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Supplement of

Holocene climates of the Iberian Peninsula: pollen-based reconstructions of changes in the west–east gradient of temperature and moisture

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Figure S1. Map showing the location of the SMPDS sites. The colour indicates the modern (a) MTCO, (b) MTWA and (c) α values.

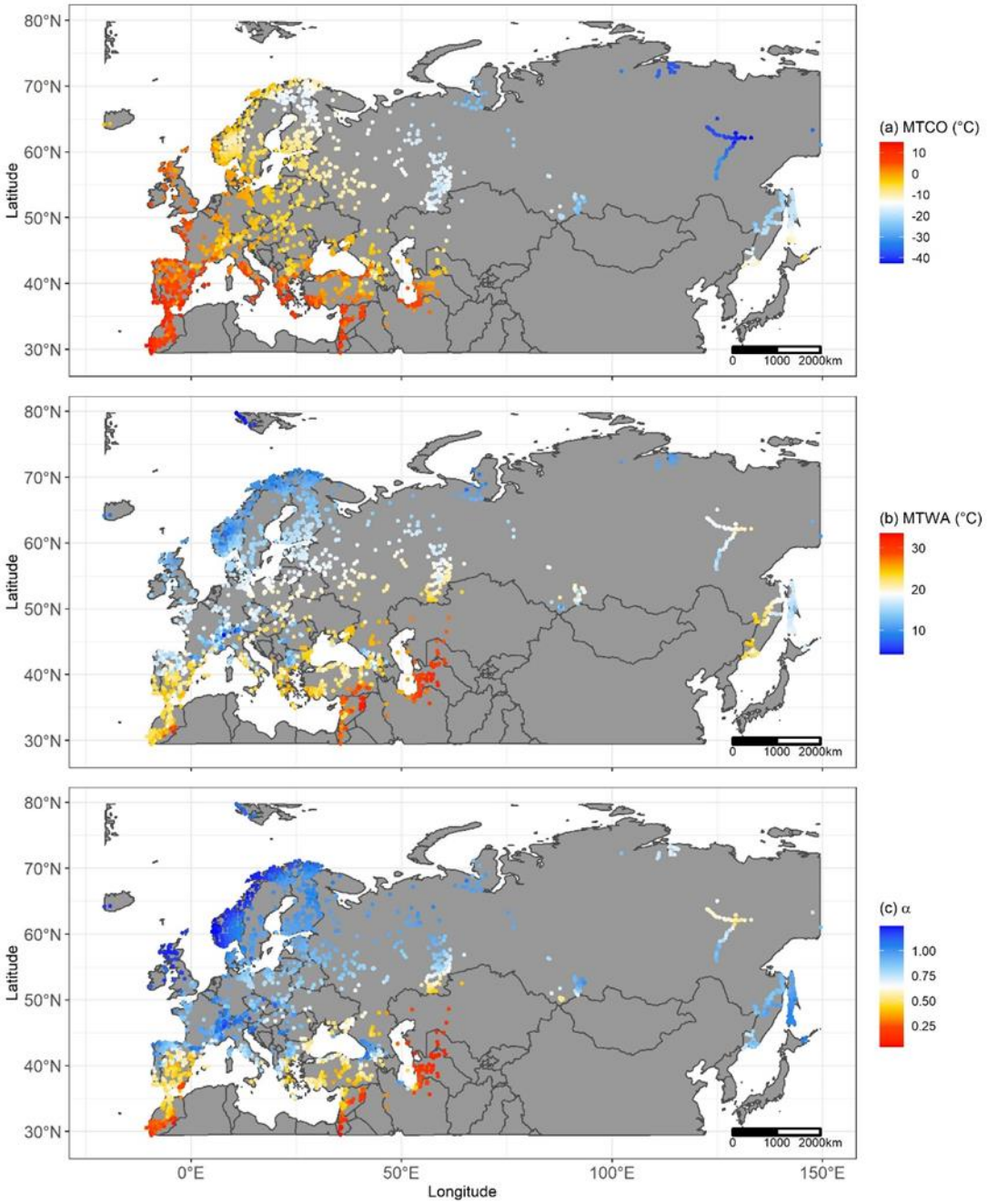


Figure S2. Changes in the west-east gradient of mean temperature of the coldest month (MTCO) through time, represented by anomalies in MTCO relative to 0.5 ka at individual sites. The red lines show the regression lines. The shades indicate the 95 % confidence intervals of the regression lines.

