Supplementary Material

Pollen-based reconstructions of long-term regional climate trends of the eastern Mediterranean during the Holocene

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Supplementary Figure 1. Map of distribution of the modern pollen samples the SPECIAL Modern Pollen Data Set (SMPDS) (Harrison, 2019) used to train the model.

Supplementary Figure 2. Distribution of Hill N2 values of the fossil pollen samples. Samples with an N2 value of <2 (indicated by the red dotted line) were excluded from the analysis.

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Supplementary Figure 5. Geopotential height, expressed as anomalies compared to present, from the LOVECLIM simulations for four key times during the Holocene: 11±0.15, 9±0.15, 6±0.15 and 3±0.15 ka.

Supplementary Table 1. Allocation of pollen taxa found in samples of the Eastern Mediterranean-Black Sea Caspian Corridor (EMBSeCBIO) pollen database into the 247 types represented in the SPECIAL Modern Pollen Data Set (SMPDS) (Harrison, 2019). The table indicates the taxonomic level of aggregation, the name used for the amalgamated taxon, and the component species or genera included in this taxon.

Taxonomic level	**Amalgamated taxon name**	**Individual taxa included**
Genus	*Abies*	*Abies, Abies alba, Abies cilicica, Abies nordmanniana, Abies pinsapo subsp marocana*
Family	Acanthaceae	*Acanthus mollis*
Genus	*Acer*	*Acer, Acer campestre, Acer campestre* type*, Acer pseudoplatanus, Acer* type
Genus	*Aconitum*	*Aconitum, Aconitum group, Aconitum napellus* type*, Aconitum septentrionale, Aconitum* type
Family	Actinidiaceae	*Actinidia*
Genus	*Adonis*	*Adonis, Adonis aestivalis* type*, Adonis* type
Family	Adoxaceae	*Adoxa, Adoxa moschatellina, Adoxa* type
Genus	*Aesculus*	*Aesculus, Aesculus hippocastanum*
Genus	*Ailanthus*	*Ailanthus*
Family	Aizoaceae	*Carpobrotus*
Genus sub-group	*Alnus*	*Alnus, Alnus glutinosa, Alnus glutinosa* type*, Alnus glutinosa/Alnus incana, Alnus incana, Alnus incana* type*, Alnus incana/Alnus cordata* type*, Alnus non-viridis, Alnus* type
Genus sub-group	*Alnus alnobetula*	*Alnus viridis*
Family	Amaranthaceae	*Aellenia* type*,* Amaranthaceae*, Amaranthus, Atriplex nudicaulis, Chenopodium, Chenopodium album, Halothamnus* type*, Noaea* type
Family	Amaryllidaceae	Amaryllidaceae*, Narcissus*
Family	Anacardiaceae	Anacardiaceae
Genus	*Andromeda*	*Andromeda*
Family	Apiaceae	*Aegopodium, Anthriscus sylvestris* type*, Anthriscus* type*,* Apiaceae*, Apium, Apium* type*, Astrantia, Astrantia* type*, Athamanta cretensis, Berula erecta* type*, Bunium* type*, Aegopodium podagraria, Bupleurum, Bupleurum* type*, Carum carvi, Chaerophyllum, Chaerophyllum hirsutum* type*, Chaerophyllum* type*, Conopodium, Conopodium majus, Daucaceae, Daucus carota, Ammi* type*, Daucus carota* type*, Daucus* type*, Echinophora, Eryngium, Eryngium ilicifolium, Eryngium* type*, Falcaria* type*, Ferula, Ferula* type*, Heracleum, Angelica, Heracleum laciniatum* type*, Heracleum sphondylium, Heracleum* type*, Laserpitium latifolium* type*, Laserpitium prutenicum, Ligusticum mutellina, Malabaila, Meum, Meum athamanticum, Neogaya simplex* type*,*

		Angelica archangelica, Oenanthe, Oenanthe type*, Orlaya, Orlaya grandiflora, Pastinaca* type*, Peucedanum, Peucedanum ostruthium, Peucedanum* type*, Pimpinella, Pimpinella major* type*, Angelica* type*, Pimpinella* type*, Pleurospermum austriacum, Sanicula, Sanicula europaea, Sanicula type, Scandix, Seseli* type*, Torilis, Torilis arvensis, Turgenia* type*, Anisosciadium* type*, Anthriscus, Anthriscus sylvestris*
Genus	*Aquilegia*	*Aquilegia* type
Family	Araceae	Araceae
Genus	*Arbutus*	*Arbutus, Arbutus* type*, Arbutus unedo*
Genus	*Arctostaphylos*	*Arctostaphylos, Arctostaphylos uva-ursi*
Genus	*Argania*	*Argania spinosa*
Family	Aristolochiaceae	*Aristolochia*
Genus	*Artemisia*	*Artemisia, Artemisia genipii/Artemisia mutellina, Artemisia herba-alba* type*, Artemisia* type*, Artemisia vulgaris* type
Family	Asclepiadaceae	Asclepiadaceae
Family	Asparagaceae	Asparagaceae*, Asparagus, Asparagus* type*, Convallaria, Convallaria* type*, Maianthemum bifolium, Maianthemum* type*, Ornithogalum type, Scilla* type
Family	Asphodelaceae	*Eremurus*
Family	Asphodeliaceae	*Asphodeline, Asphodelus, Asphodelus albus, Asphodelus albus* type*, Asphodelus fistulosus* type*, Asphodelus* type
Family	Asteraceae	Asteraceae
Family sub-group	Asteraceae (Liguliflorae)	Asteraceae (Liguliflorae)
Family sub-group	Asteroideae	*Achillea, Antennaria, Antennaria* type*, Anthemis, Anthemis* type*, Arnica montana, Aster, Aster bellidiastrum, Aster* type*, Aster/Achillea, Aster/Achillea* type*, Achillea* type*,* Asteraceae (Tubuliflorae)*,* Asteroideae*, Bellis, Bellis* type*, Bidens, Bidens* type*, Calendula, Calendula* type*, Chrysanthemum alpinum, Doronicum, Achillea/Anthemis* type*, Erigeron, Eupatorium, Eupatorium* type*, Filago* type*, Filifolium sibiricum, Gnaphalium, Gnaphalium* type*, Helianthus, Helianthus* type*, Homogyne, Achillea/Aster, Homogyne alpina, Inula, Inula* type*, Logfia* type*, Matricaria* type*, Petasites, Petasites* type*, Senecio, Senecio* type*, Solidago, Adenostyles* type*, Solidago* type*, Solidago virgaurea* type*, Tussilago farfara, Tussilago* type*, Xanthium, Xanthium spinosum, Xanthium strumarium, Xanthium* type*, Ambrosia, Ambrosia artemisiifolia* type*, Ambrosia* type*, Ambrosia/Xanthium*
Genus	*Astragalus*	*Astragalus, Astragalus alpinus* type*, Astragalus* type
Family	Berberidaceae	Berberidaceae
Genus	*Berberis*	*Berberis, Berberis vulgaris, Mahonia*
Genus	*Betula*	*Betula, Betula* type*, Betula alba, Betula alba* type*, Betula pendula, Betula pendula/Betula pubescens, Betula pubescens, Betula pubescens* type*, Betula sect. Albae, Betula tortuosa*
Genus	*Betula (Chamaebetula)*	*Betula fruticosa, Betula humilis/Betula nana, Betula nana, Betula nana* type
Family	Boraginaceae	*Alkanna, Cynoglossum creticum, Echium, Echium* type*, Echium vulgare, Heliotropium* type*, Lithospermum, Myosotis, Myosotis arvensis* type*, Myosotis* type*, Onosma, Anchusa, Pulmonaria, Pulmonaria* type*, Symphytum, Symphytum* type*, Anchusa arvensis, Anchusa type,* Boraginaceae*, Borago officinalis, Cerinthe, Cerinthe minor, Cerinthe type*

