1 Bias correction

1.1 Bias correction parameters

The parameters for the bias correction were calculated by comparing seasonal mean values between CHESS-met and the CHESS-SCAPE downscaled variables for the overlap period 1980-2015 (Section 3.3 and Appendix B). The parameters were calculated for each season for each ensemble member, for each grid box that was present in both data sets.

The offset parameter for specific humidity, μ_q, is shown in Fig. S1 and the scale parameter for wind speed is shown in S2. The difference in downwelling longwave radiation between CHESS-SCAPE and CHESS-met can be seen in in Fig. S3. The two parameters used to bias-correct the downwelling shortwave radiation, $\mu_{S,1}$ and $\mu_{S,2}$ are shown in Figs. S4 and S5, while the difference in downwelling shortwave radiation between CHESS-SCAPE and CHESS-met is shown in Fig. S6.
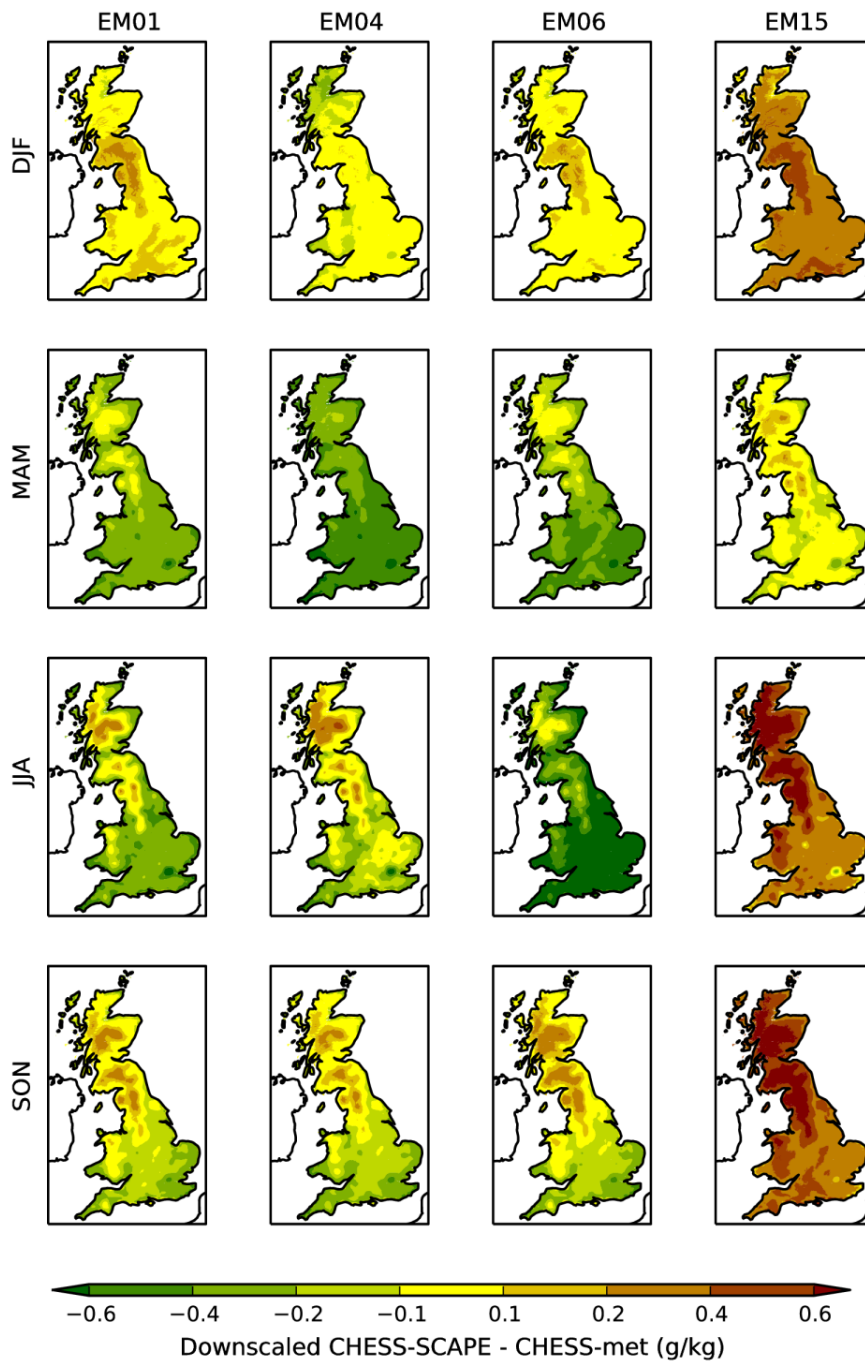
Figure S1: Difference in specific humidity between the downscaled CHESS-SCAPE data and the historical CHESS-met data, μ_q, for each season and each ensemble member.