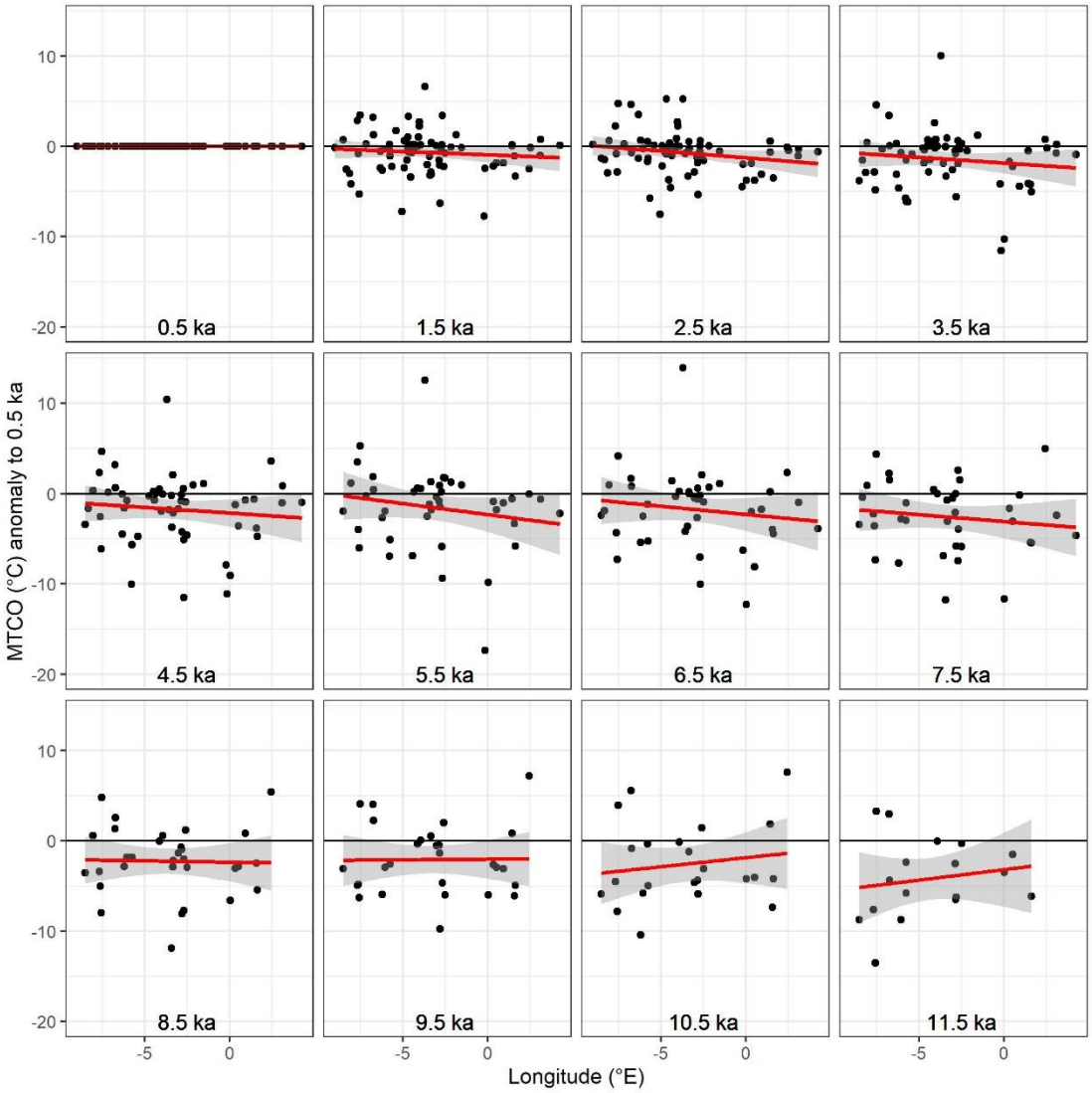


Figure S3. Changes in the west-east gradient of plant-available moisture as represented by anomalies in α relative to 0.5 ka at individual high (>1000 m) and low (<1000 m) elevation sites through the Holocene. The red lines show the regression lines. The shades indicate the 95 % confidence intervals of the regression lines.

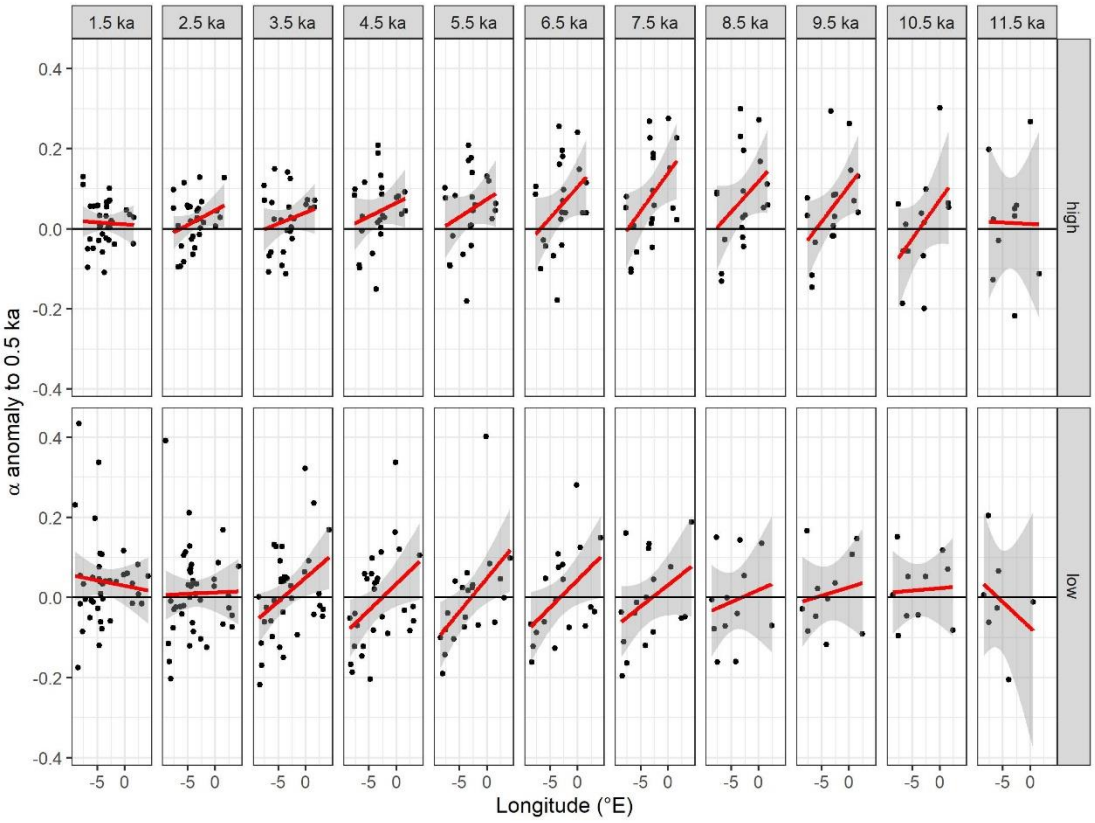


Figure S4. Changes in the elevational gradient of plant-available moisture through time, as represented by anomalies in α relative to 0.5 ka at individual sites. The red lines show the regression lines. The shades indicate the 95 % confidence intervals of the regression lines.