Family	Brassicaceae	*Arabidopsis, Cardamine pratensis* type*, Cardamine* type*, Crambe, Descurainia, Draba, Draba type, Hornungia* type*, Lepidium* type*, Matthiola, Sinapis, Barbarea* type*, Sinapis* type*, Brassica, Brassica* type*,* Brassicaceae*,* Brassicaceae type*, Capsella bursa-pastoris* type*, Capsella* type*, Cardamine*
Genus	*Bruckenthalia*	*Bruckenthalia*
Genus	*Buxus*	*Buxus, Buxus sempervirens*
Genus	*Calluna*	*Calluna, Calluna* type*, Calluna vulgaris, Calluna vulgaris* type
Family	Campanulaceae	*Campanula, Phyteuma, Phyteuma* type*, Campanula* type*,* Campanulaceae*, Jasione, Jasione montana, Jasione* type*, Legousia, Lobelia dortmanna, Lobelia* type
Family	Capparaceae	Capparidaceae*, Capparis, Capparis spinosa, Capparis* type
Family	Caprifoliaceae	Caprifoliaceae*, Scabiosa columbaria* type*, Scabiosa rotata* type*, Scabiosa* type*, Scabiosa/Succisa* type*, Succisa, Succisa pratensis, Succisa pratensis* type*, Succisa* type*, Dipsacaceae, Dipsacus, Dipsacus fullonum* type*, Dipsacus* type*, Knautia, Knautia arvensis, Knautia* type*, Scabiosa*
Genus	*Carduoideae*	*Arctium, Centaurea, Centaurea collina, Centaurea collina* type*, Centaurea cyanus, Centaurea cyanus* type*, Centaurea depressa* type*, Centaurea jacea, Centaurea jacea* type*, Centaurea montana, Centaurea montana* type*, Arctium* type*, Centaurea nigra, Centaurea nigra* type*, Centaurea rhenana* type*, Centaurea scabiosa, Centaurea scabiosa* type*, Centaurea solstitialis, Centaurea solstitialis* type*, Centaurea* type*, Cirsium, Cirsium* type*, Arctium/Jurinea, Cirsium/Carduus, Cirsium/Gundelia, Cousinia, Echinops, Gundelia* type*, Jurinea* type*, Onopordum, Onopordum* type*, Saussurea, Saussurea alpina, Carduoideae, Saussurea* type*, Serratula, Serratula* type*, Carduus, Carduus* type*, Carlina, Carlina* type*, Carthamus*
Genus	*Carpinus betulus*	*Carpinus, Carpinus betulus, Carpinus betulus* type*, Carpinus* type
Genus	*Carpinus orientalis/Ostrya*	*Carpinus orientalis, Carpinus orientalis* type*, Carpinus orientalis/Ostrya, Carpinus orientalis/Ostrya carpinifolia, Carpinus orientalis/Ostrya carpinifolia* type*, Carpinus/Ostrya, Carpinus/Ostrya* type*, Ostrya, Ostrya* type
Family	Caryophyllaceae	*Agrostemma githago, Cerastium cerastioides* type*, Cerastium fontanum* type*, Cerastium* type*, Cerastium/Stellaria* type*, Corrigiola, Dianthus, Dianthus superbus* type*, Dianthus* type*, Frankenia, Frankenia* type*, Agrostemma* type*, Gypsophila, Gypsophila fastigiata, Gypsophila repens* type*, Gypsophila* type*, Herniaria, Herniaria glabra, Herniaria* type*, Herniaria/Paronychia, Illecebrum, Loeflingia, Arenaria, Lychnis, Lychnis flos-cuculi, Lychnis flos-cuculi* type*, Lychnis* type*, Lychnis viscaria* type*, Minuartia, Minuartia rubra* type*, Minuartia* type*, Minuartia verna* type*, Moehringia* type*, Arenaria* type*, Paronychia, Paronychia type, Polycarpon, Sagina, Sagina procumbens, Sagina* type*, Saponaria, Scleranthus, Scleranthus annuus, Scleranthus perennis, Caryophyllaceae, Scleranthus* type*,* Silenaceae*, Silene, Silene acaulis, Silene acaulis* type*, Silene alba* type*, Silene dioica* type*, Silene latifolia, Silene rupestris, Silene* type*,* Caryophyllaceae subfam. Silenoideae*, Silene vulgaris type, Spergula, Spergula arvensis, Spergula* type*, Spergularia, Spergularia* type*, Stellaria, Stellaria holostea, Stellaria holostea* type*, Stellaria nemorum, Cerastium, Stellaria nemorum* type*, Stellaria palustris, Stellaria* type*, Vaccaria* type*, Cerastium alpinum* type*, Cerastium arvense* type
Genus	*Cassiope*	*Cassiope, Cassiope* type
Genus	*Castanea*	*Castanea, Castanea sativa*

Genus	*Cedrus*	*Cedrus, Cedrus atlantica, Cedrus atlantica* type*, Cedrus libani*
Family	Celastraceae	Celastraceae*, Parnassia, Parnassia palustris*
Genus	*Celtis*	*Celtis, Celtis australis*
Genus	*Ceratonia*	*Ceratonia, Ceratonia siliqua, Ceratonia* type
Genus	*Cercis*	*Cercis siliquastrum*
Genus	*Chamaedaphne*	*Chamaedaphne, Chamaedaphne calyculata*
Genus	*Chamaerops*	*Chamaerops*
Genus	*Chimaphila*	*Chimaphila umbellata*
Genus	*Cichorioideae*	*Cichorioideae, Lactuca sativa* type*, Lactuca* type*, Leontodon helveticus, Leontodon* type*, Scorzonera humilis* type*, Scorzonera* type*, Sonchus* type*, Taraxacum, Taraxacum* type*, Cichorium, Cichorium intybus* type*, Cichorium* type*, Crepis, Crepis aurea, Crepis* type*, Hieracium* type*, Lactuca*
Family	Cistaceae	Cistaceae*, Halimium/Tuberaria, Tuberaria*
Genus	*Cistus*	*Cistus, Cistus salviifolius* type*, Cistus* type*, Cistus villosus* type*, Cistus albidus* type, *Cistus incanus, Cistus ladanifer, Cistus ladanifer* type*, Cistus monspeliensis* type*, Cistus populifolius* type*, Cistus salvifolius, Cistus salviifolius*
Genus	*Clematis*	*Clematis, Clematis* type*, Clematis vitalba* type
Genus	*Clethra*	*Clethra*
Family	Clusiaceae	*Guttiferae*
Family	Colchicaceae	*Colchicum, Colchicum autumnale* type*, Colchicum* type*, Colchicum/Merendera, Merendera*
Genus	*Colutea*	*Colutea*
Family	Convolvulaceae	*Calystegia, Calystegia sepium,* Convolvulaceae*, Convolvulus, Convolvulus arvensis, Convolvulus arvensis* type*, Corema album* type*, Cuscuta, Cuscuta europaea* type
Genus	*Coriaria*	*Coriaria, Coriaria myrtifolia*
Genus	*Cornus*	Cornaceae*, Cornus, Cornus mas, Cornus mas/Cornus suecica, Cornus sanguinea, Cornus suecica*
Genus	*Corylus*	*Corylus, Corylus avellana, Corylus avellana* type*, Corylus maxima, Corylus* type
Genus	*Cotinus*	*Cotinus, Cotinus coggygria*
Genus	*Cotoneaster*	*Cotoneaster*
Family	Crassulaceae	*Crassula,* Crassulaceae*, Sedum, Sedum rosea, Sedum* type*, Sempervivum, Umbilicus, Umbilicus rupestris* type
Genus	*Crataegus*	*Crataegus, Crataegus* type
Family	Cucurbitaceae	Cucurbitaceae
Family	Cupressaceae	Cupressaceae*, Taxodiaceae, Taxodium, Cupressus, Cupressus type, Juniperus, Juniperus communis, Juniperus communis* type*, Juniperus excelsa/Juniperus oxycedrus, Juniperus sabina, Juniperus* type
Genus	*Cynomorium*	*Cynomorium*
Family	Cyperaceae	*Carex, Fimbristylis, Rhynchospora, Rhynchospora alba, Rhynchospora* type*, Schoenoplectus, Schoenoplectus lacustris ssp lacustris, Schoenoplectus* type*, Schoenus* type*, Scirpus, Scirpus lacustris* type*, Carex hirta type, Scirpus* type*, Trichophorum caespitosum, Carex* type*,* Cyperaceae*, Cyperus, Cyperus* type*, Eleocharis palustris, Eriophorum angustifolium/Eriophorum vaginatum, Eriophorum* type
Family	Cytinaceae	*Cytinus hypocistis* type