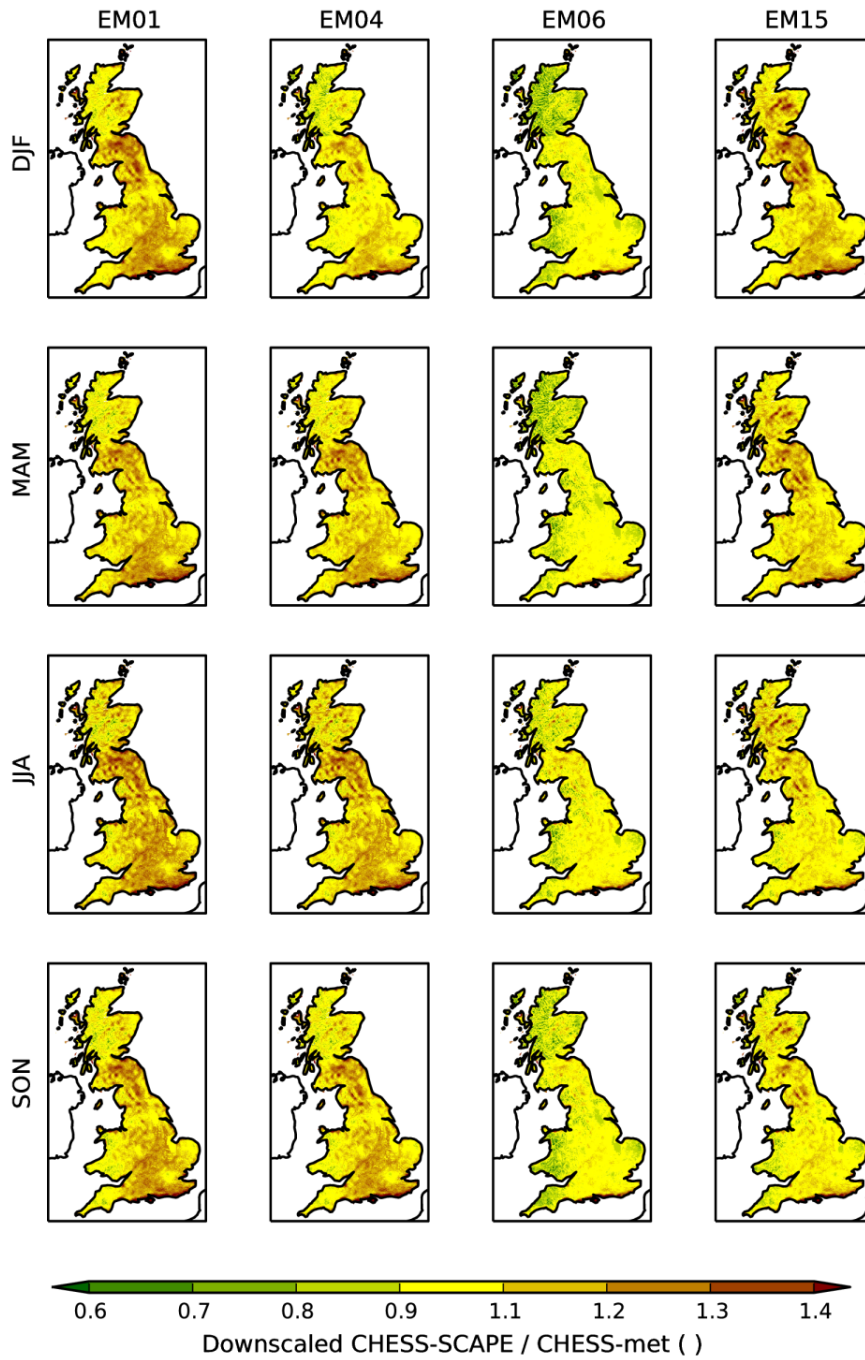
Figure S2: Ratio of 10 m wind speed between the downscaled CHESS-SCAPE data and the historical CHESS-met data, μ_u, for each season and each ensemble member.