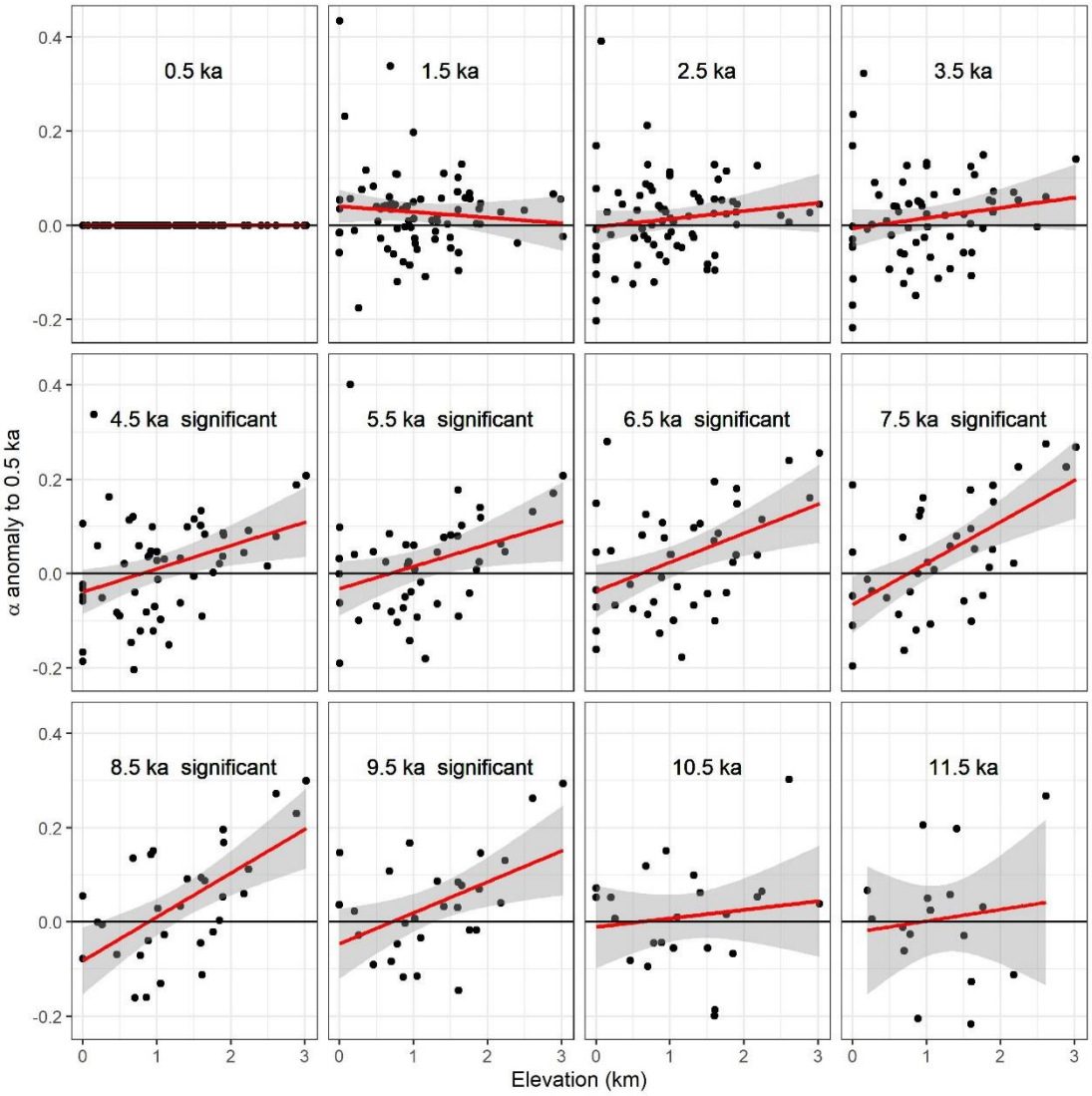


Figure S5. Changes in the west-east gradient of mean temperature of the warmest month (MTWA) through time, as represented by anomalies in MTWA relative to 0.5 ka at individual sites. The red lines show the regression lines. The shades indicate the 95 % confidence intervals of the regression lines.

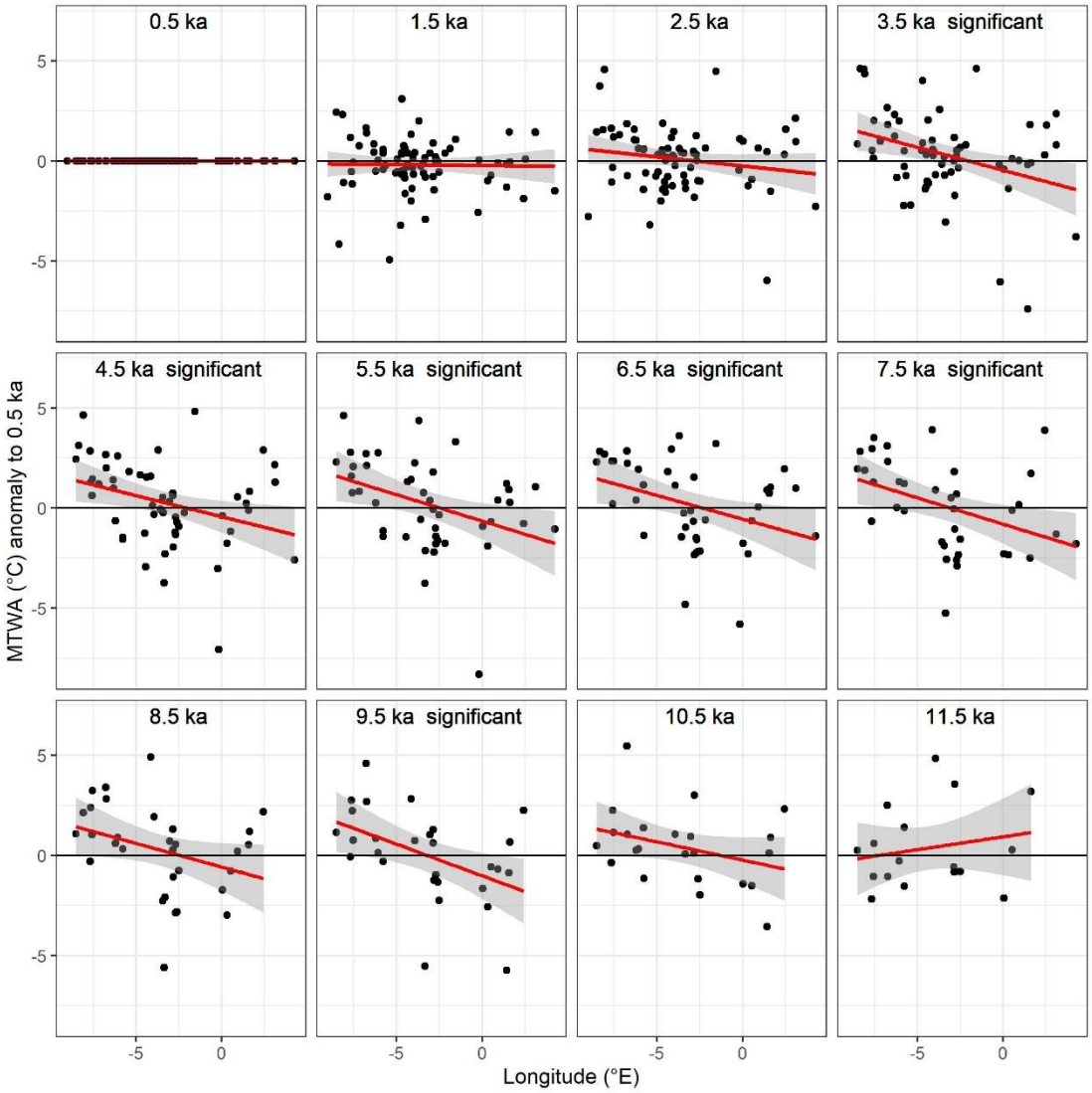


Figure S6. Changes in the west-east gradient of mean temperature of the warmest month (MTWA) as represented by anomalies in MTWA relative to 0.5 ka at individual high (>1000 m) and low (<1000 m) elevation sites through the Holocene. The red lines show the regression lines. The shades indicate the 95 % confidence intervals of the regression lines.