Genus	*Daphne*	*Daphne, Daphne gnidium, Daphne gnidium* type*, Daphne* type
Genus	*Datisca*	*Datisca*
Genus	*Delphinium*	*Delphinium* type
Family	Dennstaedtiaceae	*Pteridium, Pteridium aquilinum, Pteridium aquilinum type, Pteridium* type
Genus	*Diapensia*	*Diapensia, Diapensia lapponica*
Genus	*Dryas*	*Dryas, Dryas octopetala*
Genus	*Elaeagnus*	*Elaeagnus*
Genus	*Empetrum*	*Empetrum, Empetrum nigrum, Empetrum* type
Genus	*Ephedra*	*Ephedra, Ephedra major* type*, Ephedra* type*, Ephedra alata* type*, Ephedra distachya, Ephedra distachya* type*, Ephedra fragilis, Ephedra fragilis ssp campylopoda, Ephedra fragilis* type*, Ephedra fragilis var campylopoda, Ephedra major*
Genus	*Equisetum*	*Equisetum*
Genus	*Erica*	*Erica, Erica lusitanica* type*, Erica scoparia* type*, Erica tetralix, Erica tetralix* type*, Erica* type*, Erica umbellata* type, *Erica arborea, Erica arborea* type*, Erica australis, Erica australis* type*, Erica cinerea, Erica cinerea* type*, Erica erigena* type*, Erica lusitanica*
Family	Ericaceae	Ericaceae*, Ericales, Lecythis, Moneses, Orthilia, Phyllodoce, Pyrola*
Genus	*Euonymus*	*Euonymus, Euonymus europaeus*
Family	Euphorbiaceae	*Acalypha, Euphorbia, Euphorbia* type*,* Euphorbiaceae
Family	Fabaceae	Fabaceae*, Glycine*
Family	Fabaceae (herbs)	*Anthyllis, Lathyrus/Vicia, Lotus, Lotus corniculatus, Lotus corniculatus type, Lotus type, Lotus uliginosus, Medicago, Medicago littoralis* type*, Medicago sativa, Medicago* type*, Coronilla, Melilotus, Melilotus* type*, Onobrychis, Onobrychis* type*, Oxytropis, Phaseolus type, Trifolium, Trifolium alpinum* type*, Trifolium badium* type*, Trifolium montanum, Ebenus/Hedysarum, Trifolium pratense, Trifolium pratense* type*, Trifolium repens, Trifolium repens* type*, Trifolium spadiceum* type*, Trifolium* type*, Vicia, Vicia cracca, Vicia cracca* type*, Vicia faba* type*, Hedysarum hedysaroides, Vicia sylvatica* type*, Vicia* type*,* Viciaceae*, Hippocrepis comosa, Hippocrepis* type*, Lathyrus, Lathyrus* type*, Lathyrus/Vicia*
Genus	*Fagus*	*Fagus, Fagus orientalis, Fagus sylvatica*
Genus	*Ficus*	*Ficus, Ficus carica*
Genus	*Flueggea*	*Securinega tinctoria* type
Genus	*Frangula*	*Frangula, Frangula alnus*
Genus	*Fraxinus*	*Fraxinus, Fraxinus angustifolia, Fraxinus angustifolia subsp. oxycarpa, Fraxinus angustifolia* type*, Fraxinus excelsior, Fraxinus excelsior* type*, Fraxinus ornus, Fraxinus ornus* type*, Fraxinus oxycarpa* type
Genus	*Genisteae*	*Cytisus* type*, Ulex, Ulex* type*, Cytisus/Genista, Cytisus/Genista* type*, Cytisus/Ulex, Genista, Genista* type*, Genista/Ulex, Sarothamnus scoparius, Spartium*
Family	Gentianaceae	*Centaurium, Gentiana purpurea* type*,* Gentianaceae*, Gentianella, Gentianella campestris type, Swertia perennis, Centaurium maritimum, Centaurium* type*, Gentiana, Gentiana lutea/Gentiana pneumonanthe, Gentiana nivalis* type*, Gentiana pneumonanthe, Gentiana pneumonanthe* type*, Gentiana purpurea*
Family	Geraniaceae	*Erodium,* Geraniaceae*, Geranium, Geranium sylvaticum* type*, Geranium* type
Genus	*Halimium*	*Halimium, Halimium* type

Genus	*Hedera*	*Hedera, Hedera helix, Hedera* type
Genus	*Helianthemum*	*Helianthemum, Helianthemum croceum type, Helianthemum nummularium* type*, Helianthemum salicifolium* type*, Helianthemum* type
Genus	*Helleborus*	*Helleborus, Helleborus foetidus, Helleborus viridis* type
Genus	*Hippophae*	*Hippophae, Hippophae rhamnoides*
Genus	*Huperzia*	*Huperzia selago, Lycopodium selago*
Family	Hymenophyllaceae	*Hymenophyllum tunbrigense, Hymenophyllum wilsonii, Trichomanes speciosum*
Family	Hypericaceae	*Hypericum, Hypericum hyssopifolium, Hypericum perforatum* type*, Hypericum pulchrum* type*, Hypericum* type
Genus	*Ilex*	*Ilex, Ilex aquifolium*
Genus	*Impatiens*	*Impatiens*
Family	Iridaceae	*Crocus,* Iridaceae*, Iris, Iris pseudacorus, Iris pseudacorus* type*, Iris* type
Genus	*Jasminum*	*Jasminum, Jasminum fruticans, Jasminum* type
Family	Juglandaceae	Juglandaceae
Genus	*Juglans*	*Juglans, Juglans regia*
Family	Juncaceae	Juncaceae*, Juncus, Luzula*
Genus	*Kalmia*	*Loiseleuria procumbens*
Genus	*Koenigia*	*Koenigia islandica*
Genus	*Laburnum*	*Laburnum anagyroides*
Family	Lamiaceae	*Ajuga, Lycopus* type*, Lycopus/Mentha, Marrubium, Mentha, Mentha* type*, Mentha/Thymus, Origanum vulgare, Phlomis, Prunella, Prunella* type*, Ballota, Prunella vulgaris* type*, Scutellaria, Scutellaria* type*, Sideritis, Stachys, Stachys sylvatica* type*, Stachys sylvestris, Stachys* type*, Thymus, Thymus serpyllum, Galeopsis, Thymus* type*, Galeopsis* type*, Glechoma* type*,* Lamiaceae*, Lamium, Lamium* type*, Lycopus*
Genus	*Larix*	*Larix, Larix decidua, Larix decidua* type*, Larix/Pseudotsuga*
Genus	*Lavandula*	*Lavandula stoechas* type
Genus	*Ledum*	*Ledum, Ledum palustre, Ledum* type
Genus	*Ligustrum*	*Ligustrum, Ligustrum vulgare, Ligustrum vulgare* type
Family	Liliaceae	*Allium, Lilium martagon* type*, Lloydia serotina, Allium* type*, Anthericum, Anthericum* type*, Fritillaria lusitanica, Fritillaria* type*, Gagea,* Liliaceae*, Lilium*
Family	Linaceae	Linaceae*, Radiola linoides*
Genus	*Linnaea*	*Linnaea, Linnaea borealis*
Genus	*Linum*	*Linum, Linum bienne* type*, Linum catharticum, Linum catharticum* type*, Linum* type
Genus	*Lonicera*	*Lonicera, Lonicera caerulea, Lonicera hispida, Lonicera implexa, Lonicera periclymenum, Lonicera periclymenum* type*, Lonicera* type*, Lonicera xylosteum* type
Family	Loranthaceae	Loranthaceae
Genus	*Lycopodiella*	*Lepidotis inundata, Lycopodium inundatum*
Genus	*Lycopodium*	*Diphasiastrum, Lycopodium alpinum, Lycopodium annotinum, Lycopodium annotinum* type*, Lycopodium clavatum, Lycopodium clavatum* type*, Lycopodium complanatum, Lycopodium dubium, Lycopodium* type*, Diphasiastrum alpinum, Diphasium, Diphasium alpinum, Diphasium alpinum* type*, Diphasium complanatum, Diphasium tristachyum, Diphasium* type*, Lycopodium*

