankenthal dans les Hautes Vosges Centrales. – 41 p.; Strasbourg (MSc-thesis, Strasbourg University).

Kessler, P. (1914): Die Entstehung von Schwarzwald und Vogesen. Dargestellt in 13 Profilen auf Tafel I und II. – Jahresberichte und Mitteilungen des Oberrheinischen geologischen Vereines NF **4**: 30-35.

Konings, M. H. A. R. (1978): Een pollenanalytisch onderzoek van een profiel van een veen bij de Col de Sapois – 22 pp; Utrecht (MSc-thesis, Utrecht University).

Kool, R. P. (1978): Faigne Lac Forlet en het Gazon du Faing – een pollenanalytisch verslag uit de Vogezen – 21 pp.; Utrecht (MSc-thesis, Utrecht University).

Kutsch, C. (1936): Vor- und Frühgeschichtliches aus dem Münstertal. – Jahrbuch des Geschichtvereins für Stadt und Tal Münster/Annuaire de la Société d'histoire du Val et de la Ville de Munster **10**: 14-22.

Lemée, G. (1963): L'évolution de la végétation et du climat des Hautes Vosges Centrales depuis la dernière glaciation. – In: Le Hohneck. Aspects physiques biologiques et humains: 185-192; Strasbourg (L'association Philomathique d'Alsace et de Lorraine).

Leser, G. (1981): Silberwald et Heidenbach: témoins des anciennes activités minières, les derniers résultats. – Annuaire de la Société d'histoire du Val et de la Ville de Munster **35**: 117-120.

Leser, G., Sainty, J. & Schnitzler, B. (1983): Bilan des decouvertes archeologiques dans la Vallée de Munster. – Annuaire de la Société d'histoire du Val et de la Ville de Munster **37**: 7-24.

Matter, J. (1996): Communitas Vallis St. Gregorii II – 1525-1789. Die Geschichte der Gemeinschaft Stadt und Tal Münster vom Bauernkrieg bis zur Großen Revolution. – Annuaire de la Société d'histoire du Val et de la Ville de Munster **50**: 11-26.

Millot, G. (1963): Géologie des environs du Hohneck. – In: Le Hohneck. Aspects physiques biologiques et humains: 11-14. Strasbourg (L'Association Philomathique d'Alsace et de Lorraine).

Munaut, A. V. (1967): Recherches paleo-ecologiques en basse et moyenne Belgique. – Acta Geographica Lovaniensia **6**: 1-191.

Nölken, W. (2005): Holzkohleanalytische Untersuchungen zur Waldgeschichte der Vogesen – 182 pp.; Freiburg (PhD-thesis, Freiburg University).

Oberdorfer, E. (1937): Zur spät- und nacheiszeitliche Vegetationsgeschichte des Oberelsasses und der Vogesen. – Zeitschrift für Botanik **30**: 513-572.

Ochsenbein, G. (1963): La végétation du Hohneck. – In: Le Hohneck. Aspects physiques biologiques et humains: 157-184; Strasbourg (L'association Philomathique d'Alsace et de Lorraine).

Polge, H. (1963): Les forêts du versant occidental. – In: Le Hohneck. Aspects physiques biologiques et humains: 361-377; Strasbourg (L'association Philomathique d'Alsace et de Lorraine).

Rothé, J.-P. & Herrenschneider, A. (1963): Climatologie du Massif du Hohneck. – In: Le Hohneck. Aspects physiques biologiques et humains: 63-93; Strasbourg (L'Association Philomathique d'Alsace et de Lorraine).

Salomé, A. I. (1968): A geomorphological study of the drainage area of the Moselotte and upper Vologne in the Vosges (France). – Utrecht (PhD-thesis, Utrecht University).

Salomé, A. I. (1970): Enige glaciale vormen in het stroomgebied van de Moselotte, Vogezen. – K.N.A.G. Geografisch Tijdschrift n.s. **4**: 238-245.

Salomé, A. I. (1973): Het sneeuwdek in de Hoge Vogezen en de invloed hiervan op een geomorfologisch proces. – K.N.A.G. Geografisch Tijdschrift **7**: 21-28.

Salomé, A. I. (1974): Geomorfologisch overzicht van de Hoge Vogezen, met enkele opmerkingen over het klimaat. – In: Vogezen Symposion 1974. Geomorfologisch, bodemkundig, vegetatiekundig en palaeobotanisch onderzoek van de Centrale Vogezen: 7-14; Utrecht (Utrecht University).

Salomé, A. I. & Weiss, E. E. J. (1970): Enige resultaten van warventellingen uit de Vogezen. – Berichten Fysisch Geografisch Instituut Utrecht **2**: 3-8.

