

Supplementary Table 1. Explanatory variables included in the growth models and level of significance

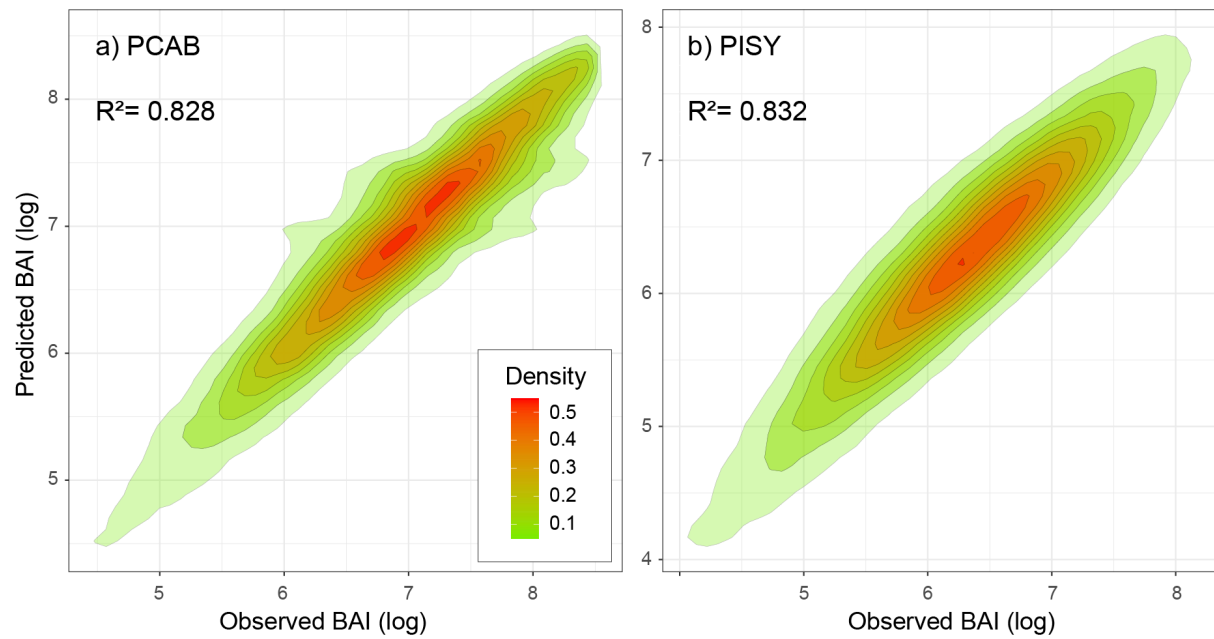
(* $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$). The excluded variables are marked with -.

	Independent variable	<i>Picea abies</i>	<i>Pinus sylvestris</i>
Individual	De Martonne Aridity Index (DMI)	***	*
	Altitude	***	***
	Latitude	*	***
	Soil water content availability	***	-
	Soil depth available for roots	***	**
	Precipitation winter	***	-
	Precipitation spring	***	***
	Precipitation summer	***	***
	Precipitation autumn	***	-
	Maximum temperature winter	***	***
	Maximum temperature spring	***	***
	Maximum temperature summer	-	-
	Maximum temperature autumn	***	***
Interactions	DMI : Altitude	-	***
	DMI : Latitude	-	-
	Altitude : Latitude	***	***
	DMI : Precipitation winter	***	-
	DMI : Precipitation spring	***	***
	DMI : Precipitation summer	***	-
	DMI : Precipitation autumn	***	-
	DMI : Maximum temperature winter	***	***
	DMI : Maximum temperature spring	-	-
	DMI : Maximum temperature summer	-	***
	DMI : Maximum temperature autumn	***	-
	Altitude : Precipitation winter	***	***
	Altitude : Precipitation spring	***	
	Altitude : Precipitation summer	***	***
	Altitude : Precipitation autumn		
	Altitude : Maximum temperature winter	***	**
	Altitude : Maximum temperature spring	***	***
	Altitude : Maximum temperature summer	-	-
	Altitude : Maximum temperature autumn	***	-
	Latitude : Precipitation winter	***	-
	Latitude : Precipitation spring	***	-
	Latitude : Precipitation summer	***	***
	Latitude : Precipitation autumn	***	-
	Latitude : Maximum temperature winter	***	-
	Latitude : Maximum temperature spring	***	***
	Latitude : Maximum temperature summer	-	***
	Latitude : Maximum temperature autumn	***	-