Genus	*Lysimachia*	*Lysimachia, Lysimachia maritima, Lysimachia nemorum, Lysimachia thyrsiflora, Lysimachia* type*, Lysimachia vulgaris, Lysimachia vulgaris* type
Family	Lythraceae	Lythraceae*, Lythrum, Lythrum salicaria, Lythrum salicaria* type*, Lythrum salicaria/Lythrum hyssopifolia, Peplis*
Family	Magnoliaceae	Magnoliaceae
Genus	*Malus*	*Malus, Malus* type
Family	Malvaceae	*Hibiscus, Lavatera* type*, Malva, Malva sylvestris* type*,* Malvaceae*, Sterculia*
Family	Melanthiaceae	*Veratrum, Veratrum* type
Genus	*Mercurialis*	*Mercurialis, Mercurialis annua, Mercurialis annua* type*, Mercurialis perennis, Mercurialis perennis* type
Genus	*Moltkia*	*Moltkia*
Family	Montiaceae	*Montia*
Family	Moraceae	Moraceae*, Morus, Morus alba, Morus alba* type*, Morus nigra*
Genus	*Myrica*	*Corylus/Myrica, Myrica, Myrica gale, Myrica gale* type*, Myrica* type
Genus	*Myricaria*	*Myricaria*
Family	Myrtaceae	Myrtaceae*, Myrtus, Myrtus communis*
Family	Nartheciaceae	*Narthecium, Narthecium ossifragum, Narthecium* type
Genus	*Nerium*	*Nerium, Nerium oleander*
Genus	*Nigella*	*Nigella*
Family	Nitrariaceae	*Nitraria, Peganum harmala*
Genus	*Olea*	*Olea, Olea europaea, Olea* type
Family	Oleaceae	*Fontanesia/Phillyrea, Olea/Ligustrum,* Oleaceae
Family	Onagraceae	*Chamaenerion, Chamaenerion angustifolium, Circaea, Epilobium, Epilobium* type*,* Onagraceae
Genus	*Ononis*	*Ononis, Ononis* type
Family	Ophioglossaceae	*Botrychium, Botrychium lunaria, Botrychium lunaria* type*, Botrychium* type*,* Ophioglossaceae*, Ophioglossum, Ophioglossum vulgatum*
Family	Orchidaceae	*Neottia* type*,* Orchidaceae
Family	Orobanchaceae	*Euphrasia, Euphrasia* type*, Melampyrum, Pedicularis, Pedicularis oederi* type*, Pedicularis palustris* type*, Pedicularis* type*, Rhinanthus, Rhinanthus* type
Family	Osmundaceae	*Osmunda, Osmunda regalis*
Family	Oxalidaceae	Oxalidaceae*, Oxalis, Oxalis acetosella, Oxalis stricta*
Genus	*Oxyria/Rumex*	*Oxyria, Rumex acetosa/Rumex acetosella, Rumex acetosa/Rumex acetosella* type*, Rumex acetosa/Rumex scutatus* type*, Rumex acetosella, Rumex acetosella* type*, Rumex alpestris, Rumex alpinus, Rumex alpinus* type*, Rumex aquaticus, Rumex aquaticus* type*, Oxyria digyna, Rumex conglomeratus* type*, Rumex crispus, Rumex crispus* type*, Rumex hydrolapathum, Rumex hydrolapathum* type*, Rumex longifolius, Rumex longifolius* type*, Rumex obtusifolius* type*, Rumex patentia* type*, Rumex sanguineus* type*, Oxyria* type*, Rumex* type*, Oxyria/Rumex, Oxyria/Rumex* type*, Rumex, Rumex acetosa, Rumex acetosa* type*, Rumex acetosa/Oxyria* type
Genus	*Paeonia*	*Paeonia*
Genus	*Paliurus*	*Paliurus, Paliurus spina-christi*

Family	Papaveraceae	*Chelidonium majus, Papaver, Papaver argemone, Papaver rhoeas* type*, Papaver* type*,* Papaveraceae*, Roemeria, Corydalis, Corydalis solida* type*, Corydalis* type*, Fumana, Fumaria, Fumaria officinalis* type*, Glaucium, Hypecoum*
Genus	*Parrotia*	*Parrotia persica*
Genus	*Periploca*	*Periploca*
Genus	*Phillyrea*	*Olea/Phillyrea, Phillyrea, Phillyrea angustifolia, Phillyrea angustifolia* type*, Phillyrea media, Phillyrea* type
Family	Phyllanthaceae	*Andrachne, Andrachne telephioides*
Genus	*Picea*	*Picea, Picea abies, Picea abies subsp abies*
Genus	*Picea orientalis*	*Picea orientalis*
Genus	*Pinus*	*Pinus*
Genus sub-group	*Pinus (diploxylon)*	*Pinus (Diploxylon), Pinus subg. Pinus, Pinus sylvestris, Pinus sylvestris* type*, Pinus sylvestris/Pinus nigra* type*, Pinus* type*, Pinus halepensis, Pinus nigra* type*, Pinus non-cembra, Pinus pinaster, Pinus pinaster* type*, Pinus pinaster/Pinus halepensis, Pinus pinea* type*, Pinus pinea/Pinus halepensis* type
Genus sub-group	*Pinus (haploxylon)*	*Pinus (Haploxylon), Pinus cembra, Pinus cembra* type*, Pinus peuce, Pinus sibirica*
Genus	*Pistacia*	*Pistacia, Pistacia lentiscus, Pistacia lentiscus* type*, Pistacia terebinthus, Pistacia terebinthus* type*, Pistacia* type
Family	Plantaginaceae	*Globularia, Plantago coronopus* type*, Plantago cylindrica* type*, Plantago lanceolata, Plantago lanceolata* type*, Plantago lusitanica, Plantago major, Plantago major* type*, Plantago major/Plantago media, Plantago maririma, Plantago maritima, Gratiola officinalis, Plantago maritima* type*, Plantago media, Plantago media* type*, Plantago media/Plantago major, Plantago media/Plantago major* type*, Plantago montana* type*, Plantago ovata* type*, Plantago psyllium* type*, Plantago tenuiflora* type*, Plantago* type*,* Plantaginaceae*, Plantago, Plantago afra* type*, Plantago albicans, Plantago alpina, Plantago alpina* type*, Plantago coronopus*
Genus	*Platanus*	*Platanus, Platanus orientalis, Platanus* type
Family	Plumbaginaceae	*Acantholimon, Limonium vulgare,* Plumbaginaceae*, Plumbago, Armeria, Armeria maritima, Armeria maritima subsp elongata, Armeria* type*, Armeria/Limonium, Armeria/Limonium type, Limonium, Limonium* type
Family	Poaceae	*Anthoxanthum, Stipa, Deschampsia, Elymus, Lygeum, Lygeum spartum, Nardus, Poa/Festuca* type*,* Poaceae*, Setaria*
Family	Polemoniaceae	Polemoniaceae*, Polemonium*
Family	Polygalaceae	*Polygala, Polygala* type*, Polygala vulgaris, Polygala vulgaris* type*,* Polygalaceae*, Polygaloides chamaebuxus*
Family	Polygonaceae	*Atraphaxis, Persicaria amphibia,* Polygonaceae*, Pteropyrum, Rheum, Rheum ribes, Rheum* type*, Bilderdykia convolvulus, Bilderdykia convolvulus* type*, Bistorta officinalis* type*, Bistorta vivipara, Calligonum, Fallopia convolvulus, Fallopia convolvulus* type*, Persicaria*

Genus	*Polygonum*	*Polygonum, Polygonum convolvulus, Polygonum convolvulus* type*, Polygonum oxyspermum* type*, Polygonum persicaria, Polygonum persicaria* type*, Polygonum sect. Persicaria, Polygonum* type*, Polygonum viviparum, Polygonum alpinum, Polygonum amphibium, Polygonum amphibium* type*, Polygonum aviculare, Polygonum aviculare* type*, Polygonum bistorta, Polygonum bistorta* type*, Polygonum bistorta/Polygonum viviparum*
Genus	*Polypodiales*	*Aspidium, Blechnum, Blechnum spicant, Cystopteris, Cystopteris fragilis, Cystopteris* type*, Dryopteridaceae/Polypodiaceae, Dryopteris, Dryopteris carthusiana, Dryopteris carthusiana* type*, Dryopteris cristata, Asplenium, Dryopteris cristata* type*, Dryopteris dilatata, Dryopteris dilatata* type*, Dryopteris filix-mas, Dryopteris filix-mas* type*, Dryopteris* type*, Dryopteris/Thelypteris, Grammitis, Gymnocarpium, Gymnocarpium dryopteris, Asplenium nidus, Pilularia,* Polypodiaceae*,* Polypodiales*, Polypodium, Polypodium vulgare, Polypodium vulgare* type*, Polystichum, Polystichum* type*, Thelypteris, Thelypteris palustris, Asplenium* type*, Thelypteris palustris* type*, Thelypteris phegopteris, Thelypteris* type*, Asplenium viride, Athyrium, Athyrium alpestre* type*, Athyrium distentifolium* type*, Athyrium filix-femina*
Genus	*Populus*	*Populus, Populus tremula, Populus tremula* type
Family	Portulacaceae	Portulacaceae
Genus	*Potentilla*	*Potentilla, Potentilla aurea, Potentilla micrantha* type*, Potentilla recta, Potentilla* type
Family	Primulaceae	*Anagallis, Primula, Primula clusiana* type*, Primula farinosa, Primula farinosa* type*, Primula hirsuta* type*, Primula* type*, Primula veris* type*, Primula vulgaris* type*,* Primulaceae*, Soldanella, Anagallis arvensis, Trientalis, Trientalis europaea, Anagallis arvensis* type*, Anagallis tenella, Anagallis* type*, Androsace, Androsaceae, Cyclamen, Cyclamen hederifolium*
Genus	*Prosopis*	*Lagonychium* type*, Prosopis*
Genus	*Prunus*	*Prunus, Prunus avium, Prunus padus, Prunus spinosa* type*, Prunus* type
Family	Pteridaceae	*Adiantum, Cheilanthes, Cryptogramma, Cryptogramma crispa, Cryptogramma crispa* type*, Pteris*
Genus	*Pterocarya*	*Pterocarya, Pterocarya fraxinifolia*
Genus	*Punica*	*Punica*
Genus	*Pyrus*	*Pyrus, Pyrus* type
Genus	*Quercus* (deciduous)	*Quercus, Quercus robur* type*, Quercus robur/Quercus petraea, Quercus (deciduous), Quercus cerris, Quercus cerris* type*, Quercus deciduous, Quercus ithaburensis, Quercus ithaburensis* type*, Quercus petraea, Quercus robur*
Genus	*Quercus* (evergreen)	*Quercus (evergreen), Quercus rotundifolia* type*, Quercus suber, Quercus suber* type*, Quercus calliprinos, Quercus calliprinos* type*, Quercus coccifera, Quercus coccifera* type*, Quercus coccifera/Quercus ilex, Quercus evergreen, Quercus ilex, Quercus ilex* type
Genus	*Quercus* (intermediate)	*Quercus canariensis type, Quercus cerris/Quercus suber, Quercus cerris/Quercus suber* type*, Quercus faginea, Quercus faginea/Quercus pubescens, Quercus faginea/Quercus pyrenaica, Quercus pubescens* type*, Quercus pyrenaica* type*, Quercus robur/Quercus pubescens* type
Family	Ranunculaceae	*Anemone, Anemone nemorosa, Anemone nemorosa type, Anemone nemorosa* type*/Hepatica nobilis, Anemone nemorosa/Anemone ranunculoides, Anemone* type*, Hepatica, Pulsatilla,* Ranunculaceae