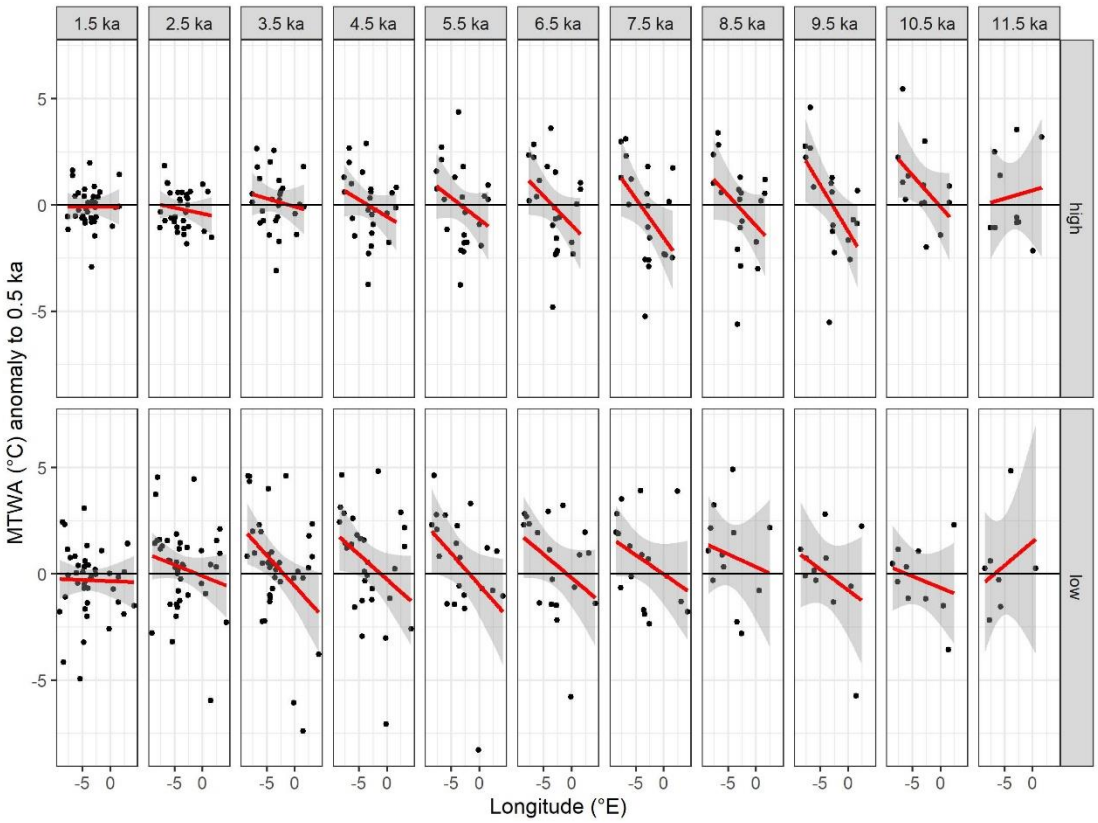


Figure S7. Changes in the elevational gradient of mean temperature of the warmest month (MTWA) through time, as represented by anomalies in MTWA relative to 0.5 ka at individual sites. The red lines show the regression lines. The shades indicate the 95 % confidence intervals of the regression lines.

