

## Palynological investigations of Younger Dryas sediments in the northern Netherlands (extended abstract)

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### Introduction

The pollen picture of the Late Glacial in the northern Netherlands has mainly been based on three diagrams viz. Waskemeer (Casparie & van Zeist 1960), Stokersdobbe (Paris et al. 1979) and Mekelermeer (Van der Hammen 1951). We obtained nine diagrams from additional locations in the same area (Fig. 1), showing the Younger Dryas period. The simplified versions will be discussed and compared with the diagrams from the 'classical' sites.

All diagrams are based on the so-called Iversen sum, which means that only spores and pollen of water plants are excluded. For technical reasons the diagrams from Ganzemeer, Gees and Wildervank suggest that the samples were taken at equal depth intervals, which is not always true. Therefore, the visual effect of the true-scale diagrams may be slightly different. The zonation in Fig. 2 is according to Firbas (1949), whose Zone III corresponds to the Younger Dryas.

In the 'classical' diagrams the Younger Dryas boundaries are defined as follows:

- Transition Allerød–Younger Dryas: decrease of AP (arboreal pollen), due to a decrease of *Pinus*; increase of Ericales (mainly *Empetrum*).
- Transition Younger Dryas–Preboreal: increase of AP, due to an increase of *Betula*; decrease of Ericales.

The nine sites (Fig. 1) have been divided into four groups on the basis of similar features in the pollen diagrams at the mentioned transitions.

1. The pingo scar Ganzemeer, situated at about 1500 m from Waskemeer, on the west of the Drenthe Plateau.
2. Three pingo scars on the Drenthe Plateau: Gees, Laaghalerveen and Bruntinge.

3. A valley fill at Hoogersmilde and a pingo scar at Smilderoosterveld, 800 m from each other on the Drenthe Plateau, and a pingo scar at Wildervank situated east of the Plateau.
4. The pingo scars Vagevuur en Zeyerveld.

### Palynological description

#### Ganzemeer (Fig. 2)

Transition Allerød–Younger Dryas: strong decrease of AP, due to a strong decrease of *Pinus*; increase of Ericales.

Transition Younger Dryas–Preboreal: increase of AP, due to an increase of *Betula*; decrease of Ericales.

Local features:

- transition Allerød–Younger Dryas: decrease of water plants, increase of *Sphagnum*.
- transition Younger Dryas–Preboreal: decrease of *Sphagnum*, increase of water plants.

There is a strong resemblance with the classical diagram of Waskemeer.

#### Gees – Laaghalerveen – Bruntinge

#### Gees (Fig. 2)

Transition Allerød–Younger Dryas: slight decrease of AP, due to a minor decrease of *Pinus*; increase of Ericales.

Transition Younger Dryas–Preboreal: increase of AP, due to an increase of *Betula* and *Pinus*; decrease of Ericales.

Local features:

- transition Allerød–Younger Dryas, decrease of water plants, increase of *Sphagnum*.

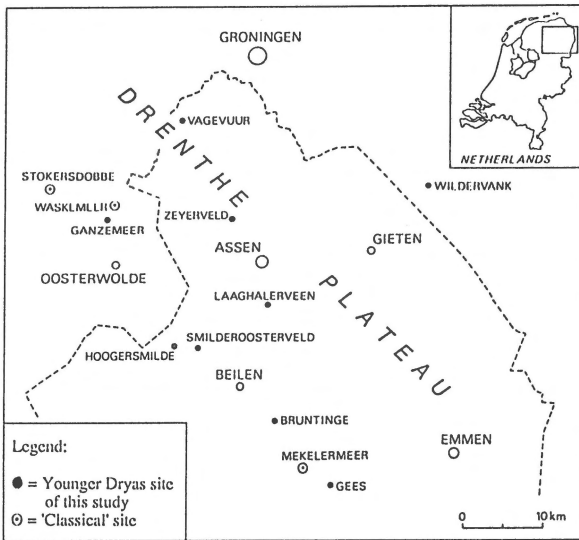


Fig. 1. Map showing the coring sites on the Drenthe Plateau and the three classical locations Waskemeer, Stokersdobbe and Mekelerveer.

– transition Younger Dryas–Preboreal, decrease *Sphagnum*, increase of water plants.

In comparison to Waskemeer a significantly lower decline in AP and *Pinus* is observed at the start of the Younger Dryas.

#### Hoogersmilde – Smilderoosterveld – Wildervank

##### Hoogersmilde

Transition Allerød–Younger Dryas: decrease of AP, due to a decrease of *Pinus* and *Betula*; increase of Ericales.

Transition Younger Dryas–Preboreal: increase of AP, due to increase of *Pinus* and *Betula*; decrease of Ericales.