Schloss, S. (1979): Pollenanalytische und stratigraphische Untersuchungen im Sewensee: Ein Beitrag zur spät- und postglazialen Vegetationsgeschichte der Südvogesen. – Dissertationes Botanicae **52**: 1-138.

Schober, G. & Wassenaar, D. P. J. (1978): Verslag van een pollenanalytisch onderzoek van een veen uit de zuidelijke Vogezen (La Mer). – Utrecht (MSc-thesis, Utrecht University).

Schober, G. & Wassenaar, D. R. J. (1979): Pollenanalytisch onderzoek van afzettingen in het Étang de Rochalins in de zuidwestelijke Vogezen. – 11 pp.; Utrecht (Internal report, Utrecht University).

Sell, Y., Berchtold, J.-P., Callot, H., Hoff, M., Gall, J.-C. & Walter, J.-M. (1998): L'Alsace et les Vosges. Géologie, milieux naturels, flore et faune. – 351 pp; Lausanne/Paris (Delachaux et Niestlé).

Souchier, B. (1971): Évolution des sols sur roches cristallines à l'étage montagnard (Vosges). – Mémoires du Service de la Carte Géologique d'Alsace et de Lorraine **33**: 1-134.

Stadelbauer, J. (1992): Ressourcenbewertung und Siedlungsentwicklung in höheren Mittelgebirgen am Beispiel der Vogesen. – Siedlungsforschung: Archäologie-Geschichte-Geographie **10**: 79-104.

Strohmeyer (1913): Über das natürliche Vorkommen der Fichte (*Picea excelsa* Lk.) in den Vogesen. – Naturwissenschaftliche Zeitschrift für Forst- und Landwirtschaft **11**: 143-151.

Sudhaus, D. (2005): Paläoökologische Untersuchungen zur spätglazialen und holozänen Landschaftsgenese des Ostschwarzwaldes im Vergleich mit den Buntsandsteinvogesen. – Freiburger Geographische Hefte **64**: 1-153.

Tamboer-Van den Heuvel, G. & Janssen, C. R. (1976): Recent pollen assemblages from the crest region of the Vosges Mountains (France). – Review of Palaeobotany and Palynology **21**: 219-240.

Teunissen, D. & Schoonen, J. M. C. P. (1973): Vegetations- und sedimentationsgeschichtliche Untersuchungen am Grand Étang bei Gérardmer (Vogesen). – Eiszeitalter und Gegenwart **23/24**: 63-75.

Tricart, J. (1963): Aspects et problèmes géomorphologiques du Massif du Hohneck. – In: Le Hohneck. Aspects physiques biologiques et humains: 43-62; Strasbourg (L'Association Philomathique d'Alsace et de Lorraine).

Van den Hoek Ostende, L. (1986): Een pollenanalytisch onderzoek van het Étang d'Orong (Vosges, France), met nadruk op de Laatglaciale vegetatiegeschiedenis. – Utrecht (MSc-thesis, Utrecht University).

Van Waveren, I. M. (1982): Laat-Holocene pollen stratigrafie van het Lac Retournemer en Laat-Glaciale pollen stratigrafie van het Lac Longemer, Vogezen. – Utrecht (MSc-thesis, Utrecht University).

Vergne, V. (2004): Les premiers indices d'impact de l'homme sur le couvert végétal des Vosges. Apport de la Bibliographie. – In: Richard, H. (ed.): Néolithisation précoce. Premières traces d'anthropisation du couvert végétal à partir des données polliniques. – 127-133; Franc-Comtoises (Presses Universitaires Franc-Comtoises).

Visset, L., Aubert, S., Belet, J. M., David, F., Fontugne, M., Galop, D., Jalut, G., Janssen, C. R., Voeltzel, D. & Huault, M. F. (1996): France. – In: Berglund, B. E., Birks, H. J. B., Ralska-Jasiewiczowa, M. & Wright, H. E. (eds): Palaeoecological events during the last 15000 years: Regional syntheses of palaeoecological studies of lakes and mires in Europe. – 575-645; Chichester (Wiley).

Walter, R. (1992): Geologie von Mitteleuropa. – 5. Auflage; 561 pp.; Stuttgart (Schweizerbart).

Walter-Simonnet, A.-V., Bossuet, G., Develle, A.-L., Bégeot, C., Ruffaldi, P., Magny, M., Adatte, T., Rossy, M., Simonnet, J.-P., de Beaulieu, J.-L., Vannière, B., Thivet, M., Millet, L., Regent, B. & Wackenheim, C. (2008): Chronologie et spatialisation de retombées de cendres volcaniques tardiglaciaires dans les massifs des Vosges et du Jura et le plateau Suisse. – Quaternaire **19**: 117-132.

