Supplementary Information for

Climate-driven changes in Mediterranean grain trade mitigated famine but introduced the Black Death to medieval Europe

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Table S1. Overview of maximum latewood density (MXD) datasets used for temperature reconstructions between 1250 and 1360 CE. JJA = June-August, JA = July-August, AS = August-September, MJ = May-June, M = May, S = September, JAS = July-September.

Reconstruction	N-Scan	Jämtland	Tyrol	Lötschental	Simplon	Pyrenees	Corsica	Smolikas
Parameter	MXD	MXD	MXD	MXD	MXD	MXD	MXD	MXD
Latitude (N)	68°00'	63°20'	47°08'	46°24'	46°06'	42°39'	42°20'	40°04'
Longitude (E)	20°00'	12°30'	11°11'	7°48'	7°55'	00°58'	9°05'	20°55'
Elevation (m asl)	300-500	400-600	1900-2100	1900-2200	1900-2300	2200-2300	1450-1600	2100-2200
Species	*Pinus sylvestris*	*Pinus sylvestris*	*Picea abies*	*Larix decidua*	*Larix decidua*	*Pinus uncinata*	*Pinus nigra*	*Pinus heldreichii*
Signal	JJA	JA	AS	JA	JA	MJ & AS	M & S	JAS

Table S2. Overview of tree ring width (TRW) and tree-ring stable isotope (TRSI) datasets used for hydroclimate reconstructions between 1250 and 1360 CE (i.e., PDSI = Palmer Drought Severity Index or precipitation = Precip). FMAMJ = February-June, JJAS = June-September, AMJ = April-June, JJA = June-August, JJ = June-July.

Reconstruction	Morocco	Germany	C Europe	C Europe	Smolikas
Parameter	TRW	TRW	TRW	TRSI	TRW
Latitude (N)	33°	51-52°	45-50°	48-51°	40°04'
Longitude (E)	-5°	9-10°	8-10°	11-19°	20°55'
Elevation (m asl)	2100-2300	100-400	50-500	200-600	2100-2200
Species	*Cedrus atlantica*	*Quercus*	*Quercus*	*Quercus*	*Pinus heldreichii*
Signal	FMAMJ PDSI	JJAS PDSI	AMJ Precip	JJA PDSI	JJ Precip

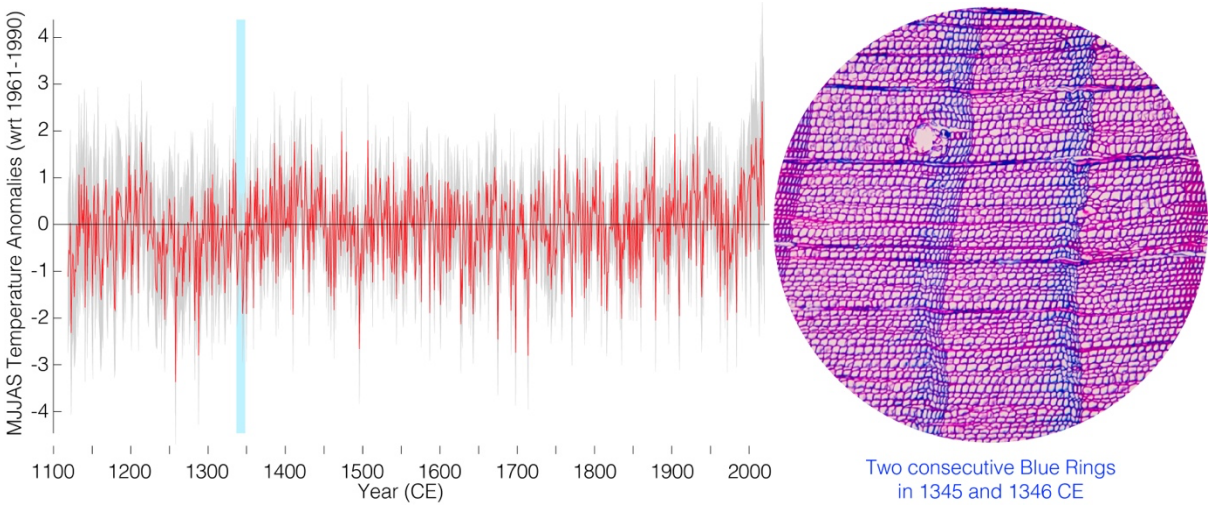

Fig. S1. May–September (MJJAS) temperature anomalies from 1119–2020 CE (uncertainties are expressed by grey shading), based on 534 maximum latewood density (MXD) measurement series from living and relict samples from Mountain pine (*Pinus uncinata*) trees from undisturbed upper treeline ecotones in the Spanish central Pyrenees (*1*). The pre-Black Death cold phase is indicated by the vertical blue shading. The right-side double-stained thin section shows two consecutive Blue Rings that were formed in 1345 and 1346 CE in a Mountain pine (*Pinus uncinate*) from the upper treeline in the central Spanish Pyrenees (*2*).