Genus	*Ranunculus*	*Ranunculus, Ranunculus ficaria* type*, Ranunculus flammula* type*, Ranunculus glacialis* type*, Ranunculus montanus* type*, Ranunculus muricatus* type*, Ranunculus nivalis* type*, Ranunculus parviflorus, Ranunculus repens* type*, Ranunculus sceleratus* type*, Ranunculus* type*, Ranunculus acer* type*, Ranunculus aconitifolius, Ranunculus aconitifolius* type*, Ranunculus acris, Ranunculus acris* type*, Ranunculus arvensis, Ranunculus arvensis* type*, Ranunculus asiaticus* type
Family	Resedaceae	*Reseda, Reseda lutea* type*,* Resedaceae
Family	Rhamnaceae	Rhamnaceae
Genus	*Rhamnus*	*Rhamnus, Rhamnus catharticus, Rhamnus* type
Genus	*Rhododendron*	*Rhododendron, Rhododendron ferrugineum, Rhododendron* type
Genus	*Rhus*	*Rhus, Rhus coriaria*
Genus	*Ribes*	*Ribes, Ribes* type
Family	Rosaceae	*Agrimonia, Fragaria* type*, Geum, Geum rivale* type*, Geum* type*, Pirus* type*, Prunus/Rubus* type*, Pyrus/Malus, Rosa, Rosa canina* type*, Rosa* type*, Agrimonia eupatoria, Rosa/Prunus,* Rosaceae*, Spiraea, Alchemilla, Alchemilla* type*, Filipendula, Filipendula* type*, Filipendula ulmaria, Filipendula vulgaris, Fragaria*
Genus	*Rosmarinus*	*Rosmarinus, Rosmarinus* type
Family	Rubiaceae	*Asperula, Galium, Galium* type*,* Rubiaceae*, Theligonum*
Genus	*Rubus*	*Rubus, Rubus arcticus, Rubus arcticus* type*, Rubus chamaemorus, Rubus fruticosus* type*, Rubus idaeus* type*, Rubus saxatilis, Rubus* type
Genus	*Ruscus*	*Ruscus*
Family	Rutaceae	*Haplophyllum, Ruta,* Rutaceae
Genus	*Salix*	*Salix, Salix glauca* type*, Salix helvetica* type*, Salix herbacea, Salix herbacea* type*, Salix herbacea/Salix reticulata, Salix pentandra* type
Genus	*Salvia*	*Salvia, Salvia verticillata* type
Genus	*Sambucus*	*Sambucus, Sambucus ebulus, Sambucus nigra, Sambucus nigra* type*, Sambucus nigra/Sambucus racemosa, Sambucus racemosa, Sambucus* type
Genus	*Sanguisorba group*	*Poterium, Sanguisorba, Sanguisorba minor, Sanguisorba minor ssp minor, Sanguisorba minor* type*, Sanguisorba officinalis, Sanguisorba* type*, Sarcopoterium*
Family	Santalaceae	*Arceuthobium oxycedri, Comandra elegans, Osyris alba* type*, Thesium*
Family	Saxifragaceae	*Chrysosplenium, Saxifraga oppositifolia, Saxifraga oppositifolia* type*, Saxifraga paniculata* type*, Saxifraga stellaris, Saxifraga stellaris* type*, Saxifraga tricuspidata,* Saxifragaceae*, Chrysosplenium* type*, Micranthes nivalis* type*, Saxifraga, Saxifraga cernua* type*, Saxifraga cespitosa* type*, Saxifraga foliolosa* type*, Saxifraga granulata, Saxifraga granulata* type
Family	Scrophulariaceae	*Antirrhinum* type*, Scrophularia/Verbascum,* Scrophulariaceae*, Verbascum, Verbascum* type*, Veronica, Veronica* type*, Antirrhinum/Linaria, Digitalis, Digitalis purpurea* type*, Digitalis* type*, Linaria, Linaria* type*, Scrophularia, Scrophularia* type
Genus	*Smilax*	*Smilax*
Family	Solanaceae	*Capsicum* type*, Lycium,* Solanaceae*, Solanum, Solanum dulcamara, Solanum nigrum, Solanum nigrum* type
Genus	*Sorbus*	*Sorbus, Sorbus aria, Sorbus aucuparia, Sorbus aucuparia* type*, Sorbus* type

Genus	*Styrax*	*Styrax officinalis*
Genus	*Suaeda*	*Suaeda, Suaeda* type
Genus	*Syringa*	*Syringa*
Genus	*Tamarix*	*Tamarix*
Genus	*Taxus*	*Taxus, Taxus baccata*
Genus	*Teucrium*	*Teucrium, Teucrium* type
Genus	*Thalictrum*	*Thalictrum, Thalictrum alpinum, Thalictrum aquilegiifolium, Thalictrum flavum* type*, Thalictrum lucidum, Thalictrum* type
Family	Thymelaeaceae	*Thymelaea,* Thymelaeaceae
Genus	*Tilia*	*Tilia, Tilia cordata, Tilia cordata* type*, Tilia platyphyllos, Tilia platyphyllos* type
Genus	*Tofieldia*	*Tofieldia*
Genus	*Trollius*	*Trollius, Trollius europaeus, Trollius* type
Genus	*Ulmus*	*Ulmus, Ulmus glabra, Ulmus glabra* type*, Ulmus minor*
Genus	*Ulmus/Zelkova*	*Ulmus/Zelkova, Zelkova, Zelkova* type
Family	Urticaceae	*Parietaria, Parietaria/Urtica, Urtica, Urtica dioica, Urtica dioica* type*, Urtica pilulifera* type*, Urtica* type*, Urtica urens,* Urticaceae
Genus	*Vaccinium*	*Vaccinium, Vaccinium myrtillus, Vaccinium myrtillus type, Vaccinium oxycoccos, Vaccinium* type*, Vaccinium uliginosum* type*, Vaccinium/Oxycoccus*
Family	Valerianaceae	*Centranthus, Valerianella, Valeriana, Valeriana dioica* type*, Valeriana officinalis, Valeriana officinalis* type*, Valeriana sambucifolia* type*, Valeriana tripteris* type*, Valeriana* type*,* Valerianaceae
Family	Verbenaceae	*Verbena, Verbena officinalis*
Genus	*Viburnum*	*Viburnum, Viburnum opulus, Viburnum opulus* type*, Viburnum* type
Family	Violaceae	*Viola, Viola arvensis* type*, Viola canina* type*, Viola palustris, Viola palustris* type*, Viola tricolor, Viola tricolor/Viola arvensis,* Violaceae
Genus	*Viscum*	*Viscum, Viscum album, Viscum album* type*, Viscum* type
Genus	*Vitex*	*Vitex*
Genus	*Ziziphus*	*Ziziphus* type*, Zizyphus, Zizyphus lotus*
Family	Zygophyllaceae	*Tribulus, Tribulus terrestris,* Zygophyllaceae*, Zygophyllum*

Supplementary Table 2. Metadata of the pollen records used in the reconstructions.