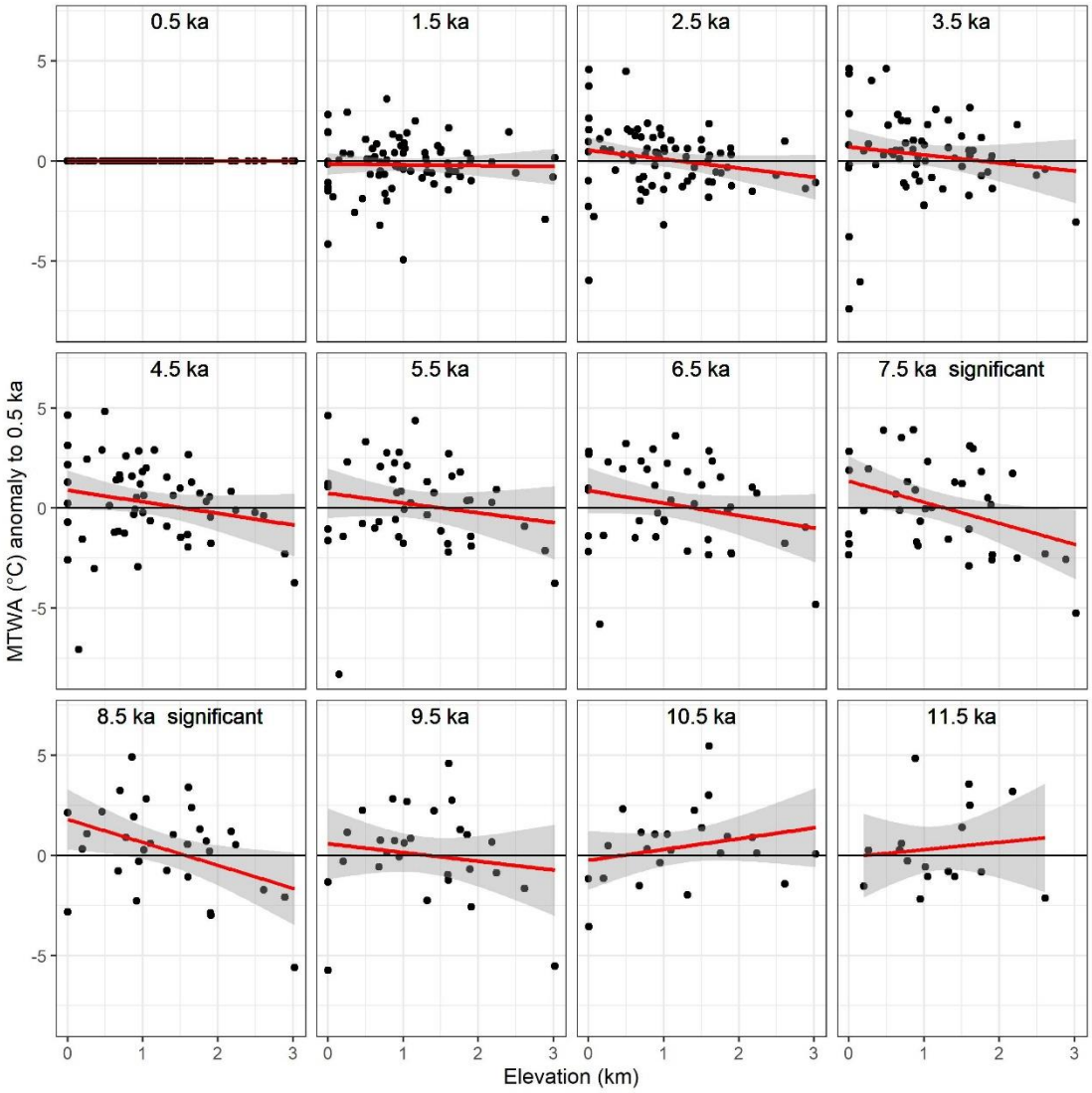


Figure S8. The difference between the westmost and eastmost simulated mean daily precipitation in Iberian Peninsula between 8 ka and 0 ka, smoothed using 100 year bins. Here BP means before 1950 AD. The black lines represent Max Planck Institute Earth System Model (MPI) simulations, the red lines represent Alfred Wagner Insitute Earth System Model (AWI) simulations, the blue lines represent Institut Pierre Simon Laplace Climate Model (IPSL-CM5) TR5AS simulations, the gold lines represent Institut Pierre Simon Laplace Climate Model (IPSL-CM6) TR6AV simulations.

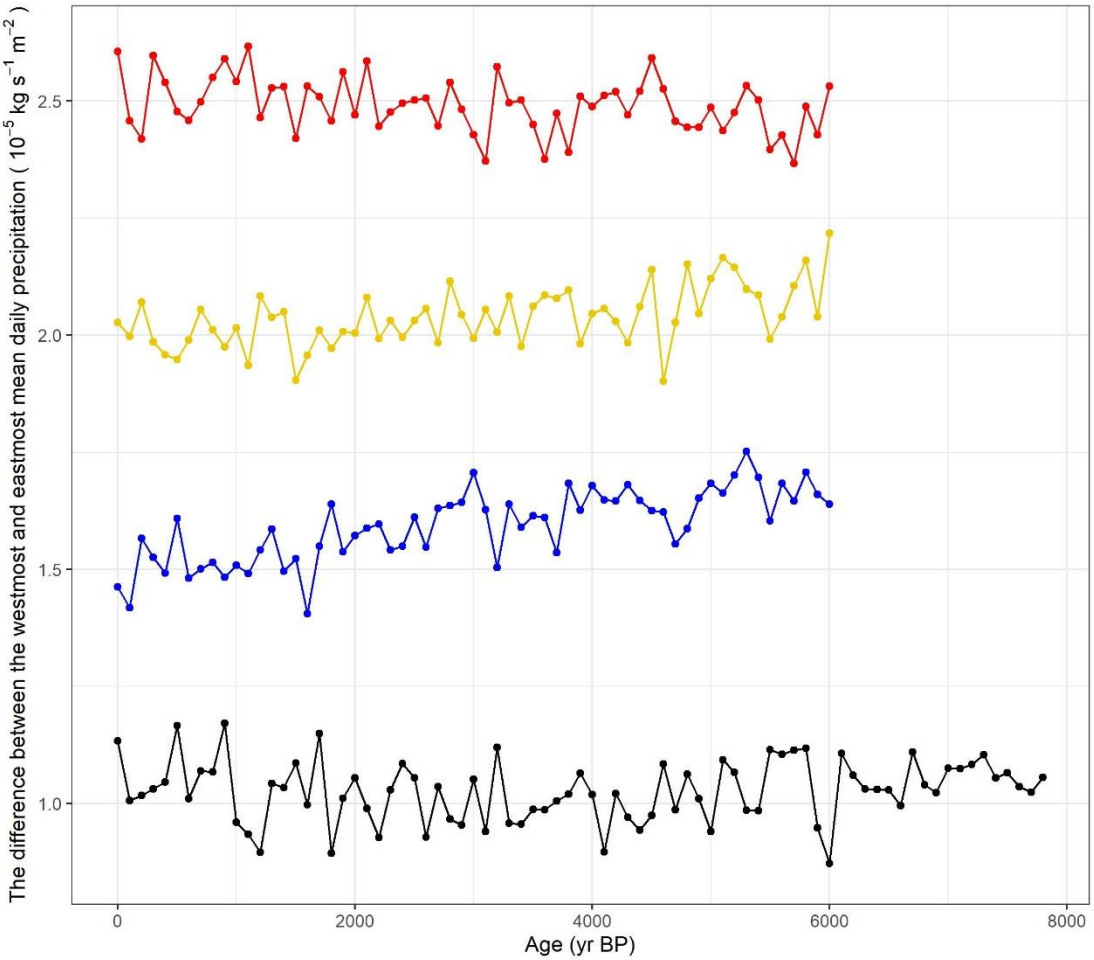


Figure S9. Reconstructed mean temperature of the warmest month (MTWA) at Basa de la Mora using fxTWA-PLS2. The grey shades represent the 95% confidence intervals.

