More is not always better: downscaling climate model outputs from 30 to 5-minute resolution has minimal impact on coherence with Late Quaternary proxies – Supplementary Online Materials

SOM. 1 Energetic cost of movement calculation.

First, we calculate the slope m of the terrain from the altitude z and the distance between cell centres d for each pair of cells i and j in the global relief map from ETOPO2022 (NOAA National Centres for Environmental Information, 2022):

$$m_{ij} = (z_j - z_i)/d_{ij}$$

We then transformed the slope (m) raster into values of energy expenditure (Joules per metre per second for an average 60kg person) following Minetti *et al.* [4]. This formula accounts for the fact that there are different energetic costs (cw) associated with moving on flat ground vs 10° slopes compared to 10° and 20° slopes, despite the difference in slope being the same.

$$cw = 60 \cdot \left((280.5m^{5}) - (58.7m^{4}) - (76.8m^{3}) + (51.9m^{2}) + (19.6m) + 2.5\right)$$

Supplementary figures

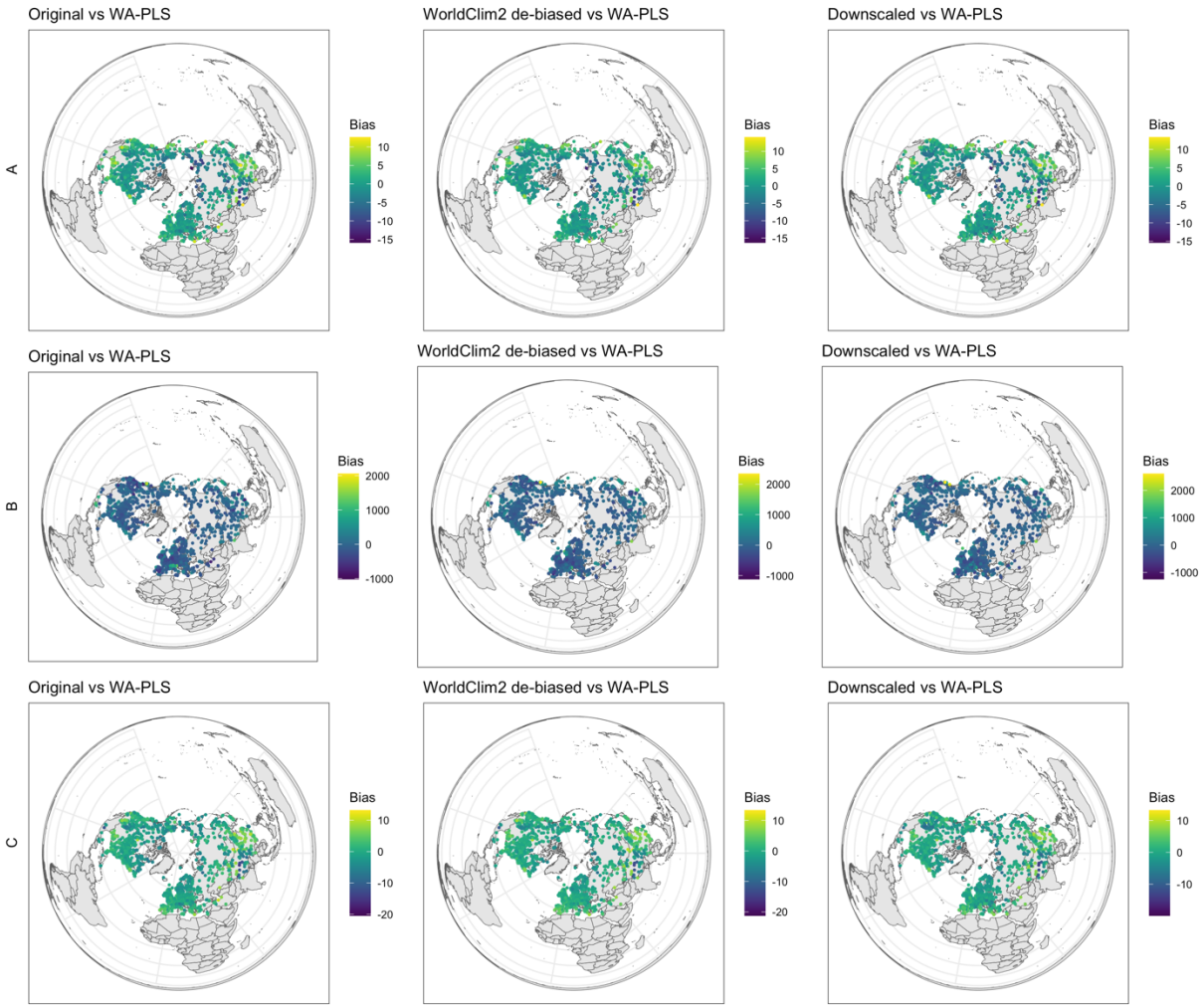

Figure S1. Absolute bias for mean annual temperature (A), mean annual precipitation (B), and mean July temperature (C) for each site comparing the WA-PLS method of proxy reconstruction with different models

Supplementary Tables:

Table S1. Proportion of proxy records (reconstructed using the MAT and WA-PLS methods) that show higher error with lower resolution (30 min) models compared to the downscaled model (5 min). Those where the proportion is higher than 0.5 (and therefore highlights a positive effect of downscaling) is shaded in grey.

	30 min model version	Proxy method	All	Europe	Asia	West North America	East North America	MIS 1	MIS 2	High altitude	Low altitude	High roughness	Low roughness
Annual temperature	Raw	MAT	0.51	0.41	0.56	0.55	0.61	0.5	0.58	0.54	0.5	0.57	0.49
		WA-PLS	0.49	0.4	0.53	0.5	0.61	0.48	0.55	0.52	0.49	0.55	0.48
	Raw WC	MAT	0.49	0.47	0.51	0.5	0.51	0.48	0.55	0.46	0.5	0.5	0.49
		WA-PLS	0.46	0.44	0.48	0.48	0.49	0.46	0.51	0.42	0.47	0.46	0.47
Annual precipitation	Raw	MAT	0.55	0.59	0.51	0.47	0.57	0.56	0.46	0.63	0.54	0.59	0.54
		WA-PLS	0.55	0.59	0.51	0.38	0.62	0.55	0.48	0.56	0.55	0.54	0.55
	Raw WC	MAT	0.48	0.49	0.47	0.49	0.48	0.48	0.45	0.49	0.48	0.47	0.49
		WA-PLS	0.48	0.5	0.49	0.48	0.46	0.48	0.49	0.45	0.49	0.47	0.49
July Temperature	Raw	MAT	0.58	0.54	0.52	0.6	0.68	0.58	0.54	0.52	0.59	0.57	0.58
		WA-PLS	0.56	0.52	0.54	0.56	0.63	0.55	0.56	0.49	0.57	0.57	0.55
	Raw WC	MAT	0.47	0.46	0.45	0.49	0.51	0.46	0.55	0.46	0.48	0.49	0.47
		WA-PLS	0.48	0.47	0.45	0.48	0.47	0.46	0.52	0.43	0.47	0.47	0.47