Latitude position	Entity name	Latitude	Longitude	Elevation	References
1	Kismohos	48.33724	20.42333	315	Willis et al (1997)
2	Preluca	47.8175	23.5358	730	Feurdean (2005); Feurdean & Bennike (2004); Feurdean et al (2008)
3	Steregoiu	47.813	23.5447	790	Björkman et al. (2003); Feurdean & Bennike (2004); Feurdean et al (2008)
4	Iaz Core	47.10833	22.66111	300	Grindean et al. (2014)
5	Kardashinski Swamp	46.51667	32.61667	4	Kremenetski (1995)
6	Capatana core	46.46611	23.13639	1220	Farcas et al. (2003)
7	Mohos1	46.083	25.9167	1050	Tantau (2003); Tantau et al. (2003)
8	Avrig 1	45.716	24.383	400	Tantau (2003); Tantau et al. (2006)
9	Pesteana peat bog	45.5433	22.8061	480	Farcas & Tantau (2012)
10	Taul Zanogutii core	45.32778	22.80278	1840	Farcas et al. (1999)
11	Semenic 1	45.18	22.0594	1400	Roesch & Fischer (2000)
12	Chernaya NG-2	44.57	33.6	2	Cordova & Lehman (2005)
13	Yaila	44.49	34.06	1205	Cordova & Lehman (2003); Cordova & Lehman (2005)
14	Lake Srebarna Lazarova94 Core	44.10914	27.06915	20	Lazarova (1995)
15	Mire Garvan Lazarova94 Core	44.10825	26.98818	20	Lazarova (1995)
16	Luganskoe	43.72	40.68	2428	Kvavadze et al. (1994)
17	Quartzevoe	43.67	41.17	2726	Kvavadze & Efremov (1996)
18	Serni Core	43.66667	40.480556	2485	Kvavadze & Efremov (1994)
19	Lake Durankulak 3	43.66667	28.55	4	Marinova (2003)
20	Adange core 1	43.31	41.33	1750	Kvavadze & Rukhadze (1989)
21	Amtkel core 1	43.27	41.31	1830	Kvavadze & Rukhadze (1989)
22	Sibista	43.23333	41.43056	2160	Kvavadze & Rukhadze (1989)
23	Lake Varna - 3	43.2	27.83333	0	Filipova-Marinova et al. (2014)
24	Khodzal Kvavadze89 Core	42.95417	41.91111	2030	Kvavadze & Rukhadze (1989)
24	Khodzal Kvavadze89 Core	42.95417	41.91111	2030	Kvavadze & Rukhadze (1989)
25	Sredna Gora Mountains	42.83333	24.83333	1300	Filipovitch (1977); Filipovitch (1992); Filipovitch et al. (1998); Petrov and Filipovitch (1987)
26	Straldza	42.6308	26.7728	137	Tonkov et al. (2008); Tonkov et al. (2009)
27	Straldzha mire CANAL	42.6308	26.7728	137	Connor et al. (2013)
28	Kumata Core	42.59028	23.25167	1770	Tonkov & Possnert (2016)
29	Vitosha Mountain Filipovitch81 Core	42.56809	23.26895	2000	Filipovitch (1975); Filipovitch (1985)
30	Beg Bunar peat bog	42.1525	22.535	1750	Lazarova et al. (2009)
31	Dry Lake 2	42.038	23.533	1900	Bozilova & Smit (1979); Bozilova et al. (1986)
32	Kupena-3	41.98333	24.3333	1356	Tonkov et al. (2013); Tonkov et al. (2014)
33	Besbog-2 Stefanova87	41.75	23.66667	2240	Stefanova et al. (2006)
34	Popovo Ezero Stefanova86	41.71667	23.66667	2185	Stefanova & Bozilova (1995)
35	Didachara core	41.68389	42.49694	2000	Connor et al. (2017)
36	Imera core 1	41.65	44.22	1610	Connor & Sagona (2007); Connor et al. (2004)
37	Aligol core 1	41.63	44.02	1550	Connor & Sagona (2007); Connor et al. (2004)

38	Lake Blatisto	41.62139	24.67806	1540	van Huis et al. (2013a); van Huis et al. (2013b)
39	Kumisi core 1	41.58	44.83	469	Connor et al (2004)
40	Sakhare core 1	41.58	45.32	800	Connor et al (2004)
41	Mutorog Bozilova93 Core	41.52432	23.61661	1700	Panovska et al. (1995)
42	Elatia-Rhodopes	41.47972	24.32583	1520	Athanasiadis et al. (1993)
42	Elatia-Rhodopes	41.47972	24.32583	1520	Gerasimidis & Athanasiadis (1995)
43	Beles Mountain	41.31944	23.01611	1400	Athanasiadis et al. (2003)
44	Lailias_core	41.26778	23.59944	1420	Gerasimidis (2000); Gerasimidis & Athanasiadis (1995)
45	Paiko	41.05167	22.27472	1080	Gerasimidis & Athanasiadis (1995); Gerasimidis et al. (2008)
46	Voras	41.0179	21.9122	1640	Gerasimidis & Athanasiadis (1995); Gerasimidis et al. (2009)
47	Lake Ohrid	40.938	20.759	693	Wagner et al. (2009)
48	Edessa1	40.81806	21.9525	350	Bottema (1974)
49	Vegoritis 8 Bottema Core	40.75	21.75	570	Bottema (1982)
50	Sapanca long core SA03R6	40.71806	30.25833	30	Leroy et al. (2010)
51	Khimaditis Ib Bottema65 Core	40.61667	21.58333	560	Bottema (1974)
52	Orestias G25	40.5117	21.2578	630	Kouli & Dermitzakis (2010)
53	Kaz Gölü	40.28333	36.15		Bottema et al. (1993)
54	Flambouro mire	40.25944	22.17083	1645	Gerasimidis & Athanasiadis (1995)
54	Flambouro mire	40.25944	22.17083	1645	Gerasimidis & Panajiotidis (2010)
55	Litochoro_core	40.13889	22.54611	25	Athanasiadis (1975)
56	Rezina	39.98778	20.77556	1760	Willis (1992)
57	Demiryurt Gölü Bottema Core	39.73333	37.383333		Bottema et al. (1993)
58	Pertouli core	39.52417	21.4775	1440	Athanasiadis (1975)
59	Trikhonis 5 Bottema Core	38.6	21.5	20	Bottema(1982)
60	Lake Almalou	37.66528	46.63194	2410	Djamali et al. (2009); Djamali et al. (2010)
61	Lake Lerna	37.58083	22.73	0	Jahns (1993)
62	HCGA05-core	37.46944	47.3525	-27	Leroy et al. (2011); Amini et al. (2012)
63	Köycegiz Gölü Bottema70 Core	36.875	28.641667	1491.76	Bottema & Woldring (1984)
64	EIG	36.55	51.4833	550	Ramezani et al. (2013)
65	Asi Gonia 1	35.24861	24.27778	780	Atherden & Hall (1999)
66	Asi Gonia 2	35.24861	24.2778	780	Atherden & Hall (1999)
67	Bouara Bottema84 core	35.23333	41.18333		Gremmen & Bottema (1991)
68	Chamsine	33.75278	35.948056	856	Hajar et al. (2010); Cheddadi & Khater (2016)
69	Wadi Shallalah	32.6	35.9	385	Cordova (2007)
70	Dead Sea DS7-1SC core	31.493	35.4361	-402	Leroy (2010)
71	Ein Gedi	31.46528	35.39417	-413	Litt et al. (2012)

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Supplementary Table 3. Details of the models used for the transient climate simulations.

Model	Model code	Time frame (yr BP)	Horizontal resolution (lat x long)	Vegetation	References
Institut Pierre Simon Laplace Earth System Model	IPSL-CMIP5	6000-0	1.875 x 3.75	prescribed	Dufresne et al., 2013; Sepulcre et al., 2020; Braconnot et al., 2019a, b
Institut Pierre Simon Laplace Earth System Model	IPSL-CMIP5	6000-0	1.25 x 2.5	dynamic	Dufresne et al., 2013; Braconnot et al., 2019a, b
Max Planck Institute Earth System Model version 1.2	MPI	7950-100	T63	dynamic	Bader et al., 2020; Dallmeyer et al., 2021
Alfred Wegener Institute Earth System Model version 2	AWI	6000-0	T63	dynamic	Sidorenko et al., 2019; Lamping et al., 2021; Shi et al., 2022
LOVECLIM	LOVECLIM	11500-0	T21	dynamic	Goosse et al., 2010; Zhang et al., 2016
Community Climate System Model, version 3	TRACE-21k-I	22000-0	T31	dynamic	Collins et al., 2006; Otto-Bleisner et al., 2006; Liu et al., 2009
Community Climate System Model, version 3	TRACE-21k-II	22000-0	T31	dynamic	He and Clark, 2022