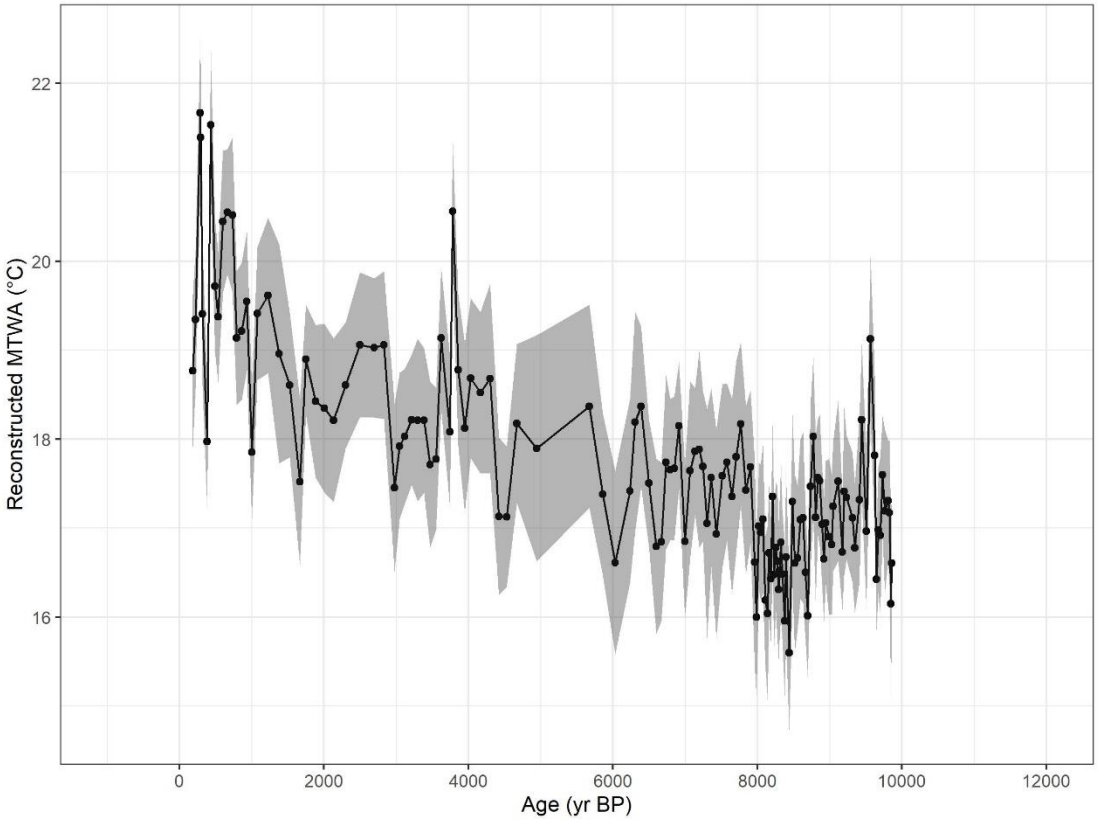


Figure S10. Reconstructed composite changes (anomalies to 0.5 ka) in (a) mean temperature of the coldest month (MTCO), (b) mean temperature of the warmest month (MTWA) and (c) plant-available moisture as represented by α, through the Holocene compared to changes in (d) winter and (e) summer insolation for the latitude of the Iberian Peninsula, using ± 500 years as the bin. The black lines show mean values across sites, with vertical line segments showing the standard deviations of mean values using 1000 bootstrap cycles of site resampling. The reconstructions of MTCO, MTWA and α are made using the original version of fxTWA-PLS (fx-TWA-PLS1).

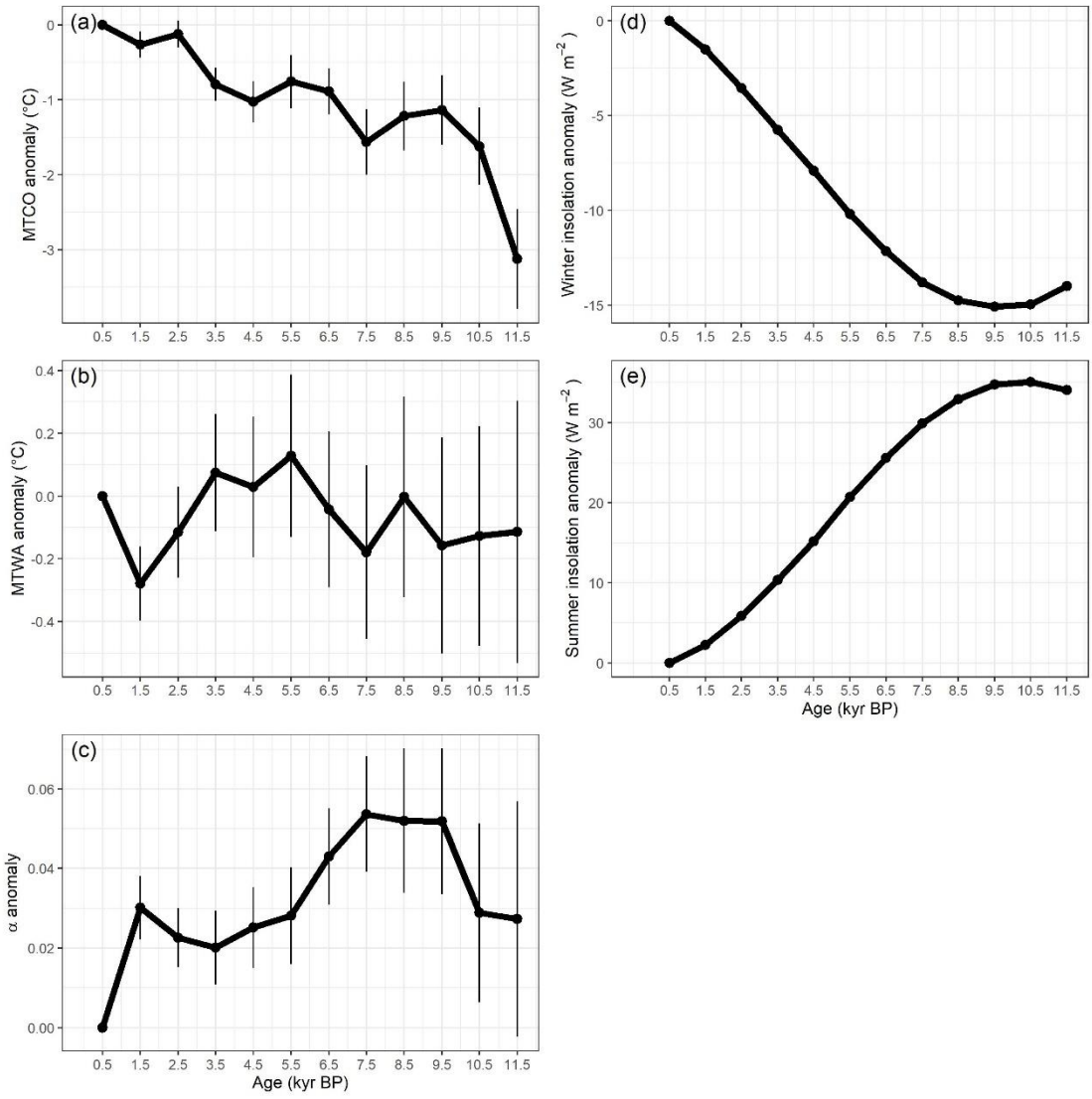
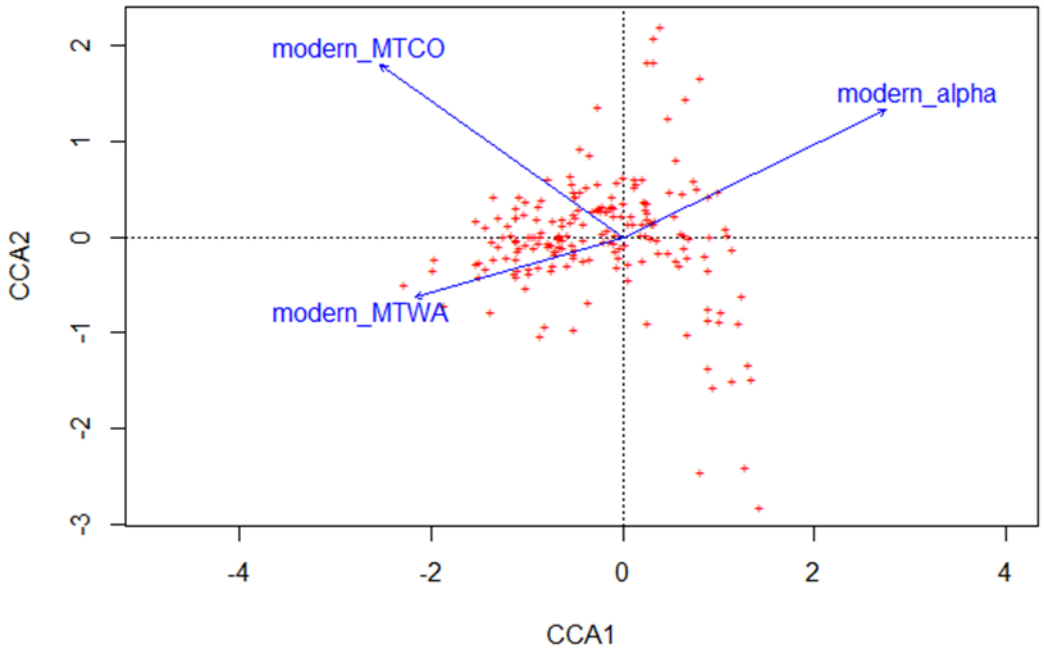