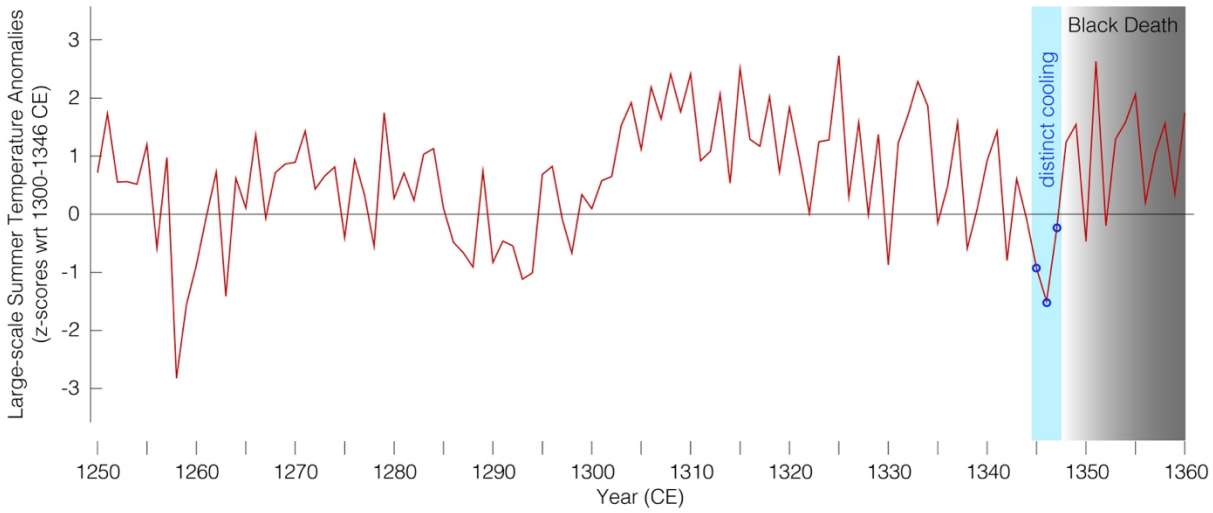

Fig. S2. Annually resolved and absolutely dated summer temperature reconstruction for the Northern Hemisphere extra-tropics (*3*), which combines maximum latewood density (MXD) measurements from 15 sites. The record is expressed as z-scores with respect to the 1300–1346 CE pre-Black Death period (mean of zero and standard deviation of one).