Wester, M. A. (1979): Een palynologisch onderzoek van Les Grands Faings (zuidelijke Vogezen). – Utrecht (MSc-thesis, Utrecht University).

Willers, A. F. M. (1979): Faigne Lac Forlet, een pollenanalytisch verslag van het onderste deel van het profiel FLF. – Utrecht (MSc-thesis, Utrecht University).

Woillard, G. (1975): Recherches palynologiques sur le Pleistocene dans l'est de la Belgique et dans les Vosges Lorraines. – Acta Geographica Lovaniensia **14**: 1-118.

Woillard, G. M. (1978): Grande Pile peat bog: a continuous pollen record for the last 140.000 years. – Quaternary Research **9**: 1-21.

Zoller, H. (1956): Die Höhenstufen, Wälder, Trockenrasen, Hochweiden und Moore der Vogesen. – Ber. der Schweiz. Bot. Gesell. **66**: 342-354.

Table 1. List of palynologically analysed sites in the Vosges Mountains (cf. figs. 4, 5). DAT = Number of ^{14}C-dates/ occurrence of the Laacher See Tephra (LST); * sites studied by Bick (1985); blanks in the collumns „palynostratigraphic zones" and „DAT" signify that this information was not available.

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
ALN	Tourbière des Aulnouses	Hatt (1937)	Peatland; 500 m asl.	Early Fagus/Abies zone	-
ALT	Altenweiher I	De Valk (1981)	Artificial lake within terrestrialised cirque; 926 m asl.	Betula/Pinus zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	8
BAR	Barembach I	Guillet (1968)	Soil profiles; 527 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	-
	Barembach II	Guillet (1968)		Fagus/Abies zone – Pinus/Picea zone	-
	Barembach	Guillet (1968)		Pinus/Picea zone	-
	Barembach III	Guillet (1971b)		Fagus/Abies zone – Pinus/Picea zone	-
BEB *	Belbriette	Darmois-Theobald & Denèfle (1981)	Peatland; 810-820 m asl.	Fagus/Abies zone - Fagus/Abies/Carpinus/Castanea/Juglans zone	-
BEL	Belmont II	Guillet (1971a)	Soil profile; 650 m asl.	Fagus/Abies zone – Pinus/Picea zone	-
BIF	Biffontaine I	Guillet (1971a)	Soil profile; 520 m asl.	Fagus/Abies zone – Pinus/Picea zone	-
CDA	Sol humique au col de Falimont	Palynological analyses suggested by Lemée (1963)	Soil profile		

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
CDF	Tourbière du Champ-du-Feu sondage 1	Dubois & Hatt (1930)	Bog ("Sattelmoor") 1030-1040 m asl.	Fagus/Abies zone	-
	Tourbière du Champ-du-Feu sondage 2 diagram 1c	Dubois & Hatt (1930), Hatt (1937)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	-
	Tourbière du Champ-du-Feu sondage 3 diagram 1b	Dubois & Hatt (1930), Hatt (1937)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Tourbière du Champ-du-Feu sondage 4	Dubois & Hatt (1930), Hatt (1937)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Tourbière du Champ-du-Feu sondage 5	Dubois & Hatt (1930)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Tourbière du Champ-du-Feu sondage 6	Dubois & Hatt (1930)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Tourbière du Champ-du-Feu sondage 7	Dubois & Hatt (1930)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Tourbière du Champ-du-Feu sondage 8	Dubois & Hatt (1930)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Hochfeld	Firbas et al. (1948)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	-
	Champ du Feu	Bunnik (1978)			
CDP	Tourbière du Col de Prayé diagramme 4a	Hatt (1937)	Peatland; 760 m asl.	Betula/Pinus zone – Fagus/Abies zone or later	-
	Tourbière du Col de Prayé diagramme 4b	Hatt (1937)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone	-
	Col de Prayé	Bunnik (1978)		Fagus/Abies zone – Pinus/Picea zone	-
CDS	Col de Surceneux	Darmois-Theobald et al. (1976)	Peatland; 810 m asl.	Corylus zone – Fagus/Abies zone	-
CHA	Chajoux	Janssen & Braber (1987), Bick et al. (1988)	Peatland; 850 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
CHE	Grand Chemin I	Woillard (1975)	Terrestrialised lake; 680 m asl.	Betula/Pinus zone – Fagus/Abies zone	-

