The strong latitudinal climate gradient from nemoral to arctic over Fennoscandia provides a unique opportunity to track GGDs changes and its imprint on leaf morphology. Quantifying seasonal GGDs as Undulation Index (Fig.1a) shows a significant correlation (Fig.1b). Thermal growing season properties can thus be deduced from fossil leaves preserved in sediments (Fig.1c).

The analysis of UI (Fig. 2a) under known GGDs (Fig. 2b) demonstrates that this relation is largely independent of regional habitat conditions such as day light length and e.g. precipitation.

Conclusions:
This study proves that the UI can be applied in GGDs reconstructing over a wide geographical range and further provides a new calibration set for Betula pubescens. Combining B. pubescens with B.nana we are now able to reconstruct growing season dynamics over past phases of rapid climate change independent of vegetation succession, local light regimes and migrational species shifts.

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