Since the core shows a change in sediment from gyttja to peat, a hiatus in the sedimentation cannot be excluded.

Local features: the regular increase of Cyperaceae pollen and *Sphagnum* spores in combination with a decrease of *Betula* pollen, and vice versa, indicates changing water levels during the Younger Dryas. At the transition Allerød–Younger Dryas, a decrease of water plants and an increase of *Sphagnum* occur.

Contrary to Waskemeer, the Allerød–Younger Dryas transition shows a decline in *Pinus* as well as in *Betula*.

##### Smilderoosterveld

Transition Allerød–Younger Dryas: decrease of AP, due to a decrease of *Pinus*; increase of Ericales.

Transition Younger Dryas–Preboreal: increase of AP, due to an increase of *Betula*; decrease of Ericales.

The upper part of the Younger Dryas interval consists of humous sand which was dated  $10\,250 \pm 100$  BP. The beginning of sand sedimentation coincides with a sharp rise of the percentages of Ericales, mainly *Empetrum*, and a decrease of *Betula* pollen. *Pinus* percentages remain the same.

Local features: transition Allerød–Younger Dryas: decrease of water plants, increase of *Sphagnum*. On top of the sand layer a *Sphagnum* decrease and a water plants increase are observed.

The pollen picture at both transitions is similar to that of Waskemeer, but less pronounced.

##### Wildervank (Fig. 2)

Transition Allerød–Younger Dryas: decrease of AP, due to a decrease of *Betula*; increase of Ericales.

Transition Younger Dryas–Preboreal: not visible in the pollen curve.

The upper part of the sediment showing a Younger Dryas pollen assemblage is dated at  $10\,070 \pm 60$  BP, suggesting a Preboreal age.

Local features: transition Allerød–Younger Dryas: decrease of *Menyanthes* pollen, while *Sphagnum* spores and *Pediastrum* appear. During the sedimentation of sand in the later part of the Younger Dryas, *Sphagnum* spores and *Empetrum* pollen increased.

In contrast with the Waskemeer diagram, Wildervank shows a *Betula* decrease at the beginning of the Younger Dryas, whereas no palynological difference can be detected at the beginning of the Preboreal.

##### Vagevuur – zeyerveld

##### Vagevuur

Transition Allerød–Younger Dryas: decrease of AP, due to a decrease of *Betula*; increase of Ericales.

Transition Younger Dryas–Preboreal: no clear change visible in the pollen curves.

Just above the Younger Dryas sediment, pollen are found that belong to a post-Atlantic period, pointing to a large hiatus.

Local features: *Sphagnum* spores and *Pediastrum*, both transitions are not visible.