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
CHE	Grand Chemin IIIb	Woilard (1975)		Weichselian Lateglacial – Betula/Pinus zone	-
	Grand Chemin IV	Woillard (1975)		Weichselian Lateglacial – Betula/Pinus zone	-
CSQ	Cirque Squainfa-ing	Darmois-Theobald et al. (1976)	Terrestrialised cirque; 800-850 m asl.	Corylus zone – Fagus/Abies zone	-
EDB	Étang du Boffy	Woillard (1975)	Floating vegetation mat in lake; 540 m asl.	Weichselian Lateglacial – Corylus zone	-
EDM	Étang de Mach-ais	Hatt (1937)	Peatland underlain by lake sediments; floating mat on water underlain by peat; 980 m asl.	Basal samples: Betula/Pinus zone; Peat: Fagus/Abies zone Floating mat: Fagus/Abies zone (or later)	-
ERG	Étang de Rocha-lins	Schober & Wassenaar (1979)			
ETO *	Étang d'Orong	Van den Hoek Ostende (1986)	660 m asl.		
FAG	La Fagne de la Savoureuse	Dresch et al. (1966)	Peatland; ca. 1000 m asl.	Betula/Pinus zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
FAR *	Feignes d'Ortimont	Hatt (1937)	Bog; 1100 m asl.	Corylus zone – Pinus/Picea zone (Picea not displayed in diagram)	-
	Feigne/Faigne d'Artimont (also macrofossil diagram)	Janssen (1974), Janssen et al. (1974, 1975), Kalis (1985), Bick et al. (1988)		Betula/Pinus zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	8
FDL *	Feignes de la Londe diagram-me 18a	Hatt (1937)	Bog; 1050 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Feignes de la Londe diagram-me 18b	Hatt (1937)		Betula/Pinus zone – Fagus/Abies zone or later	-
FJO	Frère Joseph I	Woillard (1975)	Terrestrialised cirque; 850 m asl.	Weichselian Lateglacial – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Frère Joseph II	Woillard (1975)		Weichselian Lateglacial	
FRT *	Tourbière du Frankenthal	Hatt (1937)	Terrestrialised cirque; 1030 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Étang du Frank-enthal	Hatt (1937)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	2 unpublished pollen diagrams	Mentioned by Hatt (1937)			

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
FRT *	Frankental I (including macrofossils)	Firbas et al. (1948)		Betula/Pinus zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Frankental II (including macrofossils)	Firbas et al. (1948)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Frankental III (including macrofossils)	Firbas et al. (1948)		Pinus/Picea zone	-
	Frankenthal	Kauffmann (1994)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Tourbière de l'Étang noir 1	De Klerk & Hölzer, research in progress		Fagus/Abies/Carpinus/Castanea/Juglans zone – Pinus/Picea zone	Plan-ned
	Tourbière de l'Étang noir 2	De Klerk & Hölzer, research in progress		Fagus/Abies/Carpinus/Castanea/Juglans zone – Pinus/Picea zone	Plan-ned
	Tourbière de l'Étang noir 3	De Klerk & Hölzer, research in progress		Fagus/Abies/Carpinus/Castanea/Juglans zone – Pinus/Picea zone	Plan-ned
GBA *	Grande Basse	Kalis (1984), Bick et al. (1988), selected depth trajectory displayed by Kalis (2014)	Peatland; 910-950 m asl.	Betula/Pinus zone – Pinus/Picea zone	6
	Grande Basse	Kalis et al. (2006)		Fagus/Abies/Carpinus/Castanea/Juglans zone – Pinus/Picea zone	4
GDF *	Gazon du Faing diagramme 13a	Hatt (1937)	Bog; 1250 m asl.	unclear	-
	Gazon du Faing diagramme 13b	Hatt (1937)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Tourbière du Gazon de Faing	Lemée (1963)		Betula/Pinus zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Gazon du Faing	Kool (1978), Bick et al. (1988)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	-
GET *	Grand Étang	Teunissen & Schoonen (1973)	Lake; 790 m asl.	Weichselian Pleniglacial – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
GGO	La Grande Goutte G1	Dresch et al. (1966)	Peatland; 1080 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	-

