

A chironomid-based temperature reconstruction for the Younger Dryas-Holocene transition from a palaeo-channel of the Niers-Rhine, Germany

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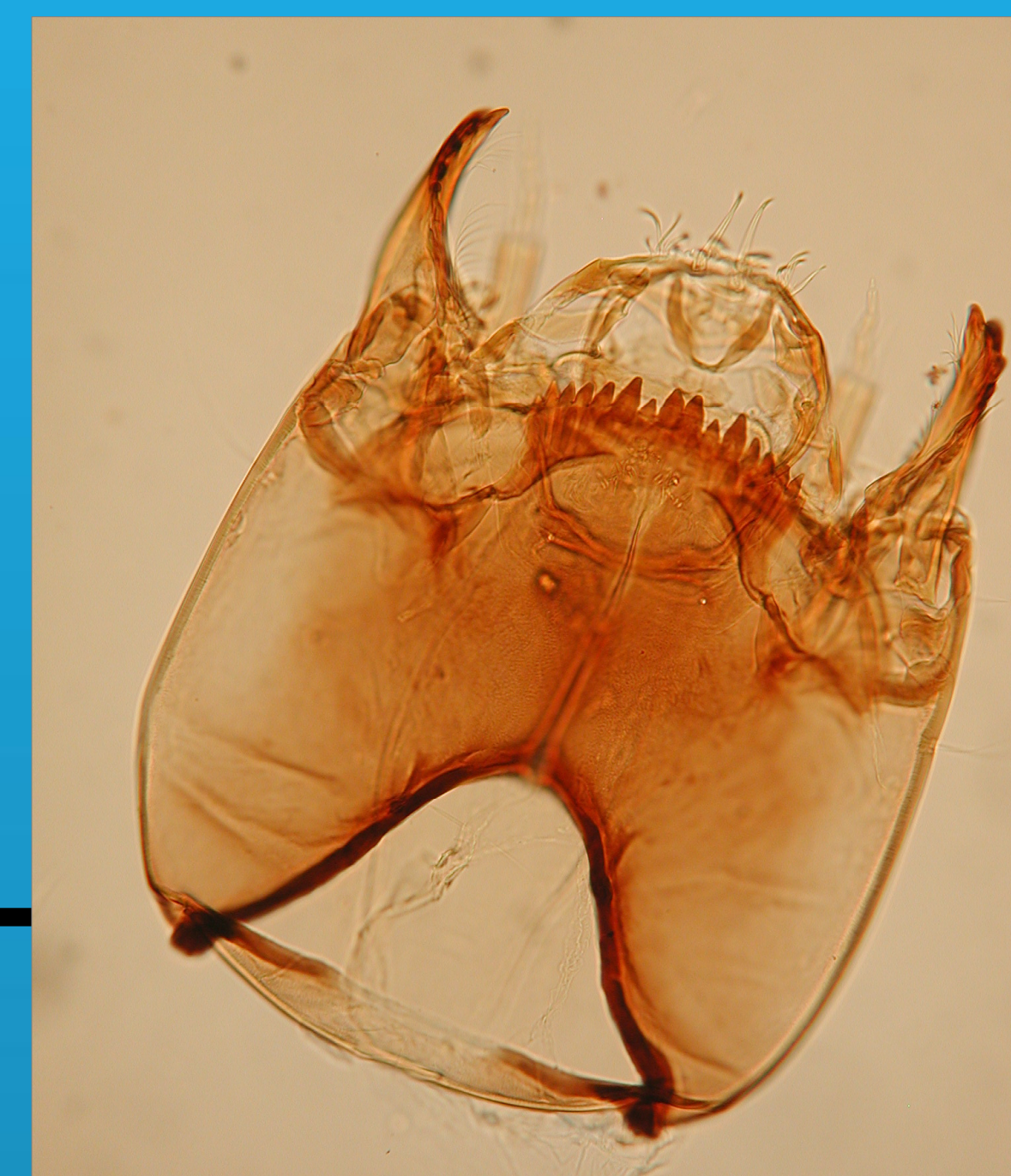


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Research outline

A multi-proxy analysis of a calcareous gyttja from a palaeo-channel resulted in a reconstruction of temperature and local environmental conditions at the end of the last ice age (~12,000 to 10,500 cal yr BP).