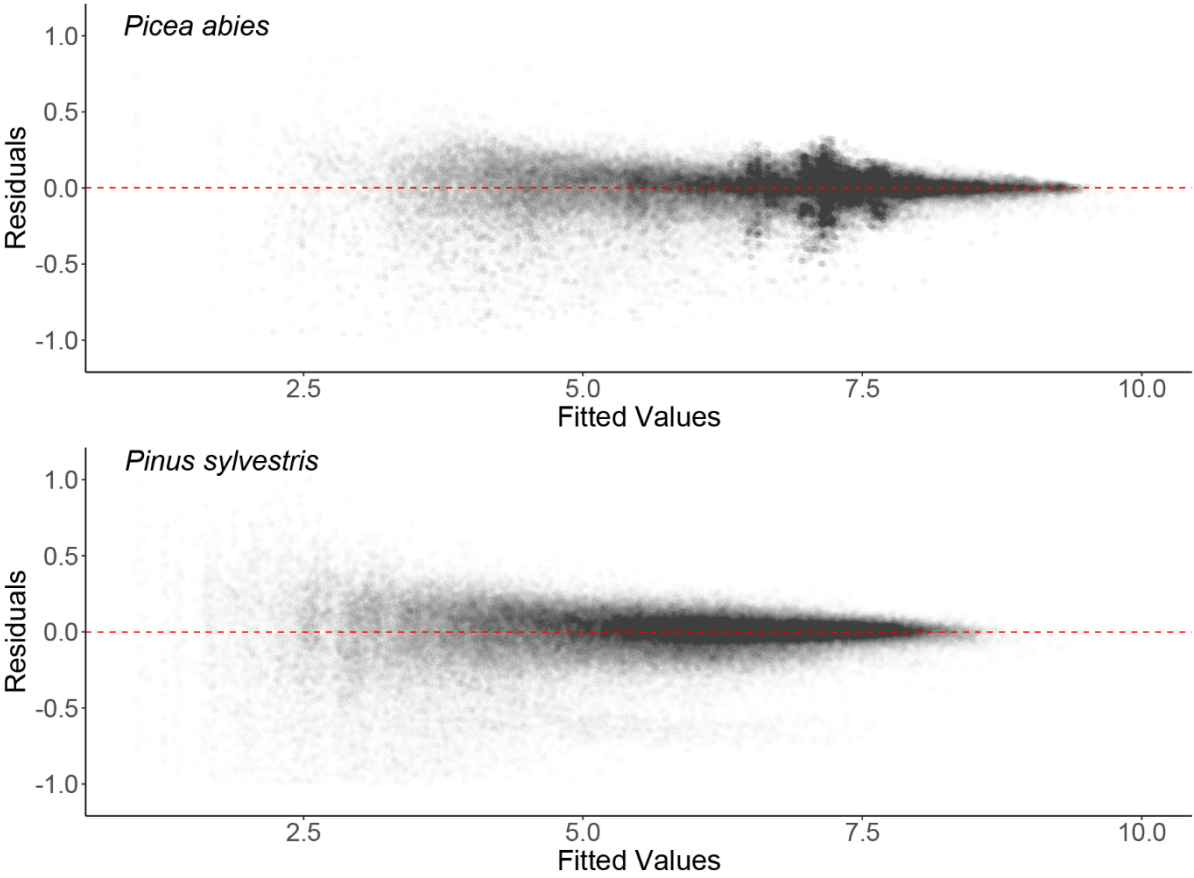
Supplementary Table 2. Range of parameters used for calculating the range of applicability of the growth models.

	<i>Picea abies</i>		<i>Pinus sylvestris</i>		units
	min	max	min	max	
Altitude	1	2300	1	2000	m a.s.l.
Annual Precipitation	290	3400	208	3100	mm
Precipitation winter	30	1039	19	1132	mm
Precipitation spring	31	835	22	983	mm
Precipitation summer	39	1063	3	832	mm
Precipitation autumn	40	1291	28	984	mm
Annual maximum temperature	-0.6	16.5	-0.6	20.5	°C
Maximum temperature winter	-16.7	9	-16.7	14.7	°C
Maximum temperature spring	-2.2	17	-2.8	20.6	°C
Maximum temperature summer	9.1	27.3	8.4	31	°C
Maximum temperature autumn	-1.6	17.4	-1.7	21.8	°C

Supplementary Figure 1. Model performance fit to data and correlation coefficients between observed versus predicted growth values.