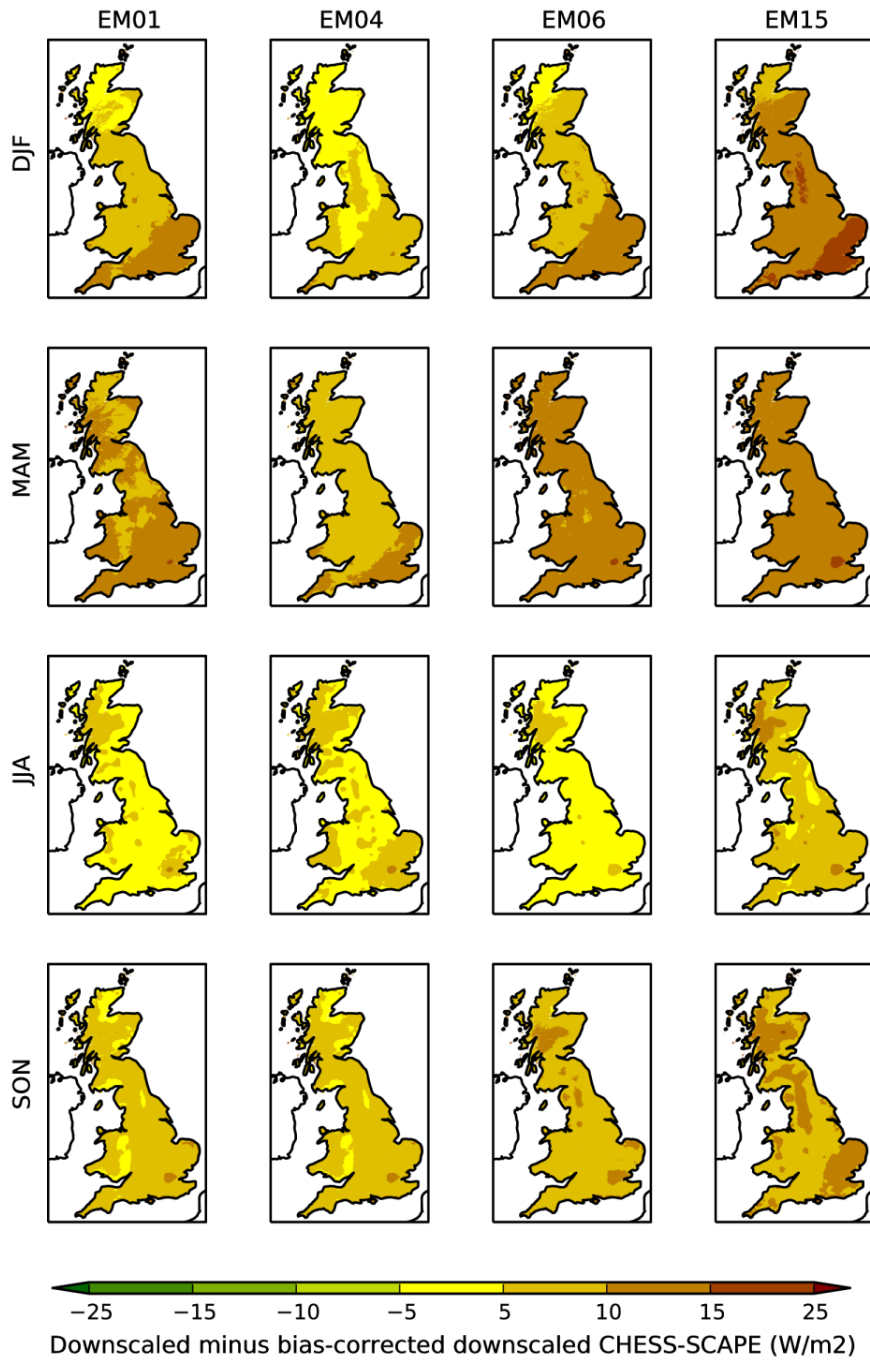
Figure S3: Difference in downwelling longwave radiation between the downscaled CHESS-SCAPE data and the historical CHESS-met data, for each season and each ensemble member.