Figure S11. Canonical Correspondence Analysis (CCA) plots of modern and fossil-reconstructed MTCO, MTWA and α.



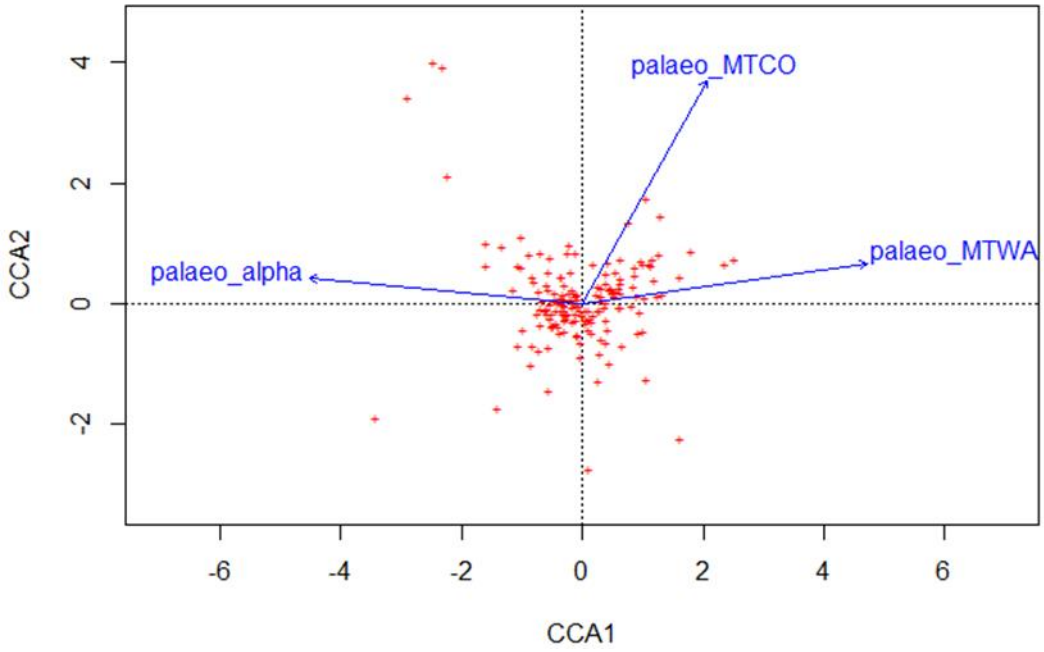


Table S1. Obligate aquatics, insectivorous species, introduced species, and taxa that only occur in cultivation.

Name	The reason why it was removed
Alisma	aquatic
Alisma plantago-aquatica	aquatic
Alismataceae	aquatic
Althaenia	aquatic
Aponogeton	aquatic
Avena	cultivar
Avena sativa	cultivar
Azolla	aquatic
Azolla africana	aquatic
Azolla filiculoides	aquatic
Baldellia	aquatic
Baldellia ranunculoides	aquatic
Batrachium	aquatic
Brasenia	aquatic
Brasenia schreberi	aquatic
Butomaceae	aquatic
Butomus	aquatic
Butomus umbellatus	aquatic
Cabomba	aquatic
Caldesia parnassifolia	aquatic
Calla	aquatic
Calla palustris	aquatic
Callitriche	aquatic
Callitriche obtusangula	aquatic
Callitriche stagnalis	aquatic
Caltha	aquatic
Caltha leptosepala	aquatic
Caltha palustris	aquatic

Cannabaceae	cultivar
Cannabis	cultivar
Cannabis sativa	cultivar
Carya	introduced
Casuarina	introduced
Celtis reticulata	introduced
Centella asiatica	aquatic
Centrostachys aquatica	aquatic
Ceratophyllaceae	aquatic
Ceratophyllum	aquatic
Ceratophyllum demersum	aquatic
Ceratophyllum kolce	aquatic
Ceratopteris	aquatic
Ceratopteris cornuta	aquatic
Cerealia	cultivar
Cicuta	aquatic
Cicuta virosa	aquatic
Cladium	aquatic
Cladium mariscoides	aquatic
Cladium mariscus	aquatic
Cladium mariscus subsp. jamaicense	aquatic
Comarum	aquatic
Comarum palustre	aquatic
Crinum natans	aquatic
Damasonium	aquatic
Drosera	carnivorous
Drosera anglica	carnivorous
Drosera binata	carnivorous
Drosera rotundifolia	carnivorous
Droseraceae	carnivorous
Echinodorus	aquatic

Eichhornia	aquatic
Eichhornia crassipes	aquatic
Elatine	aquatic
Elodea	aquatic
Eucommia	introduced
Fagopyrum	cultivar
Fagopyrum esculentum	cultivar
Fagopyrum tataricum	cultivar
Fothergila major	introduced
Glyceria	aquatic
Glyceria maxima	aquatic
Helianthus annuus	cultivar
Helosciadium inundatum	aquatic
Heteranthera	aquatic
Hippuris	aquatic
Hippuris vulgaris	aquatic
Hordeum	cultivar
Hottonia	aquatic
Hottonia palustris	aquatic
Humulus	cultivar
Humulus lupulus	cultivar
Hydrocharis	aquatic
Hydrocharis morsus-ranae	aquatic
Hydrocharitaceae	aquatic
Hydrocleys	aquatic
Hydrocotyle	aquatic
Hydrocotyle novae-zelandiae	aquatic
Hydrocotyle ranunculoides	aquatic
Hydrocotyle umbellata	aquatic
Hydrocotyle vulgaris	aquatic
Hygrophila	aquatic