13 **Supplementary Figure 2.** Model’s residuals distribution across fitted values.

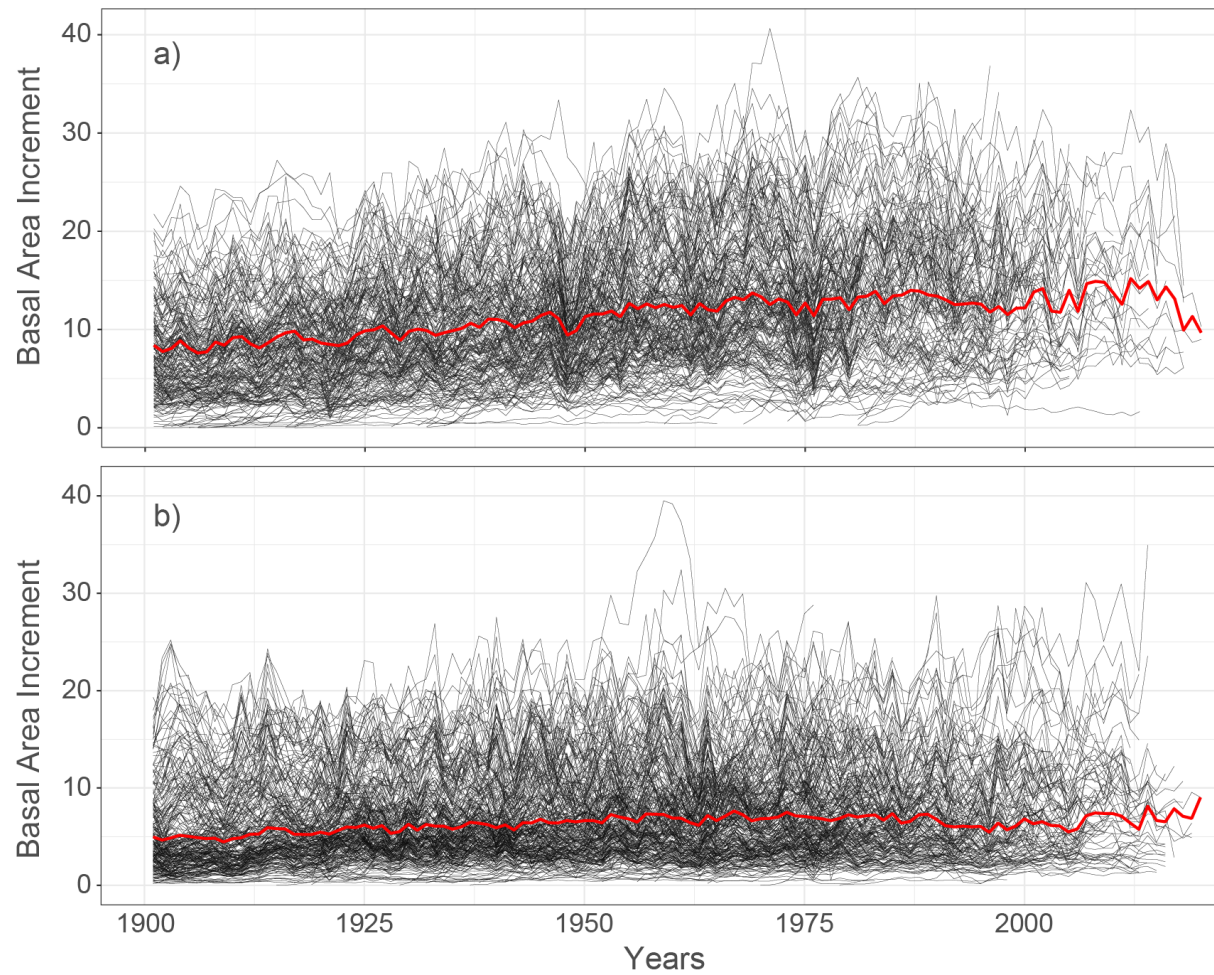


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