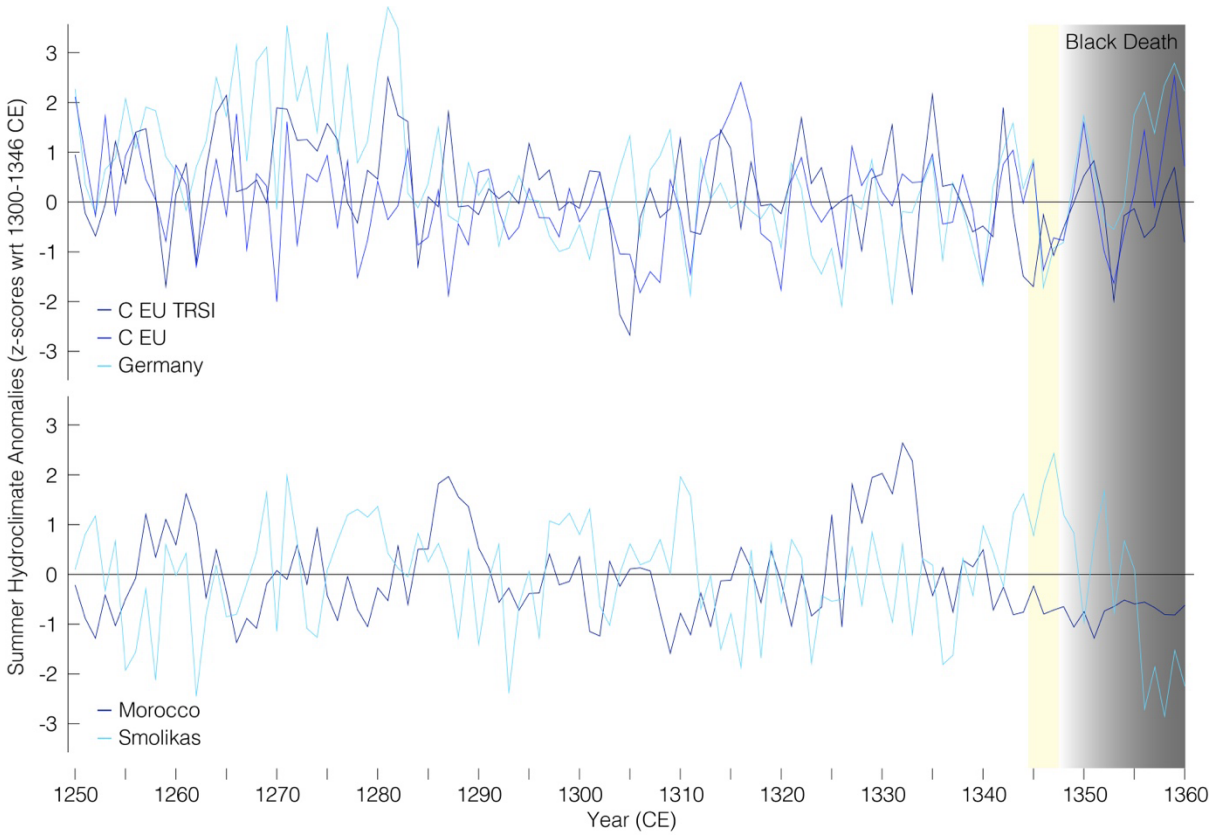

Fig. S3. Comparison of annually resolved and absolutely dated summer temperature reconstructions that use tree-ring width (TRW) or tree-ring stable isotopes (TRSI) measurements from hundreds and thousands of core and disc samples from living and relict trees collected at five different regions across central Europe and the Mediterranean (see Supplementary Table S2 for details). The individual records are expressed as z-scores with respect to the 1300–1346 CE pre-Black Death period (mean of zero and standard deviation of one).

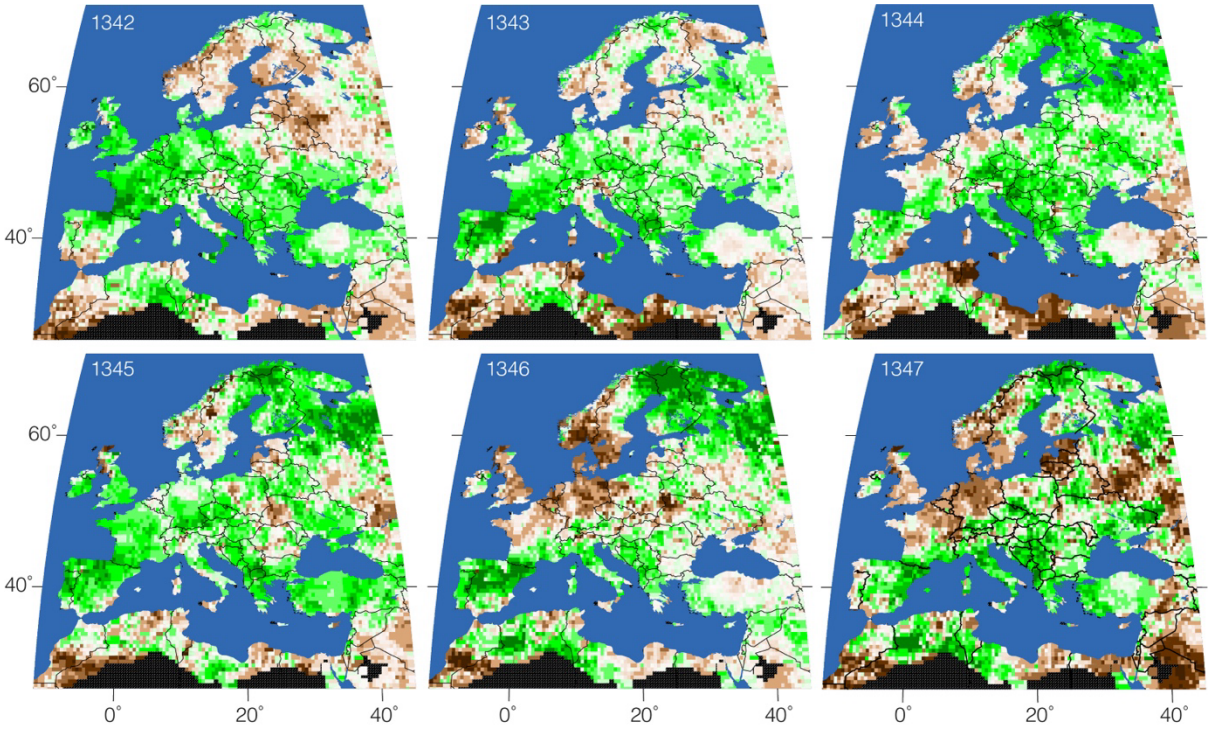

Fig. S4. A set of year-by-year maps of reconstructed summer season (June-August) self-calibrating Palmer Drought Severity Index (scPDSI) using a 5414-point half-degree longitude-by-latitude grid of an on an updated version of the Old World Drought Atlas (OWDA) (*4*). The JJA scPDSI reflects spring-summer soil moisture conditions and is uses regression-based climate field reconstructions.

References

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