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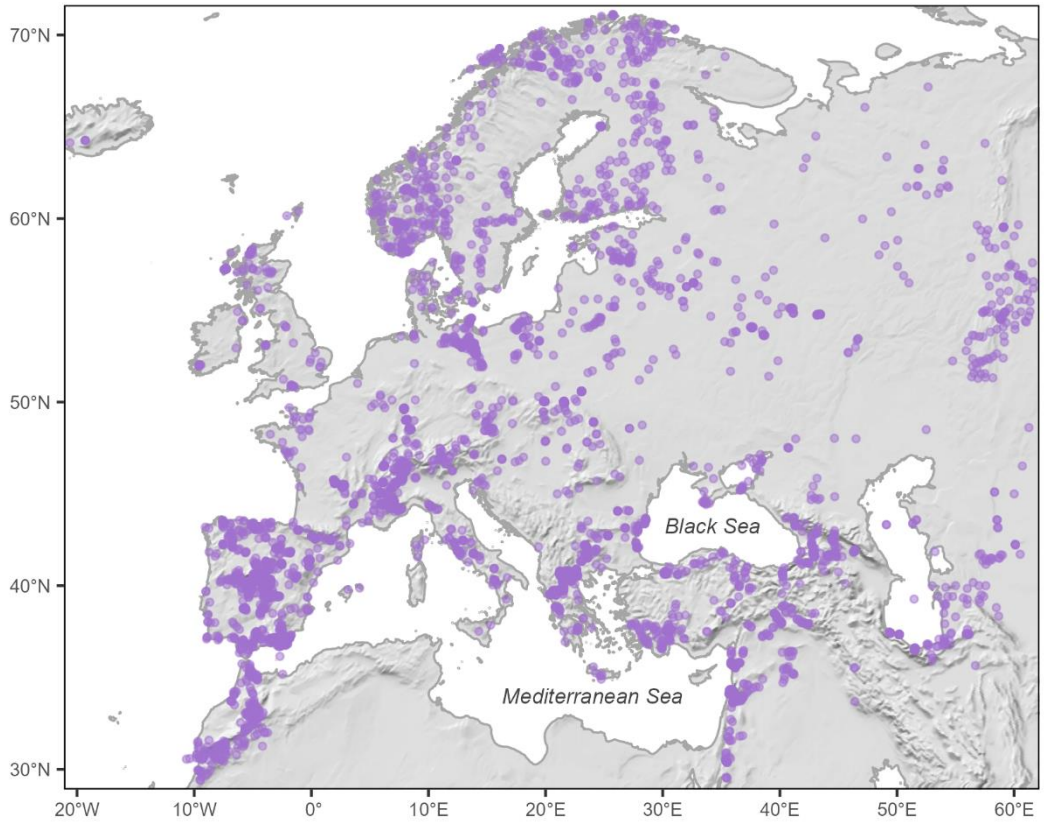
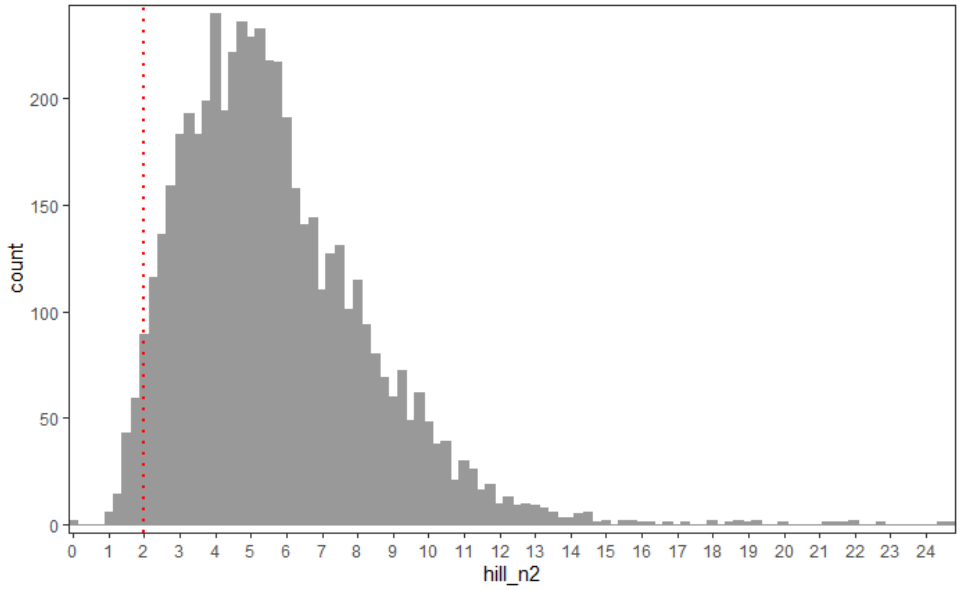
Supplementary Table 4. Leave-out cross-validation fitness of fxTWA-PLSv2 for mean temperature of the coldest month (MTCO), mean temperature of the warmest month (MTWA), growing degree days above base level 0°C (GDD0) and plant-available moisture (α) with p-spline smoothed fx estimation, using bins of 0.02, 0.02 and 0.002, showing results for all the components. RMSEP is the root-mean-square error of prediction. p assesses whether using the current number of components is significantly different from using one component less; the last significant number of components is indicated in bold. The degree of overall compression is assessed by linear regression of the cross-validated reconstructions onto the climate variable, where b1 and b1.se are the slope and the standard error of the slope, respectively. The overall compression is reduced as the slope approaches 1.

Variable	Component	R2	Average bias	Max absolute bias	Min absolute bias	RMSEP	p	b1	b1.se
MTCO	1	0.67	-0.41	19.78	0.00	4.08	0.001	0.82	0.01
MTCO	2	0.70	-0.37	16.47	0.00	3.85	0.001	0.84	0.01
MTCO	3	0.72	-0.20	22.75	0.00	3.72	0.001	0.86	0.01
MTCO	**4**	**0.73**	**-0.22**	**26.35**	**0.00**	**3.67**	**0.001**	**0.86**	**0.01**
MTCO	5	0.73	-0.22	30.22	0.00	3.70	0.948	0.87	0.01
MTWA	1	0.61	-0.19	15.33	0.00	3.36	0.001	0.76	0.01
MTWA	**2**	**0.63**	**-0.10**	**14.05**	**0.00**	**3.22**	**0.001**	**0.78**	**0.01**
MTWA	3	0.63	-0.08	13.90	0.00	3.22	0.699	0.78	0.01
MTWA	4	0.64	-0.13	15.07	0.00	3.20	0.027	0.78	0.01
MTWA	5	0.64	-0.11	13.87	0.00	3.20	0.405	0.79	0.01
GDD0	1	0.67	67.56	3907.85	0.56	916.31	0.001	0.78	0.01
GDD0	**2**	**0.69**	**56.46**	**3702.27**	**0.24**	**880.33**	**0.001**	**0.79**	**0.01**
GDD0	3	0.70	57.82	3740.39	0.02	877.97	0.155	0.79	0.01
GDD0	4	0.70	34.31	4231.43	0.65	871.31	0.069	0.79	0.01
GDD0	5	0.70	36.70	4961.93	0.00	872.04	0.654	0.80	0.01
α	1	0.71	-0.01	0.64	0.00	0.16	0.001	0.79	0.01
α	**2**	**0.73**	**-0.01**	**0.65**	**0.00**	**0.15**	**0.001**	**0.80**	**0.01**
α	3	0.73	-0.01	0.65	0.00	0.15	0.593	0.80	0.01
α	4	0.74	-0.01	0.65	0.00	0.15	0.001	0.82	0.01
α	5	0.74	-0.01	0.68	0.00	0.15	0.431	0.83	0.01

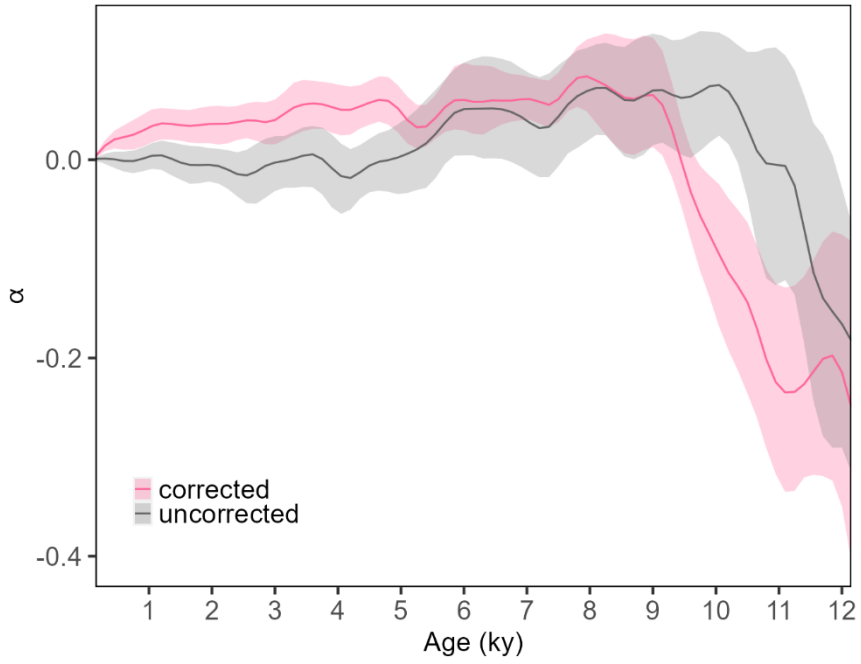
Supplementary Figure 1. Map of distribution of the modern pollen samples the SPECIAL Modern Pollen Data Set (SMPDS) (Harrison, 2019) used to train the model.