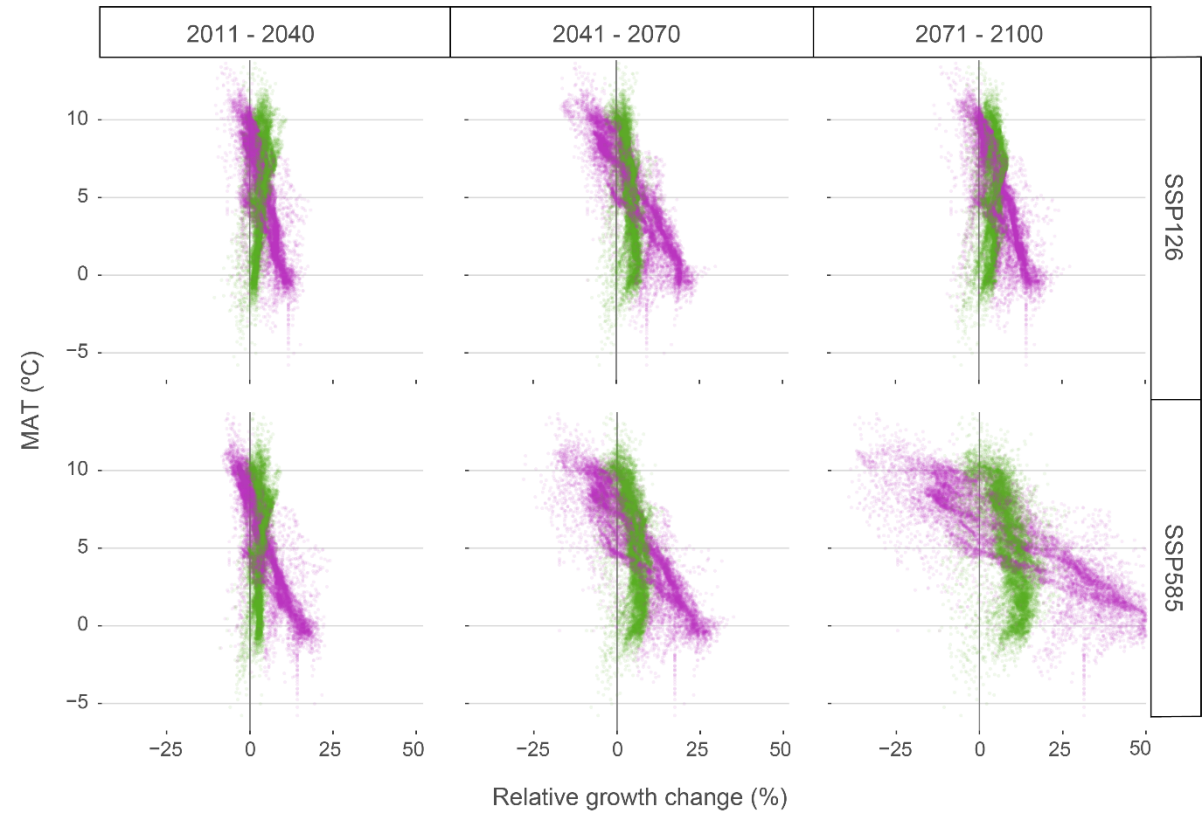
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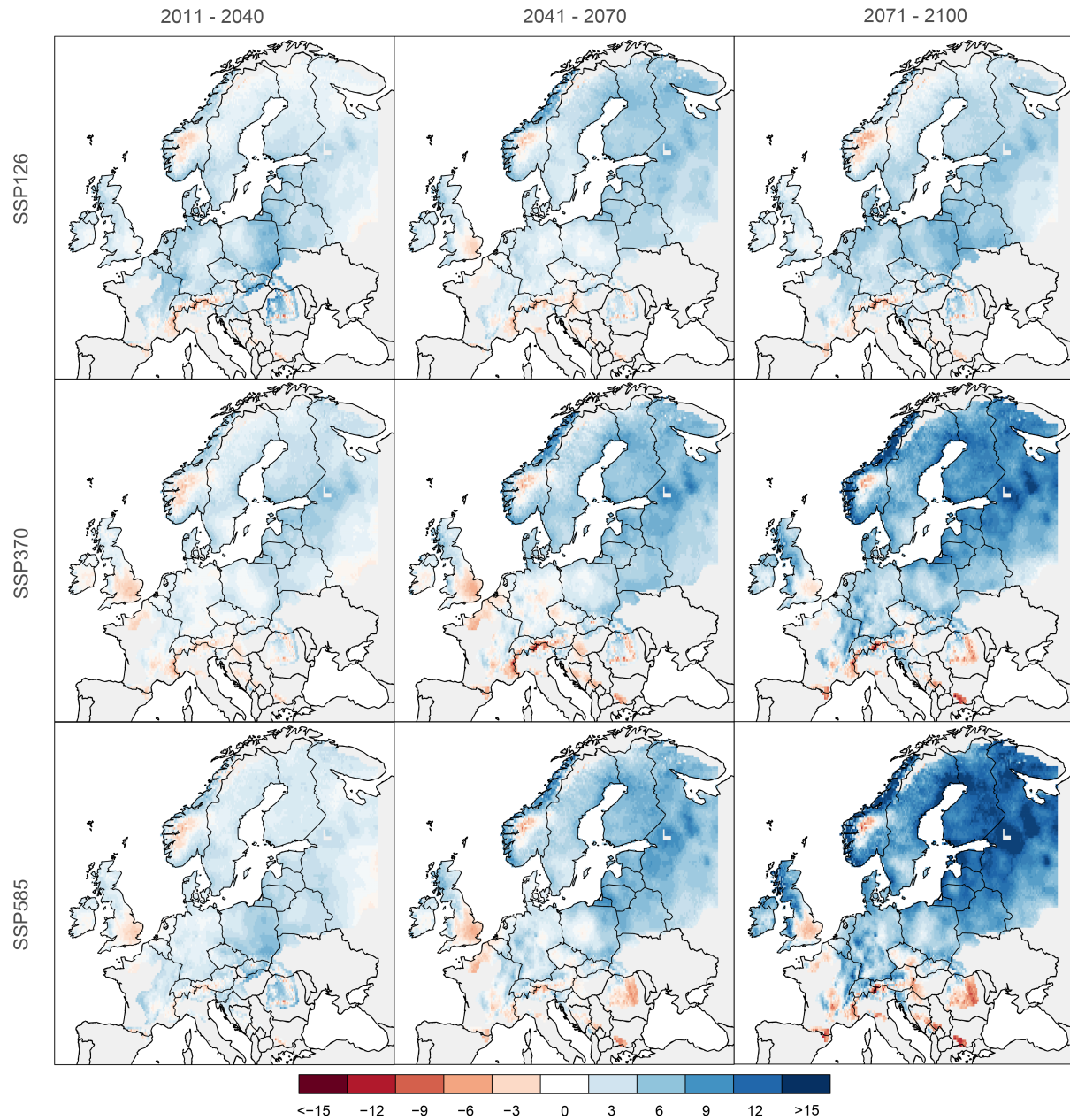
Supplementary Figure 3. Mean Basal Area Increment chronologies of the 223 *Picea abies* (a) and the 272 *Pinus sylvestris* (b) sites from 1900 (grey lines). The thick red line indicates the species' mean Basal Area Increment.



