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Validation of a CDF-t bias correction method using palaeo-data for the Mid-Holocene and the Last Glacial Maximum

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The main objective of this study is to develop and test a method of bias correction for paleoclimate model simulations using the "Cumulative Distribution Functions – transform" (CDF-t) method. The CDF-t is a quantile-mapping based method, extended to account for climate change signal. Here we apply the CDF-t to climate model outputs for the Mid-Holocene and the Last Glacial Maximum, simulated by the climate model of intermediate complexity iLOVECLIM at 5.625° resolution. Additionally, we test the proposed methodology on iLOVECLIM model outputs dynamically downscaled on a 0.25° resolution.

The results are validated through inverse and forward modelling approaches. The inverse approach implies comparing the obtained results with proxy-based reconstructed climatic variables. Here we use temperature and precipitation reconstructions, obtained with inverse modelling methods from pollen data. In this study, both gridded and point-based multi-proxy reconstruction datasets were used for the analysis.

The forward approach includes a further step of vegetation modelling, using the climatologies derived from bias-corrected outputs of the iLOVECLIM model in CARAIB (CARbon Assimilation In the Biosphere) global dynamic vegetation model. The modelled biomes are evaluated in comparison with pollen-based biome reconstructions BIOME6000.

The findings of this study indicate that the use of the proposed methodology results in significant improvements in climate and vegetation modelling and suggest that the CDF-t method is an valuable approach to reduce biases in paleoclimate modelling.