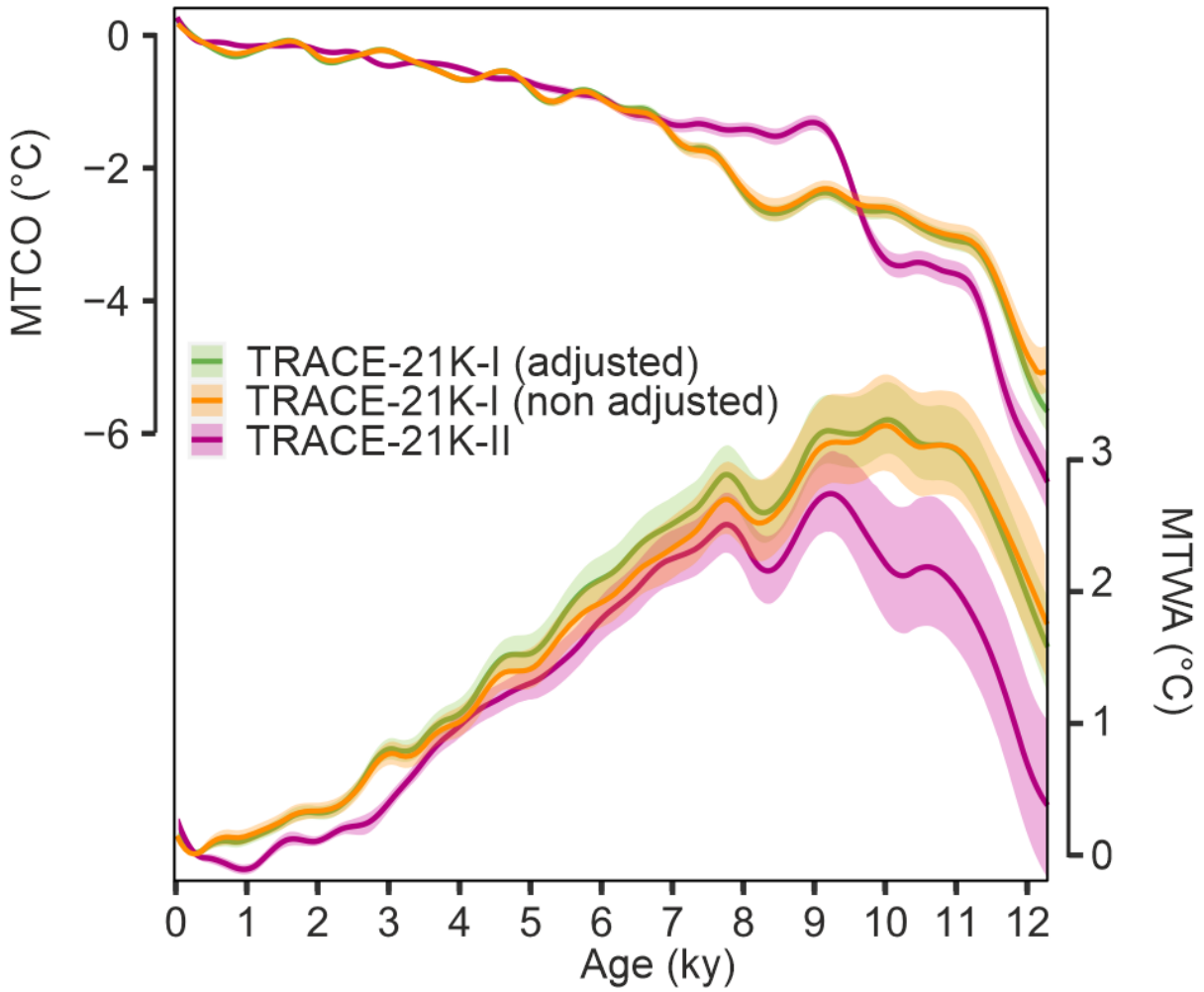
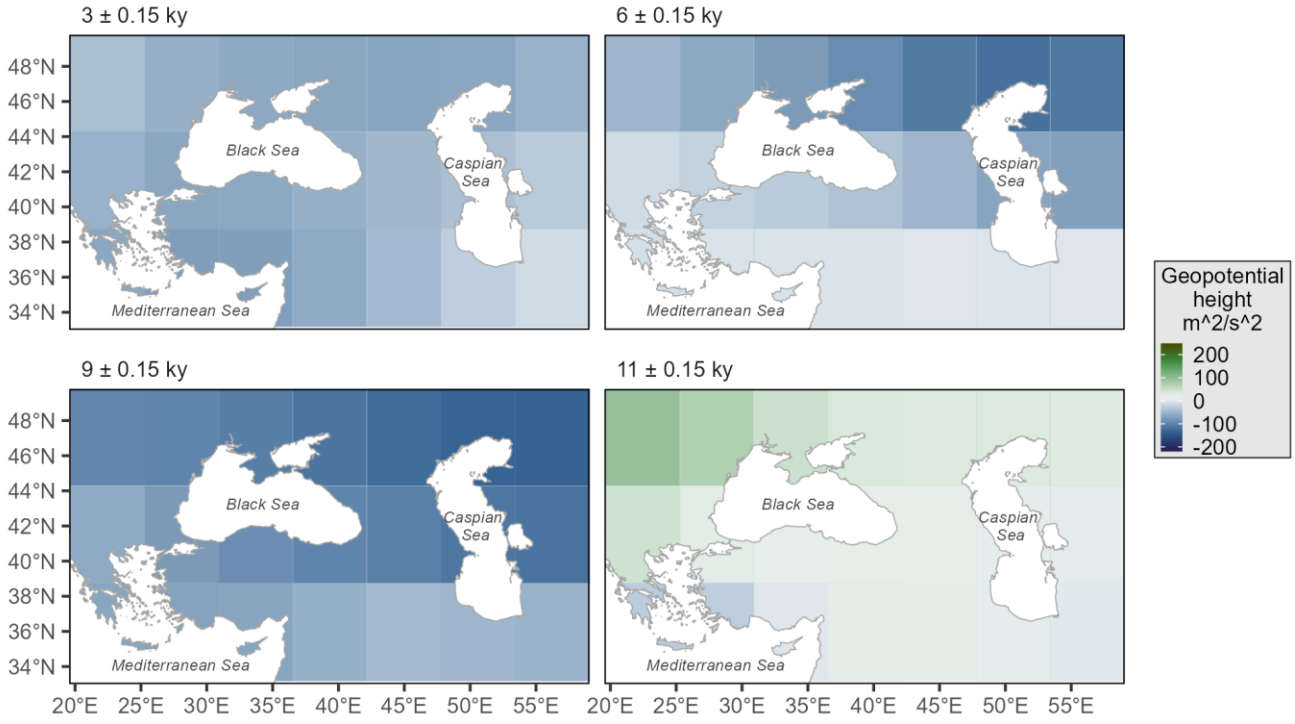
Supplementary Figure 2. Distribution of Hill N2 values of the fossil pollen samples. Samples with an N2 value of <2 (indicated by the red dotted line) were excluded from the analysis.



Supplementary Figure 3. Impact of correcting for the direct effect of changing CO2 levels following Prentice et al. (2022) on the reconstruction of α. The original reconstruction is shown in green and the corrected reconstruction in red.



Supplementary Figure 4. Comparison of mean temperature of the coldest month (MTCO) and mean temperature of the warmest month (MTWA) in the EMBSeCBIO domain from the TRACE-21K-I simulation, showing both the calendar adjusted version (green) and non-calendar adjusted version (orange), and compared to the non-calendar adjusted outputs from the TRACE-21K-II (red) simulation.



Supplementary Figure 5. Geopotential height, expressed as anomalies compared to present, from the LOVECLIM simulations for four key times during the Holocene: 11±0.15, 9±0.15, 6±0.15 and 3±0.15 ka.