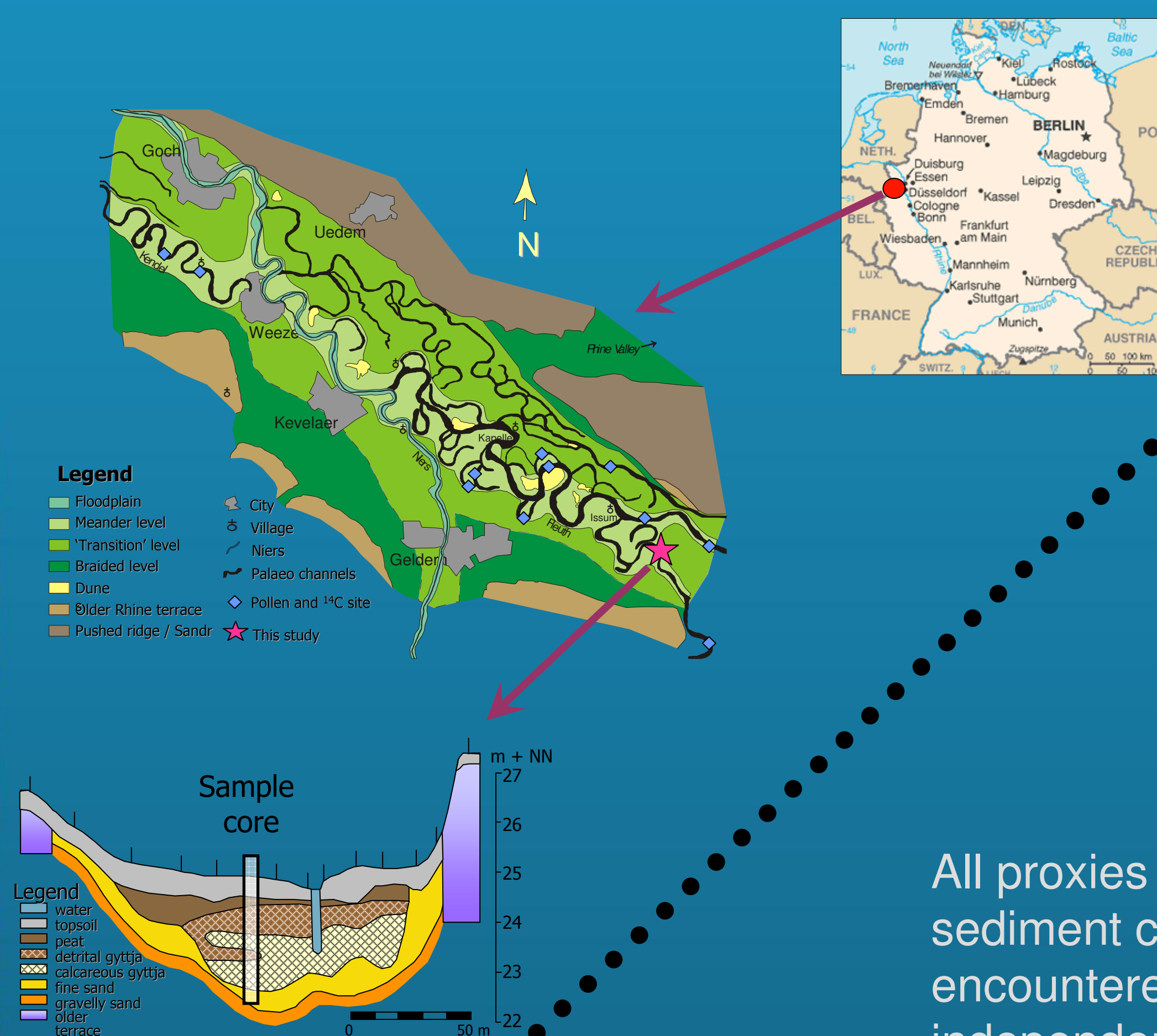


Conclusion

Both aquatic and terrestrial proxies indicate a rapid ecosystem response to warming at the Younger Dryas–Holocene transition in the Niers-Rhine valley. Chironomids indicate a ~3°C increase in mean July air temperature at this boundary.