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
GGO	La Grande Goutte G3	Dresch et al. (1966)		Corylus/Quercus/Tilia/Ulmus/ Fraxinus zone – Fagus/Abies/ Carpinus/Castanea/Juglans zone	-
GLO *	La Goutte Loiselot		Bog; 835 m asl.		
	Glo α (also macrofossils)	Edelman (1985)	(outside peatland)	Fagus/Abies zone – Pinus/ Picea zone	-
	GLo B (also macrofossils)	Edelman (1985)		Corylus/Quercus/Tilia/Ulmus/ Fraxinus zone – Pinus/Picea zone	-
	GLo E (also macrofossils)	Edelman (1985), Bick et al. (1988)		Corylus zone – Pinus/Picea zone	8
	GLo F (also macrofossils)	Edelman (1985)		Corylus zone – Pinus/Picea zone	2
	GLo G (also macrofossils)	Edelman (1985)		Fagus/Abies/Carpinus/ Castanea/Juglans zone – Pinus/Picea zone	-
	GLo H (also macrofossils)	Edelman (1985)		Fagus/Abies zone – Pinus/ Picea zone	-
	Glo I (also macrofossils)	Edelman (1985)		Upper part of Fagus/Abies/ Carpinus/Castanea/Juglans zone	1
	GLo J (also macrofossils)	Edelman (1985), Visset et al. (1996)		Weichselian Lateglacial – Pinus/Picea zone	6
	GLo KL (also macrofossils)	Edelman (1985)		Corylus/Quercus/Tilia/Ulmus/ Fraxinus zone – Pinus/Picea zone	1
	GLo M (also macrofossils)	Edelman (1985)		Weichselian Lateglacial – Pinus/Picea zone	-
GOR	Saint-Gorgon I	Guillet (1968, 1970)	Soil profiles; 320 m asl.	Corylus/Quercus/Tilia/Ulmus/ Fraxinus zone – Pinus/Picea zone	-
	Saint-Gorgon II	Guillet (1970)		Fagus/Abies zone or later	-
	Saint-Gorgon III	Guillet (1970)		Fagus/Abies zone or later	-
	Saint-Gorgon IV	Guillet (1970)		Fagus/Abies zone or later	-
GPI	Tourbière des Grandes Piéraches	Hatt (1937)	Peatland; 550 m asl.	Corylus/Quercus/Tilia/Ulmus/ Fraxinus zone – Fagus/Abies zone	-
GPR	Grands Prés I	Woillard (1975)	Floating vegetation mat; 460 m asl.	Betula/Pinus zone – Fagus/ Abies zone	-
	Grands Prés IIa	Woillard (1975)		Weichselian Lateglacial	-
	Grands Prés IIb	Woillard (1975)		Weichselian Lateglacial – Corylus/Quercus/Tilia/Ulmus/ Fraxinus zone	-

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
GPR	Grands Prés IIc	Woillard (1975)		Probably the later part of the Holocene	-
GRF	Les Grands Faings	Wester (1979)			
GRP	Grande Pile I	Woillard (1975)	Peatland, at greater depth lake sediments; 330 m asl.	Betula/Pinus zone – Fagus/Abies zone	-
	Grande Pile II	Woillard (1975)		Late Saalian – Betula/Pinus zone	-
	Grande Pile III	Woillard (1975)		Saalian – Weichselian Pleniglacial	-
	Grande Pile IV	Woillard (1975)		Weichselian Pleniglacial	-
	Grande Pile VI	Woillard (1975)		Weichselian Pleniglacial	-
	Grande Pile VII	Woillard (1975)		Betula/Pinus zone – Corylus zone	-
	Grande Pile X	Woillard (1975, 1978)		Late Saalian – Betula/Pinus zone	-
	Grande Pile XX	De Beaulieu & Reille (1992)		Late Saalian – Corylus zone	-
HAV	Tourbière des Hauts-Viaux	Hatt (1937)	Bog; 875 m asl.	Corylus/Quercus/Tilia/Ulmus/ Fraxinus zone – Fagus/Abies zone or later	-
	Hauts-Viaux	Janssen & Braber (1987), Bick et al. (1988)		Fagus/Abies zone – Fagus/ Abies/Carpinus/Castanea/Juglans zone	-
	Tourbière des Hautes Viaux	Kalis (2014)		Fagus/Abies zone – Fagus/ Abies/Carpinus/Castanea/ Juglans zone	-
HEL	Sainte-Hélène I	Guillet (1970)	Soil profile; 320 m asl.	Corylus/Quercus/Tilia/Ulmus/ Fraxinus zone – Pinus/Picea zone	-
	Sainte-Hélène II	Guillet et al. (1972)	Bog	Fagus/Abies zone	4
HIR *	Hirschsteinried ou Tourbière de l'Altenberg	Hatt (1937)	Bog; 1004 m asl.	Fagus/Abies zone – Pinus/ Picea zone	-
	Hirschsteinried	Oberdorfer (1937)		Ending of Corylus/Quercus/ Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	-
KA1	Kabo I	De Valk (1981)	Soil profile; 1325 m asl.	Fagus/Abies zone – Pinus/ Picea zone	-
KA2	Kabo II	De Valk (1981)	Soil profile; 1290 m asl.	Fagus/Abies zone – Pinus/ Picea zone	-
KA3	Kabo III	De Valk (1981)	Soil profile; 1280 m asl.	Fagus/Abies zone – Pinus/ Picea zone	-

