THE EFFECT OF RAPID CLIMATIC OSCILLATIONS ON THE ENVIRONMENT IN NW-EUROPE DURING GREENLAND INTERSTADIAL 1

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INTRODUCTION

Rapid climatic oscillations are recorded in the Greenland oxygen isotope records during GI-1 (the Bølling/Allerød Interstadial). What is the effect on the terrestrial environment?

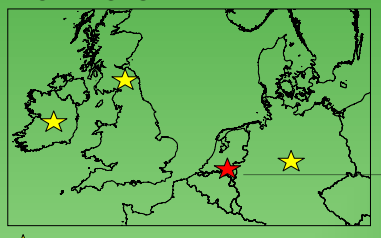
RESEARCH QUESTIONS

- Did temperature changes during Greenland Interstadial 1 occur synchronous in a west-east transect?
- Can we determine a west-east gradient in the amplitude of temperature changes associated with a decreasing Atlantic influence?
- Did changes in vegetation occur synchronous to temperature changes?

METHODS

Multi-proxy analyses will be carried out on calcareous lake deposits along an west-east transect in NW-Europe. Analyses will comprise oxygen isotopes, pollen and chironomids, while AMS ^{14}C dating and tephra are used for correlation.

LOCATIONS

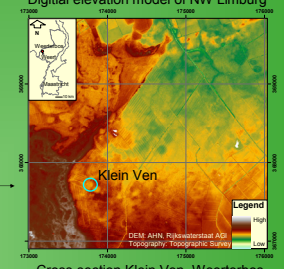


Sampling sites

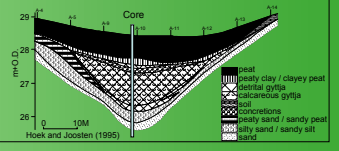
Site in The Netherlands:

- Klein Ven, Weerterbos, NW Limburg
- Circular depression (pingo remnant) in Pleistocene coversand
- Calcareous gyttja infill

Digitial elevation model of NW Limburg



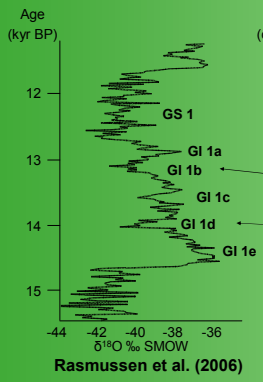
Cross-section Klein Ven, Weerterbos



CORRELATION BETWEEN CLIMATE AND VEGETATION

OXYGEN ISOTOPES

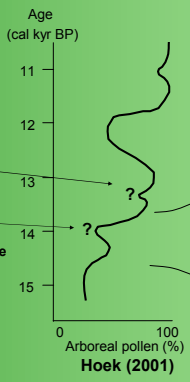
NGRIP, Greenland



Rasmussen et al. (2006)

POLLEN

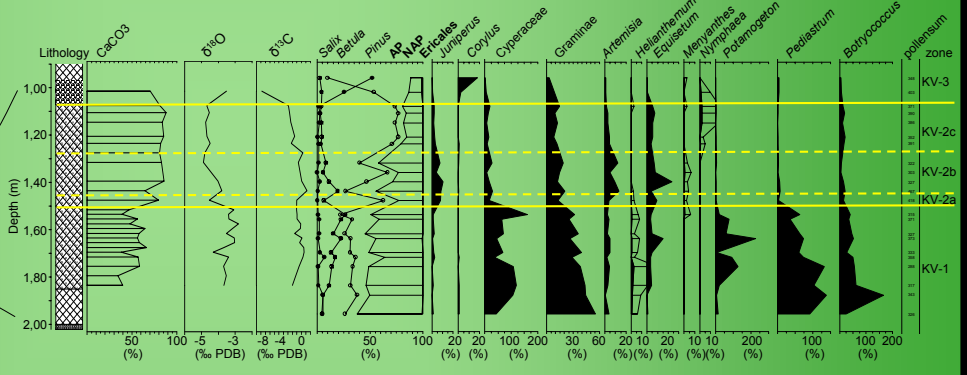
The Netherlands



Hoek (2001)

OXYGEN ISOTOPES AND POLLEN

Klein Ven, Weerterbos, The Netherlands



Can changes in vegetation be correlated to climatic oscillations?

Isotopic correlation between NGRIP and Klein Ven

- KV-1 (δ^{18}O high) can be correlated to GI-1e (warm)
- KV-2 (δ^{18}O low) can be correlated to GI-1d+1c (colder)

Vegetation development Klein Ven

- KV-1: Open herbaceous vegetation
- KV-2: Expansion of birch forest
- KV-2b: Regressive phase during forest expansion

PRELIMINARY CONCLUSIONS

The multi-proxy approach allows us to establish (a)synchroneity between climatic and related environmental changes:

Forest expansion took place AFTER the warmest part of the Interstadial (lag effect: migration, soil stabilization)

The regressive phase in vegetation (KV-2b) is so far not visible in the δ^{18}O record: not a climatic change?

FURTHER RESEARCH

Higher resolution pollen and oxygen isotopes:

- Is the regressive phase in vegetation (KV-2b) visible in the δ^{18}O record?

Chironomid analysis (reconstruction of mean July temperature):

- Is the transition from KV-1 to KV-2 induced by local factors or climatic change?
- Is the regressive phase in vegetation (KV-2b) the result of a lowering of summer temperature?

Tephra and AMS ^{14}C dating (chronology):

- Did changes occur synchronous at other sites?

LEADS AND LAGS BETWEEN CLIMATE AND ENVIRONMENT

REFERENCES

Hoek, W.Z. and Joosten, J.H.J. (1995), Pingo-ruïnes en kalkgyttja in het Weerterbos, Natuur Historisch Maandblad 84-10, p. 234-241.

Hoek, W.Z. (2001), Vegetation response to the ~14.7 and ~11.5 ka cal. BP climate transitions: is vegetation lagging climate? Global and Planetary change 30, p. 103-115.

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