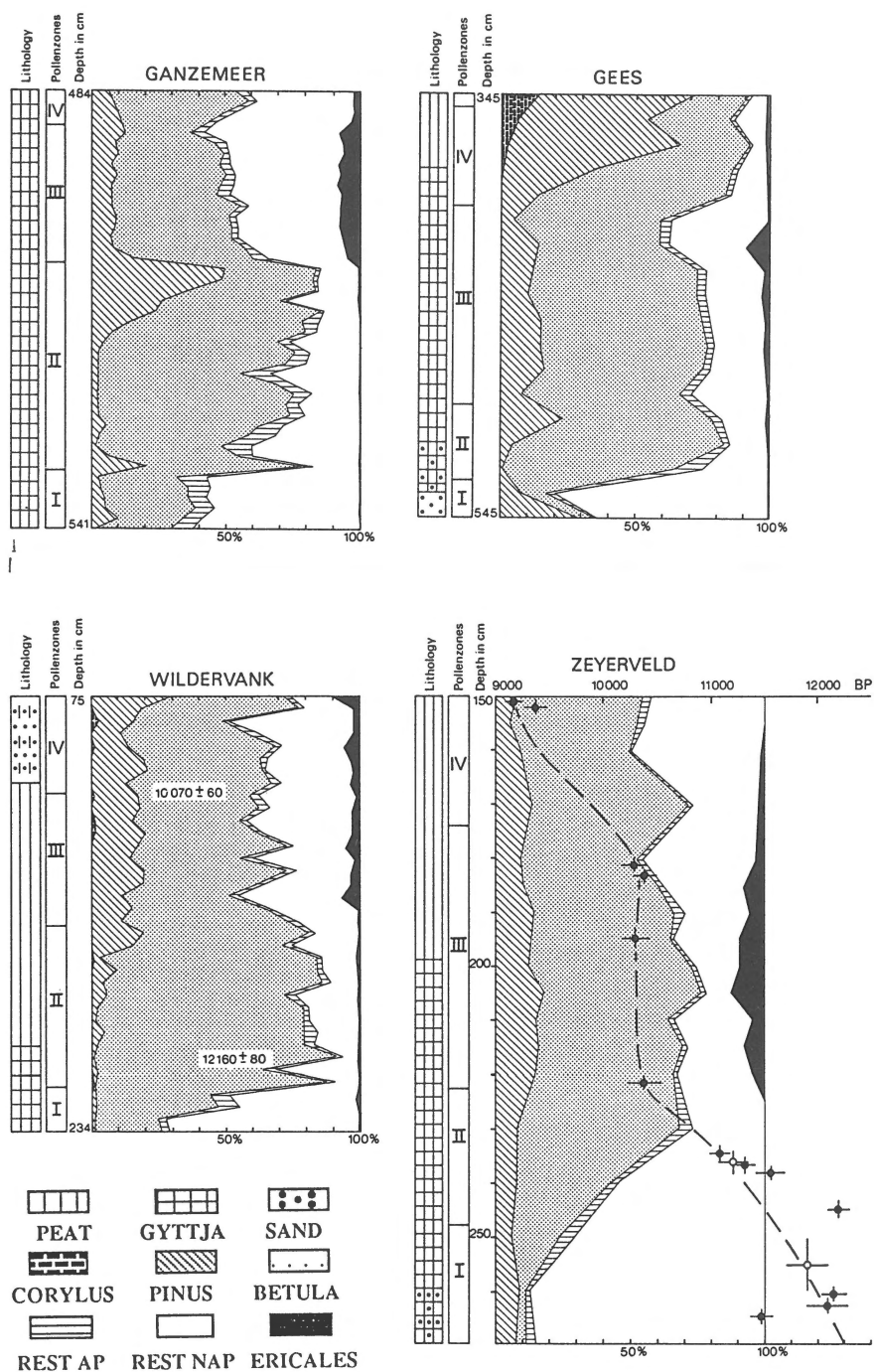


Fig. 2. Simplified pollen diagrams from Younger Dryas (Zone III) sequences in four cores on the Drenthe Plateau (Fig. 1). Note two  $^{14}\text{C}$  dates of the Wildervank core. The deeper  $^{14}\text{C}$  dates of the Zeyerveld core suggest marked changes in accumulation rates or natural fluctuations in  $^{14}\text{C}$ . Open symbols refer to ages obtained on the combined alkaline extracts of a few  $^{14}\text{C}$  samples, which often contain a younger infiltration. I-IV are pollen zones according to Firbas (1949). AP: arboreal pollen, NAP: non-arboreal pollen.

At this site, the Allerød–Younger Dryas transition coincides with a decline of *Betula*, instead of *Pinus* as is the case in Waskemeer.

#### Zeyerveld (Fig. 2)

Transition Allerød–Younger Dryas: AP unchanged, decrease of *Betula*, increase of *Pinus* and Ericales.

Transition Younger Dryas–Preboreal: increase of AP due to increase of *Betula* and *Pinus*; decrease of Ericales.

Local features:

- transition Allerød–Younger Dryas, increase of *Sphagnum*, decrease of waterplants.
- transition Younger Dryas–Preboreal, increase of water plants (*Myriophyllum alterniflorum*), while *Sphagnum* disappears.

<sup>14</sup>C dates clearly show a plateau around 10 300 BP in the Younger Dryas. Below the base of the Younger Dryas the differences between <sup>14</sup>C ages of closely spaced samples are relatively large. The core does not show other indications for a hiatus. Consequently, the sedimentation rate may have been low, or we are confronted with a natural <sup>14</sup>C fluctuation during this period.

The style of the pollen curve, at both transitions, is completely different from that of Waskemeer.

#### Conclusions

The ‘classical’ pollen picture of Waskemeer and Ganzemeer is characterized by a strong increase of *Pinus* at the end of the Allerød, followed by a sharp

decline at the base of the Younger Dryas. However this phenomenon is not seen in the diagrams of this study. Except for Zeyerveld, all sites show a decrease of AP at the Allerød–Younger Dryas transition, due to a decrease of either *Pinus* or *Betula*, or of both.

The behaviour of *Pinus* and *Betula* also differs widely in the respective pollen diagrams at the Younger Dryas–Preboreal transition.

The frequency variations in Ericales seem to be the most conspicuous and consistent phenomenon observed in pollen diagrams of the Younger Dryas in the northern Netherlands. A rise in water level in the pingo scars as deduced from local pollen and spores evidence, seems to cause a stronger decrease in the abundance of *Betula* than in that of *Pinus*.

The changes in hydrological conditions at the beginning and the end of the Younger Dryas, as indicated by the pollen sequences, occurred all over the Drenthe Plateau.

#### References

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