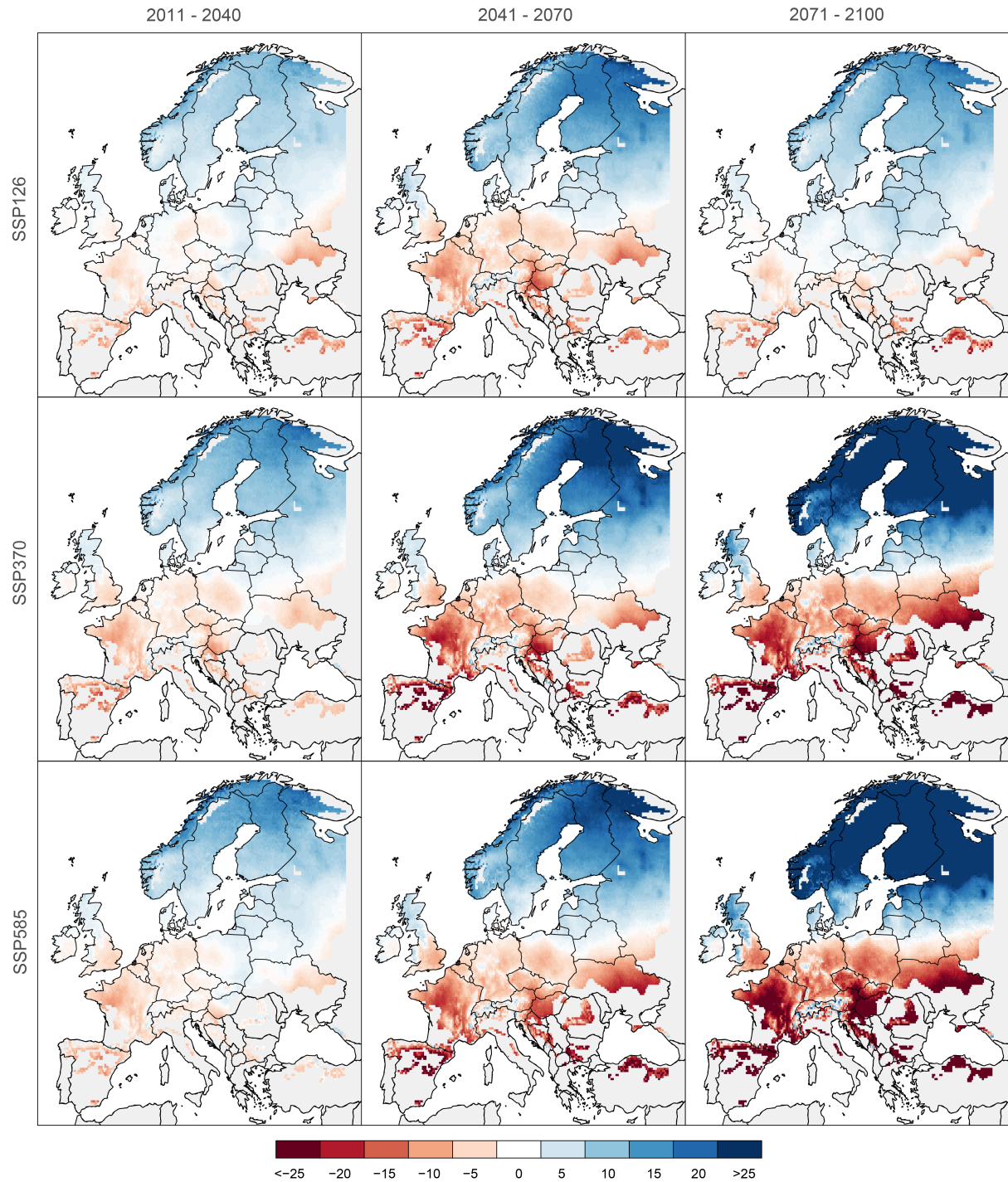
Supplementary Figure 4. Projected growth changes of *Picea abies* (green) and *Pinus sylvestris* (purple) growth along Mean Annual Temperature (MAT) gradients. Changes are expressed as relative differences of Basal Area Increment (in %) considering the CMIP6 scenarios SSP126, and SSP585 for the periods 2011-2040, 2041-2070, and 2071-2100 relative to the 1986–2016 mean.