1. Research area

Channel infills of the Niers-Rhine fluvial system (abruptly abandoned in the Early Holocene) provide well-preserved records of Lateglacial/Early Holocene climate and environmental changes.



2. Methods

A sediment core (a) from one of the palaeo-channels was analysed for chironomids (=non-biting midges) (b), pollen (c), stable isotopes (d) and lithological parameters (e).

All proxies were measured on the same sediment core to avoid problems previously encountered with correlating multiple, independently dated records.

b.

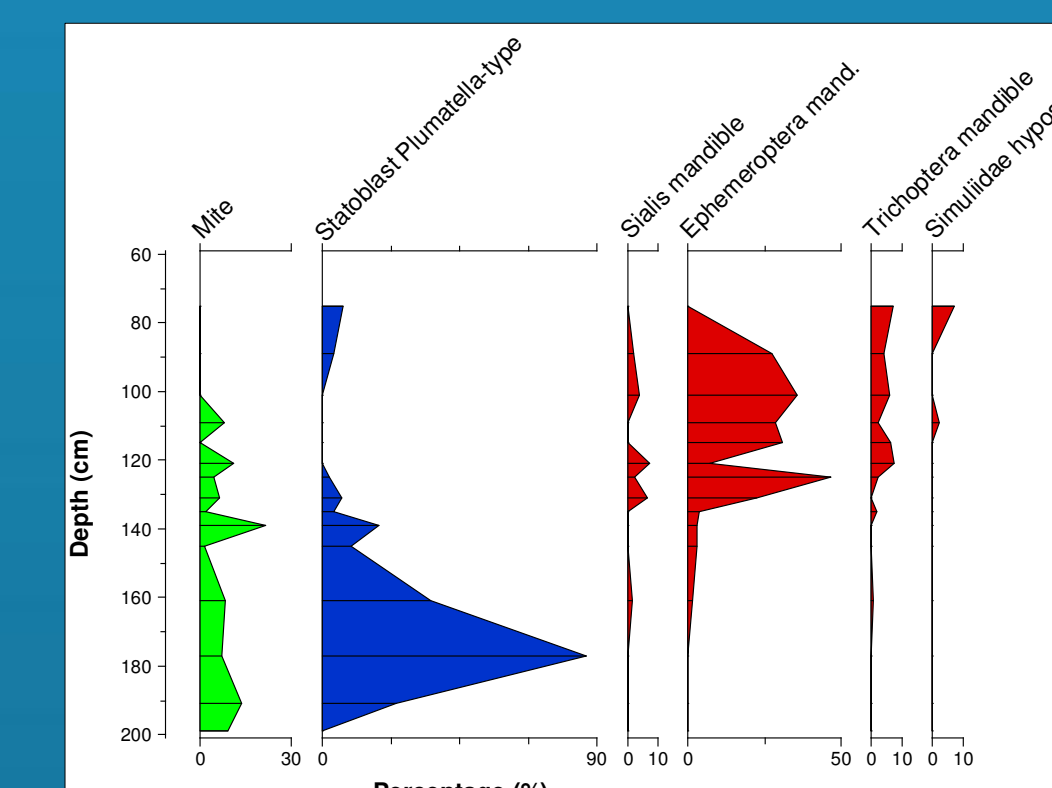
c.

d.