Isoetes	aquatic
Isoetes echinospora	aquatic
Isoetes histrix	aquatic
Isoetes lacustris	aquatic
Isoetes setacea	aquatic
Keteeleria	introduced
Lemna	aquatic
Lemna minor	aquatic
Lemna valdiviana	aquatic
Lemnaceae	aquatic
Lemnoideae	aquatic
Lentibulariaceae	carnivorous
Lepilaena	aquatic
Limosella aquatica	aquatic
Littorella	aquatic
Littorella uniflora	aquatic
Ludwigia palustris	aquatic
Machaeranthera tortifolia	introduced
Marsileaceae	aquatic
Martretia	aquatic
Menyanthaceae	aquatic
Menyanthes	aquatic
Menyanthes trifoliata	aquatic
Monochoria	aquatic
Myosoton aquaticum	aquatic
Myriophyllum	aquatic
Myriophyllum alterniflorum	aquatic
Myriophyllum aquaticum	aquatic
Myriophyllum sibiricum	aquatic
Myriophyllum spicatum	aquatic
Myriophyllum verticillatum	aquatic

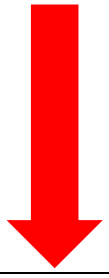
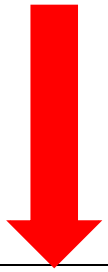
Nelumbo	aquatic
Nepenthes	carnivorous
Nephrophyllidium crista-galli	aquatic
Nicotiana tabacum	cultivar
Nuphar	aquatic
Nuphar lutea	aquatic
Nuphar polysepala	aquatic
Nymphaea	aquatic
Nymphaea alba	aquatic
Nymphaea lotus	aquatic
Nymphaea nouchali	aquatic
Nymphaea odorata	aquatic
Nymphaeaceae	aquatic
Nymphoides	aquatic
Nymphoides indica	aquatic
Nymphoides peltata	aquatic
Oenanthe aquatica	aquatic
Oenanthe aquatica	aquatic
Oryza	cultivar
Oryza sativa	cultivar
Ottelia	aquatic
Parthenocissus	introduced
Paulownia	introduced
Phacelia	introduced
Phragmites	aquatic
Phragmites australis	aquatic
Pilularia	aquatic
Pilularia globulifera	aquatic
Pinguicula	carnivorous
Pinguicula vulgaris	carnivorous
Pistia stratiotes	aquatic

Plantago uniflora	aquatic
Polygonum (aquatic)	aquatic
Polypodium pellucidum	introduced
Pontederia	aquatic
Pontederiaceae	aquatic
Potamogeton	aquatic
Potamogeton natans	aquatic
Potamogeton pectinatus	aquatic
Potamogeton thunbergii	aquatic
Potamogetonaceae	aquatic
Potentilla palustris	aquatic
Ranunculus acris	aquatic
Ranunculus aquatilis	aquatic
Ranunculus batrachioides	aquatic
Ranunculus flammula	aquatic
Ranunculus lingua	aquatic
Ranunculus peltatus	aquatic
Ranunculus sceleratus	aquatic
Ranunculus trichophyllus	aquatic
Rheum officinale	introduced
Ribes montigenum type	introduced
Rorippa amphibia	aquatic
Ruppia	aquatic
Ruppia maritima	aquatic
Ruppiaceae	aquatic
Sagittaria	aquatic
Sagittaria guayanensis type	aquatic
Sagittaria sagittifolia	aquatic
Salvinia	aquatic
Samolus valerandi	aquatic
Sarcobatus	introduced

Sarracenia	carnivorous
Scheuchzeria	aquatic
Scheuchzeria palustris	aquatic
Secale	cultivar
Sparganiaceae	aquatic
Sparganium	aquatic
Sparganium angustifolium	aquatic
Sparganium emersum	aquatic
Sparganium erectum	aquatic
Sparganium minimum	aquatic
Steris segetalis	aquatic
Stratiotes	aquatic
Stratiotes aloides	aquatic
Stuckenia	aquatic
Stuckenia pectinata	aquatic
Stuckenia vaginata	aquatic
Symphoricarpus	introduced
Trapa	aquatic
Trapa natans	aquatic
Triglochin	aquatic
Triglochin maritima	aquatic
Triticum	cultivar
Typha	aquatic
Typha angustifolia	aquatic
Typha domingensis	aquatic
Typha latifolia	aquatic
Typha minima	aquatic
Typha orientalis	aquatic
Typhaceae	aquatic
Utricularia vulgaris	aquatic
Vitis	cultivar

Vitis vinifera	cultivar
Zannichellia	aquatic
Zannichellia palustris	aquatic
Zea	cultivar
Zea mays	cultivar
Zizania	aquatic
Zizania aquatica	aquatic

Table S2. Relative contributions of individual taxa to the reconstructions of mean temperature of the coldest month (MTCO), mean temperature of the warmest month (MTWA) and plant-available moisture (α). The plots show the top 10 taxa for each end of the climate gradient after first screening out taxa that are relatively rare (i.e. occur < the median number of occurrences of all taxa in the fossil pollen record, which is 178 samples).

	MTCO	**MTWA**		**α**
 Increasing cold	*Abies*	*Ilex*	 Increasing wet	*Myrica*
	Tilia	*Taxus*		*Taxus*
	Thalictrum	*Saxifragaceae*		*Ilex*
	Betula	*Myrica*		*Calluna*
	Onagraceae	*Orobanchaceae*		*Orobanchaceae*
	Ericaceae	*Calluna*		*Sorbus*
	Lycopodium	*Potentilla*		*Potentilla*
	Salix	*Onagraceae*		*Betula*
	Ulmus	*Sorbus*		*Onagraceae*
	Orobanchaceae	*Salix*		*Ericaceae*
...				
Increasing warm 	*Quercus.intermediate*	*Amaranthaceae*	Increasing dry 	*Olea*
	Phillyrea	*Myrtaceae*		*Myrtaceae*
	Cistaceae	*Cistus*		*Quercus.evergreen*
	Oleaceae	*Amaryllidaceae*		*Pistacia*
	Cistus	*Phillyrea*		*Cistaceae*
	Arbutus	*Pistacia*		*Amaryllidaceae*
	Pistacia	*Ephedra*		*Cistus*
	Myrtaceae	*Thymelaeaceae*		*Ephedra*
	Ilex	*Tamarix*		*Tamarix*
	Thymelaeaceae	*Oleaceae*		*Thymelaeaceae*

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