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
KA4	Kabo IV	DE VALK (1981)	Soil profile; 1150 m asl.	FAGUS/ABIES zone – PINUS/PICEA zone	-
KA5	Kabo V	DE VALK (1981)	Soil profile; 1250 m asl.	FAGUS/ABIES zone – PINUS/PICEA zone	-
KA6	Kabo VI	DE VALK (1981)	Soil profile; 1290 m asl.	FAGUS/ABIES zone – PINUS/PICEA zone	-
KA7	Kabo VII	DE VALK (1981)	Soil profile; 1290 m asl.	FAGUS/ABIES zone – PINUS/PICEA zone	-
LDF	Fainge Lac Forlet	KOOL (1978), WILLERS (1979)	ca. 1080 m asl.		
LDR *	Lac de Retournemer	HATT (1937)	Terrestrialisation zone of lake; 780 m asl.	FAGUS-ABIES zone or later	-
	Lac de Retournemer	BICK et al. (1988)		BETULA/PINUS zone – FAGUS-ABIES zone or later	-
LME	La Mer	SCHOBER & WASSENAAR (1978)			
LON	Lac Longemer	VAN WAVEREN (1982)	Lake; ca. 730 m asl.		
MAC *	Machey I	WOILLARD (1975)	Terrestrialised cirque 980-993 m asl.	BETULA/PINUS zone – CORYLUS zone	-
	Machey II	WOILLARD (1975)		Weichselian Lateglacial – BETULA/PINUS zone	-
	Machey	DARMOIS-THEOBALD & DENÈFLE (1981)		FAGUS/ABIES zone – FAGUS/ABIES/CARPINUS/CASTANEA/JUGLANS zone	-
MAR	Tourbière de Pinéfaing	HATT (1937)	Terrestrialised lake, partly with bog; 770 m asl.	BETULA/PINUS zone – FAGUS/ABIES zone or later	-
	Marirose	BICK et al. (1988)		Weichselian Lateglacial – FAGUS/ABIES zone	-
MAX	Tourbière de la Maxe ou de Salm diagramme 2a	HATT (1937)	Strongly degraded peatland; 625 m asl.	BETULA/PINUS zone – FAGUS/ABIES zone or later	-
	Tourbière de la Maxe ou de Salm diagramme 2b	HATT (1937)		BETULA/PINUS zone – FAGUS/ABIES zone or later	-
	Maxmoor (including macrofossils)	FIRBAS et al. (1948)		BETULA/PINUS zone – FAGUS/ABIES/CARPINUS/CASTANEA/JUGLANS zone	-
	Marais de la Maxe	Mentioned by F. BUNNIK (pers. com.)		Weichselian Lateglacial – PINUS/PICEA zone	-
	Marais de la Maxe	GEVELAAR (1982)			
	Marais de la Maxe	J.-N. HAAS (pers. com.; research in progress)			

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
MFB	Tourbière de la Morte-Femme	Hatt (1937), Durand & Guillet (1966)	Bog; 615 m asl.	Betula/Pinus zone – Fagus/Abies zone (probably older part)	-
	Tourbière du Beillard	Durand & Guillet (1966)		Betula/Pinus zone – Corylus/Quercus/Tilia/Ulmus/Fraxinus zone	4
MO1 *?	Moselotte I	De Valk (1979, 1981), Bick et al. (1988), Visset et al. (1996)	Small bog; 1290 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	7
MO2 *?	Moselotte II	De Valk (1979, 1981)	Small bog; 1260 m asl.	Fagus/Abies zone – Pinus/Picea zone	-
MOT	Tourbière des Mottes	Hatt (1937)	Peatland; 500 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone	-
RAH	Tourbière du Rahin/Vallée du Rahin	Dresch et al. (1966)	terrestrialised cirque; 916 m asl.	Betula/Pinus zone – Fagus/Abies zone	-
RDC *?	Tourbe de la route des Crêtes Fig. 1	Dubois & Dubois (1937)	Bog; 1190-1215 m asl.	Fagus/Abies zone	-
	Tourbe de la route des Crêtes Fig. 2	Dubois & Dubois (1937)		Fagus/Abies zone	-
RDF	Roche des Fées	Guillet (1971a)	Soil profile; 640 m asl.	Fagus/Abies zone – Pinus/Picea zone	-
RDK	Route de Kli-genthal I	Guillet (1971b)	Soil profile; 750 m asl.	Fagus/Abies zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Route de Kligenthal II	Guillet (1971b)	Soil profile; 790 m asl.	Fagus/Abies zone or later	-
RDL	Route de Liaucourt	Guillet (1971b)	Soil profile; 920 m asl.	Fagus/Abies zone – Pinus/Picea zone	-
RFA *	Rouge Faigne	Kalis (1984a), selected depth trajectory displayed by Kalis (2014)	Bog (“Sattelmoor”); 1145 m asl.	Betula/Pinus zone or Corylus zone – Pinus/Picea zone	5
RJA	Tourbière du rond Jardin près Corcieux	Hatt (1937)	Degraded peatland	Betula/Pinus zone – Fagus/Abies zone	-
RON *	Le Ronfaing	Janssen & Salomé (1974), Bick et al. (1988)	Bog; 610 m asl.	Weichselian Lateglacial – Pinus/Picea zone	5 (pre-sent-ed by Jans-sen 1974)