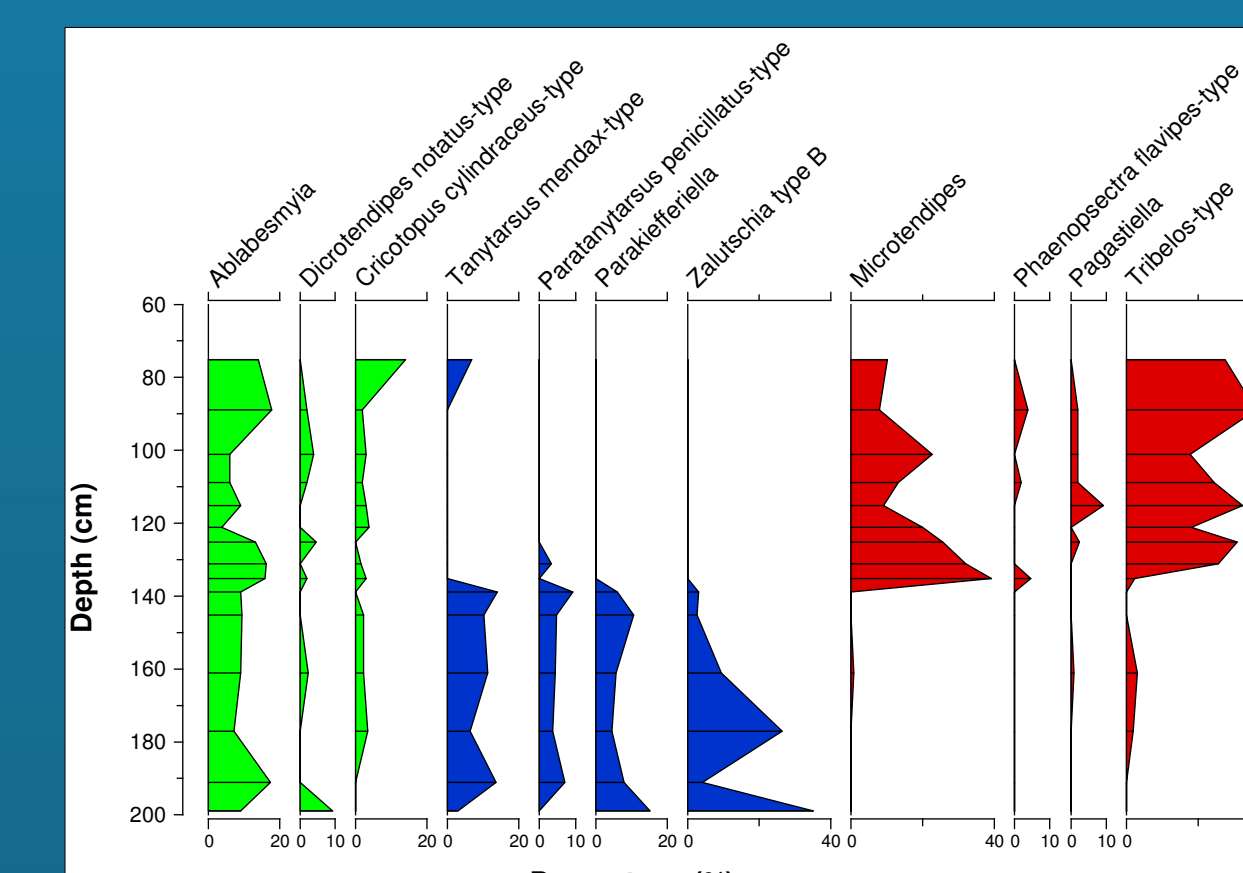
e.

a.