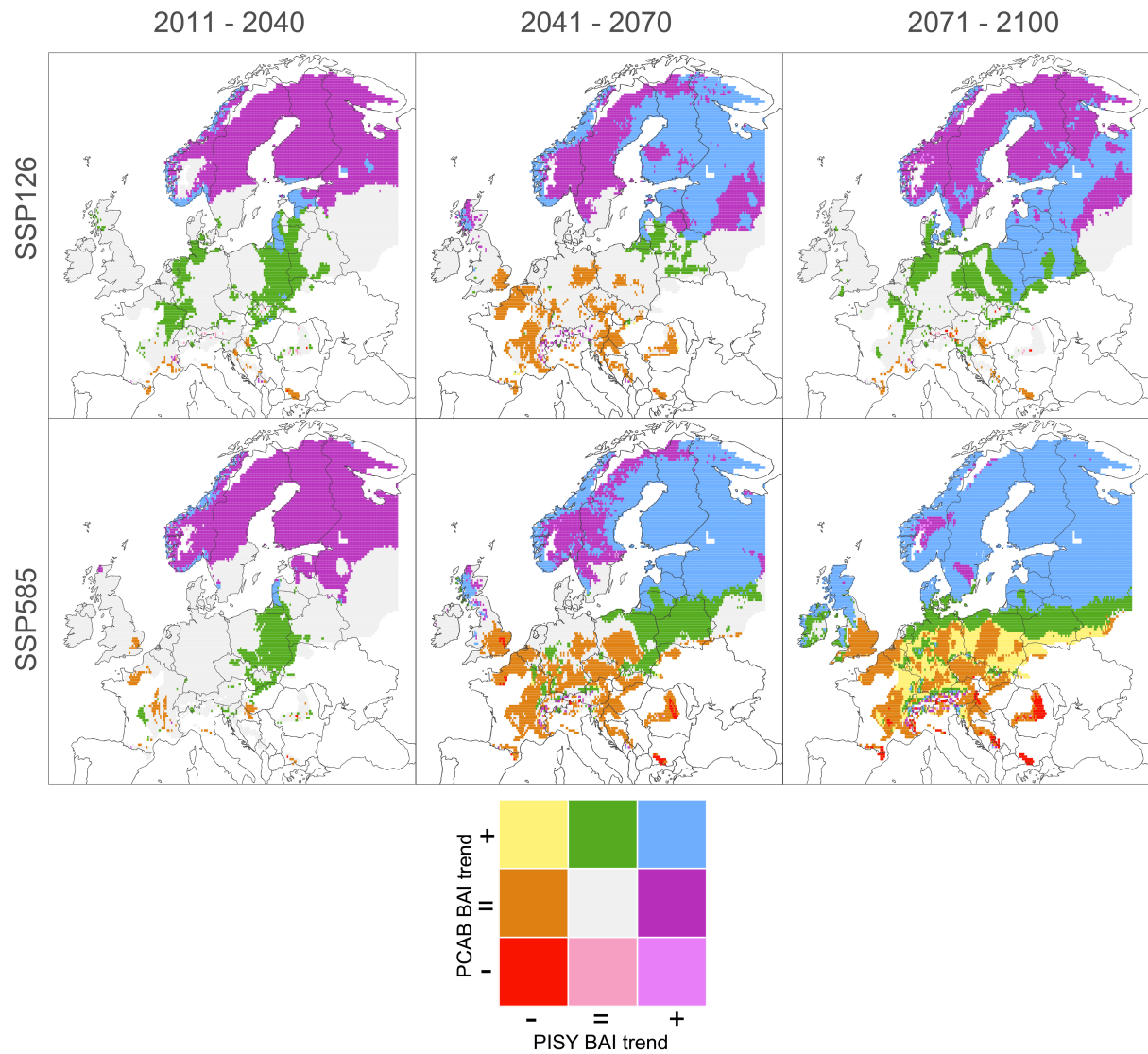
Supplementary Figure 5. Relative changes in tree growth of *Picea abies*, projected under CMIP6 scenarios SSP126, SSP370, and SSP585, for the periods 2011-2040, 2041-2070, and 2071-2100. The changes are expressed in percent BAI change relative to the 1986–2016 period mean.