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
ROT *	Rothried	Hatt (1937)	Bog developed on a terrestrialised cirque; 835 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	Rotried	Oberdorfer (1937)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	-
ROT *	Rotried I (including macrofossils)	Firbas et al. (1948)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	-
	Rotried II (including macrofossils)	Firbas et al. (1948)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	-
	Rotried III (including macrofossils)	Firbas et al. (1948)		Pinus/Picea zone	-
RPS	Rond Pertuis Supérieure II	Bunnik (1978)	Terrestrialised cirque; 690 m asl.	Fagus/Abies zone	-
	Tourbière du Rond Pertuis supérieure	Sudhaus (2005)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Pinus/Picea zone	4
SAP *	Col de Sapois	Konings (1978)	Peatland; 830 m asl.		
SBE (location unclear)	Schneeberg I	Firbas et al. (1948)	Peatland; 900 m asl.	Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Schneeberg II	Firbas et al. (1948)		Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Schneeberg III	Firbas et al. (1948)		Fagus/Abies/Carpinus/Castanea/Juglans zone	-
SDH	Soil tourbeux des Hautes Chaumes	Lemée (1963)	Peatland; 1290 m asl.	Fagus/Abies zone or later	-
SEW	Sewen (including macrofossils)	Firbas et al. (1948)	Carr covering lake sediments; 500 m asl.	Early Weichselian Lateglacial – Fagus/Abies zone	-
	Sewensee SI-3	Schloss (1979)	Peatland covering lake sediments	Early Weichselian Lateglacial – Fagus/Abies/Carpinus/Castanea/Juglans zone	LST
	Sewensee SII-3	Schloss (1979)	Peatland	Early Weichselian Lateglacial and (above an hiatus) Fagus/Abies zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Sewensee SIV-1 (including macrofossils)	Schloss (1979)	Peatland covering lake sediments	Early Weichselian Lateglacial – Fagus/Abies/Carpinus/Castanea/Juglans zone	-
	Sewensee SIV-3	Schloss (1979)	Peatland covering lake sediments	Early Weichselian Lateglacial – Fagus/Abies/Carpinus/Castanea/Juglans zone	-

