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Can a calibration in time be used to infer climate for the last 1000 years climate using chironomids (non-biting midges) preserved in lake sediments?

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Calibrations in space (i.e chironomid samples in many lakes calibrated with meteorological data) are generally used to quantitatively reconstruct air/water temperature. However, developing such transfer functions is time- and money- consuming, thus many chironomid-inferred temperature records are based on transfer functions from other regions. Here, another way of obtaining quantitative climate reconstructions from chironomid assemblages is assessed. A calibration in time (i.e. chironomid assemblage time series calibrated with meteorological data (AD 1864-1950)) was developed using a weighted-average-partial-least-square (WAPLS) model and compared with a calibration in space model for the last 1000 years. The calibration in time had a weaker correlation coefficient (r2=0.71) than the calibration in space (r2=0.86), but the error of prediction (RMSEP=0.58°C) and the maximum bias (Max Bias=0.73°C) outperformed the statistics of the calibration in space (RMSEP=1.5°C; Max Bias=1.72), probably due to the smaller temperature gradient of the calibration and the lower number of chironomid taxa. However, both models provided 70% of inferences with differences with instrumental data <1°C at near-annual resolution and 80% of inferences with differences with instrumental data <1°C when 2-year means were used for comparison. On millenial scale, the calibration in space provided a temperature reconstruction similar to those obtained with other archives/proxies. This better performance might be due to the better represenation of fossil taxa in the calibration in time