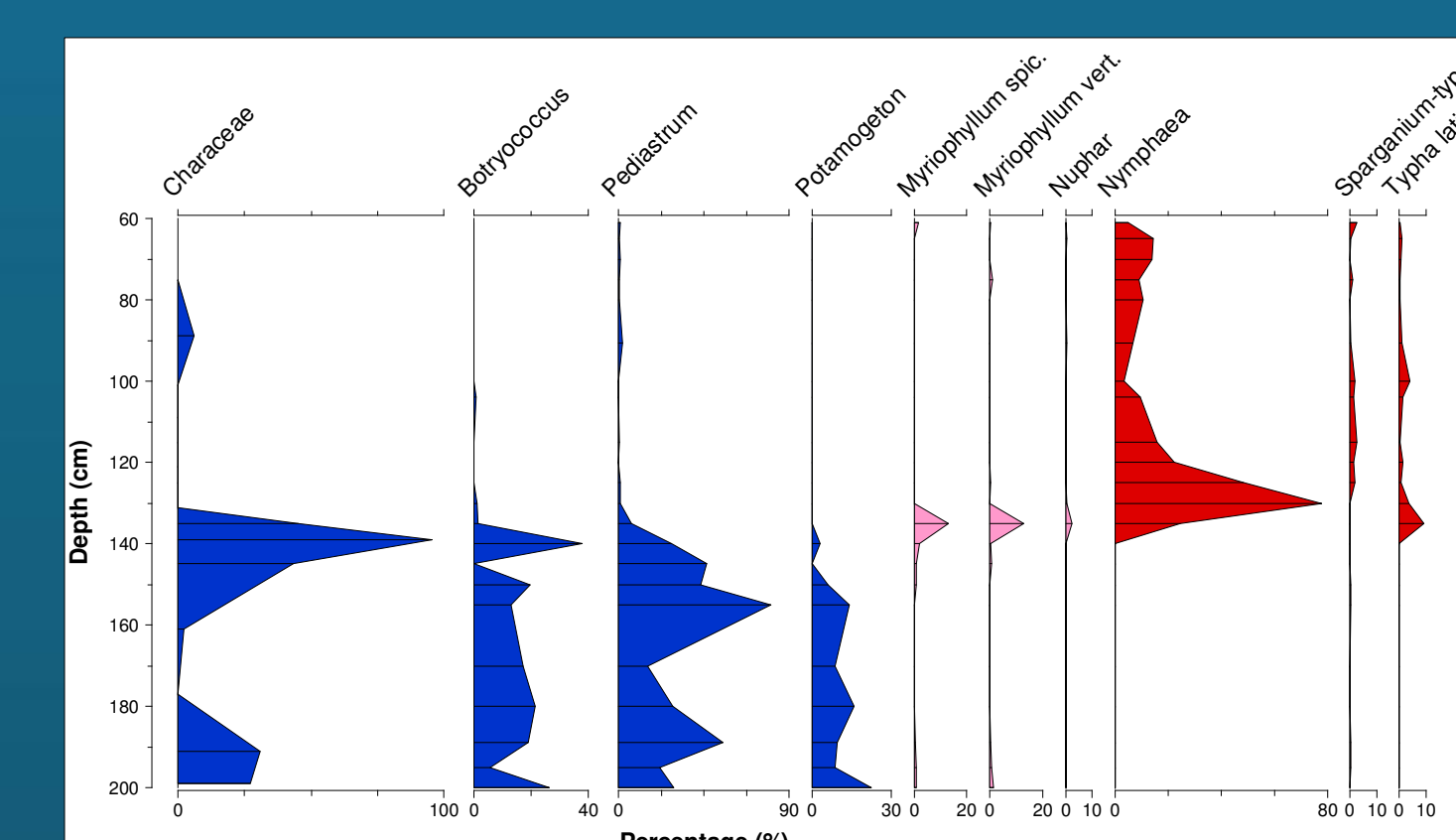
3. Local developments



Invertebrates



Chironomids

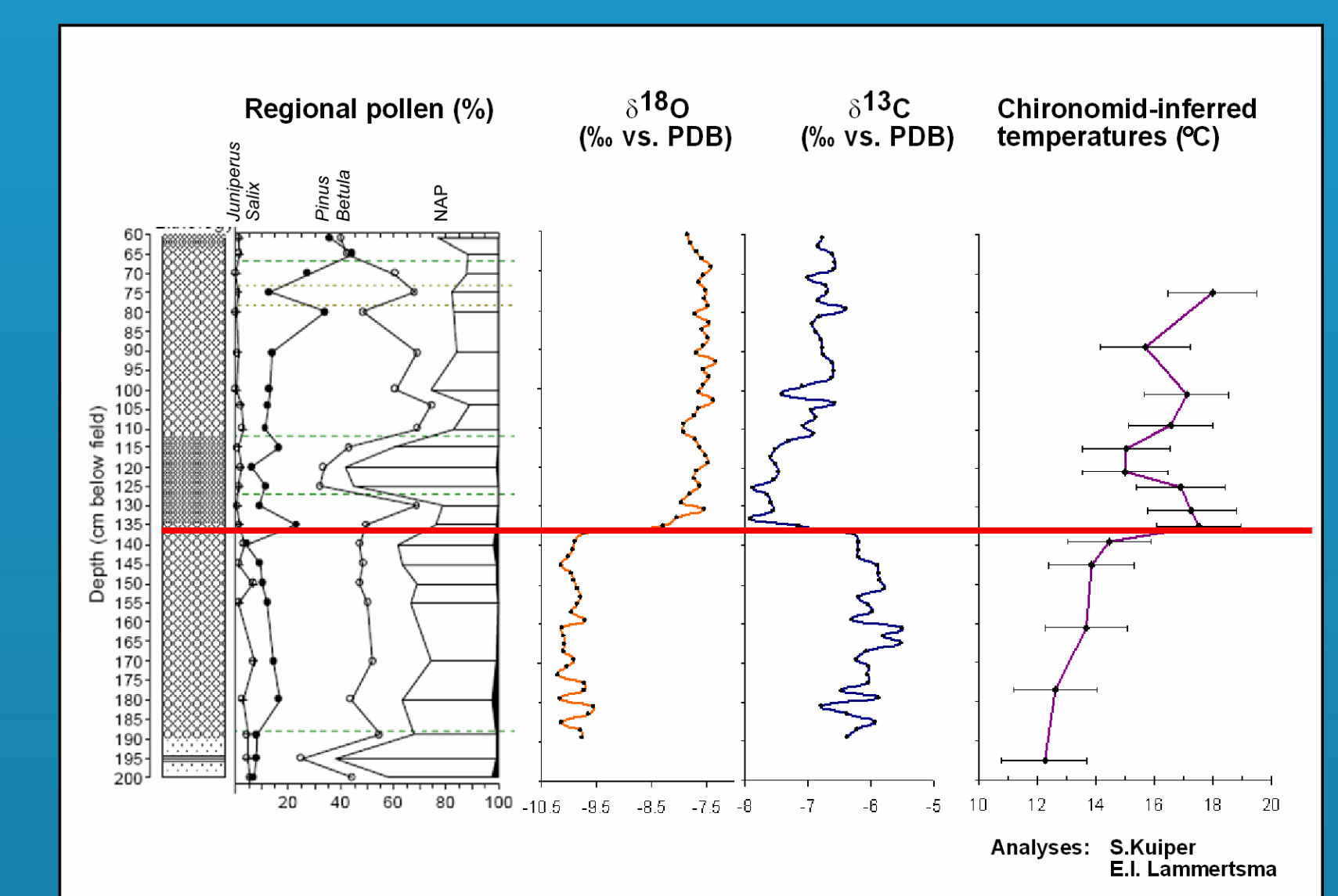


Local vegetation

4. Regional framework

Early Holocene

Younger Dryas



In comparison with regional pollen, the transition in local flora and fauna reflects the Younger Dryas–Holocene boundary.

Chironomid-based temperatures show an increase of ~3°C mean summer temperature at this transition.

This climate amelioration is reflected in the stable isotope record.

A clear shift in aquatic flora and fauna occurs at 137 cm sediment depth, indicating a sudden change in the local environment.