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
SEW	Sewensee SIV-4 (including macrofossils)	Schloss (1979)	Lake sediments	Early Weichselian Lateglacial – Corylus/Quercus/Tilia/Ulmus/Fraxinus zone	LST
	Sewensee SIV-6 (including macrofossils)	Schloss (1979)	Peatland covering lake sediments	Early Weichselian Lateglacial – Fagus/Abies/Carpinus/Castanea/Juglans zone	LST
	Sewensee TI-4	Schloss (1979)	Lake sediments	Early Weichselian Lateglacial – Corylus zone	LST
SZW	Schmeltzwasen	Hatt (1937)	Peatland; 504 m asl.	Fagus/Abies zone and/or later	-
TAI	Taintrux I	Guillet (1971a)	Soil profile; 530 m asl.	Fagus/Abies zone – Pinus/Picea zone	-
TAN *	Tourbière du Tanet ou Taneck	Hatt (1937)	Bog; 1250 m asl.	Fagus/Abies zone or later	-
	Tanneckmoor	Oberdorfer (1937)		Fagus/Abies zone – Pinus/Picea zone	-
	Tourbière du Tanet	Janssen & Janssen-Kettlitz (1972), Janssen (1974), Janssen et al. (1974), De Valk (1974), Bick et al. (1988)		Fagus/Abies zone – Pinus/Picea zone	5
TBK	Tourbière du Brunnkesselloch ou de Stillenbach	Hatt (1937)	Peatland; 960 m asl.	Single sample from Betula/Pinus zone or lower Corylus zone, overlain by Fagus/Abies zone or later	-
TBR	Tête de Blanche Roches	F. Bunnik, pers. comm.	Mire; 810 m asl.	Fagus/Abies zone – Pinus/Picea zone	-
TCC	Tourbière de la chaume du Chitelet	Palynological analyses suggested by Lemée (1963)			
TCT	Tourbière Chaume Thiriet 1	De Klerk & Hölzer (2009/2010)	Sloping mire; ca. 1100 m asl.	Ending of Fagus/Abies zone – Pinus/Picea zone	Planned
	Tourbière Chaume Thiriet 2	De Klerk & Hölzer (2009/2010)		Fagus/Abies/Carpinus/Castanea/Juglans zone – Pinus/Picea zone	Planned
TDE	Tourbière de la Demoiselle	Hatt (1937)	Bog/Peatland, at greater depth lake sediments; 545 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
	La Demoiselle I	Woillard (1975)		Corylus zone – Corylus/Quercus/Tilia/Ulmus/Fraxinus zone	-
	La Demoiselle II	Woillard (1975)		Weichselian Lateglacial – Betula/Pinus zone	-
	La Demoiselle III	Woillard (1975)		Weichselian Lateglacial	-
TDS	Tourbière de la Soutte	Hatt (1937)	Peatland; 925 m asl.	Betula/Pinus zone – Fagus/Abies zone or later	-

Site code	Diagram name	Source	Site description	Palynostratigraphic zones covered by the pollen diagram	DAT
TED	Tourbière de l'Étang du Devin ou Hexenweier	Hatt (1937)	Terrestrialised cirque; 929 m asl.	Betula/Pinus zone – Pinus/Picea zone (Picea not displayed in diagram)	-
TLB *	Tourbière du Lac de Blanchemer	Hatt (1937)	Terrestrialised cirque, floating mat with below the water more peat; 970 m asl.	Corylus zone – Fagus/Abies zone or later (basal peat); single sample from floating mat difficult to judge	-
TLC	Tourbière du Lac Sec ou Trockensee	Hatt (1937)	terrestrialised cirque; 1010 m asl.	Corylus zone – Fagus/Abies zone or later	-
TLI	Tourbière de Lispach	Hatt (1937)	Peatland; 900 m asl.	Betula/Pinus zone – Fagus/Abies zone or later	-
TLL *	Tourbe du Lac de Lispach	Hatt (1937)	Bog; 900 m asl.	Corylus zone – Fagus/Abies zone or later	-
TLR	Tourbe du Lac de Retournemer	Hatt (1937)	Terrestrialisation zone of lake; 780 m asl.	Fagus/Abies zone or later	-
TPA *	Tête du Petit Artimont	De Valk (1974), Kalis (1985)	Peatland; 1230 m asl.	Fagus/Abies zone – Fagus/Abies/Carpinus/Castanea/Juglans zone	4
TPC	Tourbière du Pré-Champ	Hatt (1937)	Peatland; 585 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone or later	-
TRF *	Trois Fours	De Valk (1981)	Small bog 1230 m asl.	Corylus zone – Pinus/Picea zone	-
URB	Urbis Fig. 3	Oberdorfer (1937)	Terrestrialised glacial valley, 450 m asl.	Early Weichselian Lateglacial – beginning Fagus/Abies zone	-
	Urbis Fig. 4	Oberdorfer (1937)		Weichselian Lateglacial	-
	Urbis Fig. 6	Oberdorfer (1937)		Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – Fagus/Abies zone and probably later (relevant pollen types not displayed/counted)	-
	Urbis Fig. 7	Oberdorfer (1937)		Fagus/Abies zone and probably later (relevant pollen types not displayed/counted)	-
VET	Vallée de L'Étang	Darmois-Theobald et al. (1976)	Peatland; 805 m asl.	Betula/Pinus zone – beginning of Fagus/Abies zone	-
WOR *	Wormsawald A	Janssen et al. (1974), De Valk (1981)	Small bog; 1040 m asl.	Fagus/Abies zone – Pinus/Picea zone	-
	Wormsawald B	De Valk (1981)	Small bog; 1060 m asl.	Slightly before Fagus/Abies zone – Pinus/Picea zone	-
XON	Tourbe de Xonrupt	Hatt (1937)	Peatland; 720 m asl.	Corylus/Quercus/Tilia/Ulmus/Fraxinus zone – beginning of Fagus/Abies zone	-