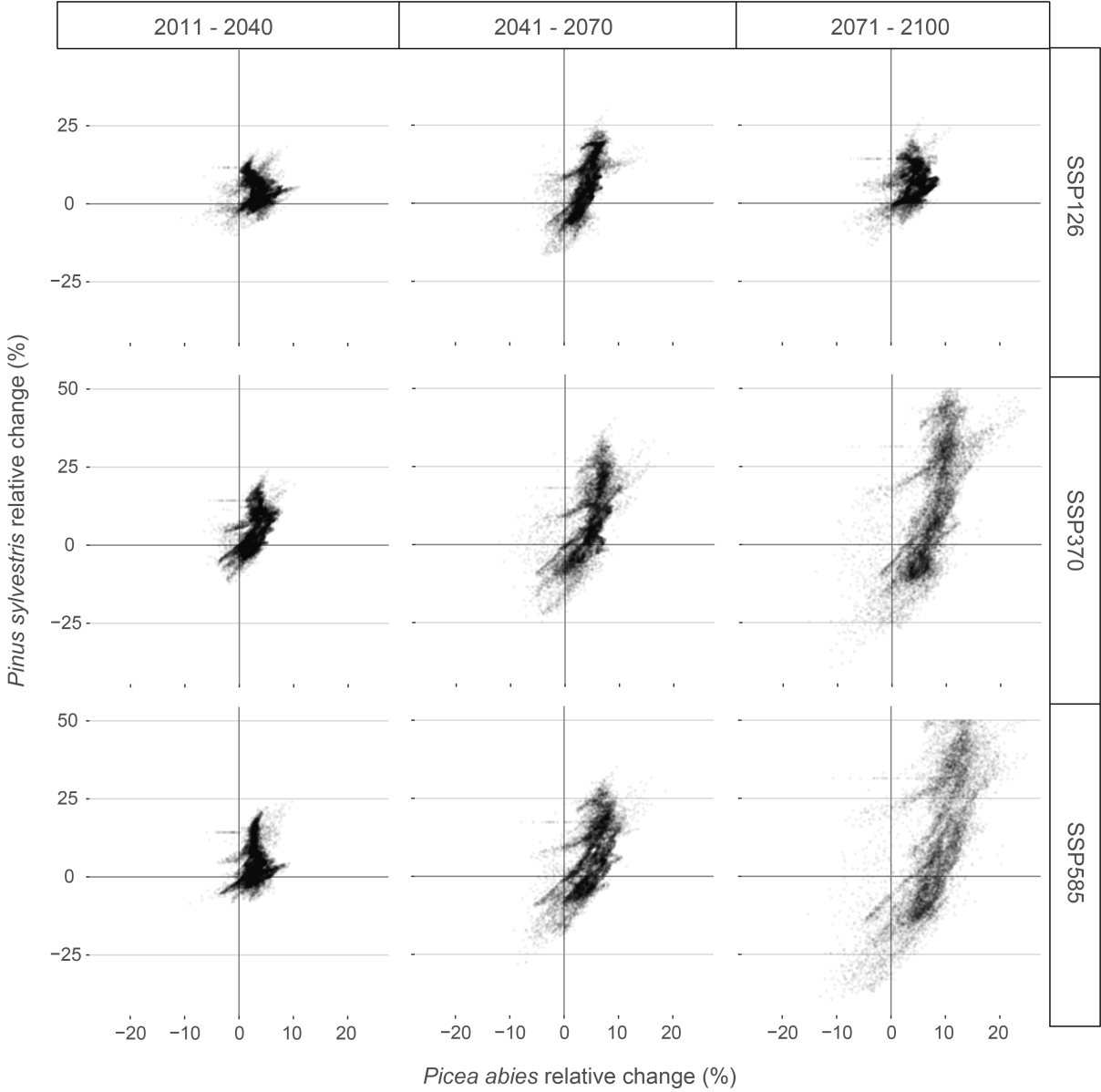
Supplementary Figure 6. Relative changes in tree growth of *Pinus sylvestris*, projected under CMIP6 scenarios SSP126, SSP370, and SSP585, for the periods 2011-2040, 2041-2070, and 2071-2100. The changes are expressed in percent BAI change relative to the 1986–2016 period mean



Supplementary Figure 7. Combined growth trends projections at shared *Picea abies* and *Pinus sylvestris* distribution across Europe. Colors represent combinations of Basal Area Increment (BAI) trends (positive +, neutral =, negative -; see Methods), projected under CMIP6 scenarios SSP1-2.6 and SSP5-8.5, over the periods 2011-2040 (a), 2041-2070 (b), and 2071-2100 (c) relative to the 1986-2016 mean.



Supplementary Figure 8. Comparative growth changes of *Picea abies* and *Pinus sylvestris* across the shared species distribution, expressed in percentage. Different panels refer to the CMIP6 scenarios SSP126, SSP370, and SSP585, for the periods 2011-2040, 2041-2070, and 2071-2100.



Supplementary Figure 9. Density curves representing the range and frequency of mean annual temperature and mean annual precipitation of the study sites (chronologies) compared with the shared distribution of both species. The number represents the combination of number of observations (sites per species, pixels for the species distribution) multiplied by the number of years included in the analysis (1955-2016).