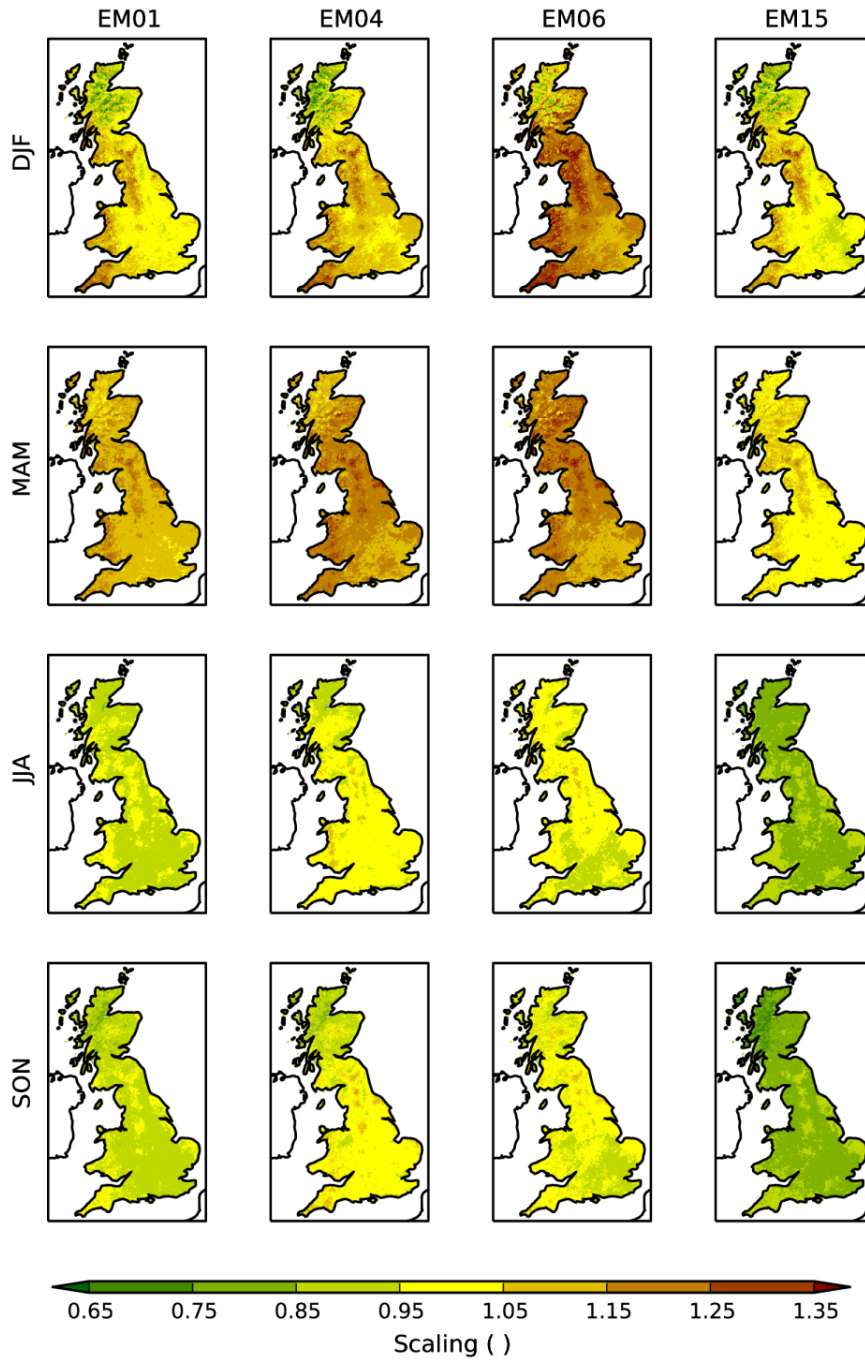
Figure S4: Scaling parameter for bias correction of downwelling shortwave radiation between the down-scaled CHESS-SCAPE data and the historical CHESS-met data, $\mu_{S,1}$, for each season and each ensemble member.
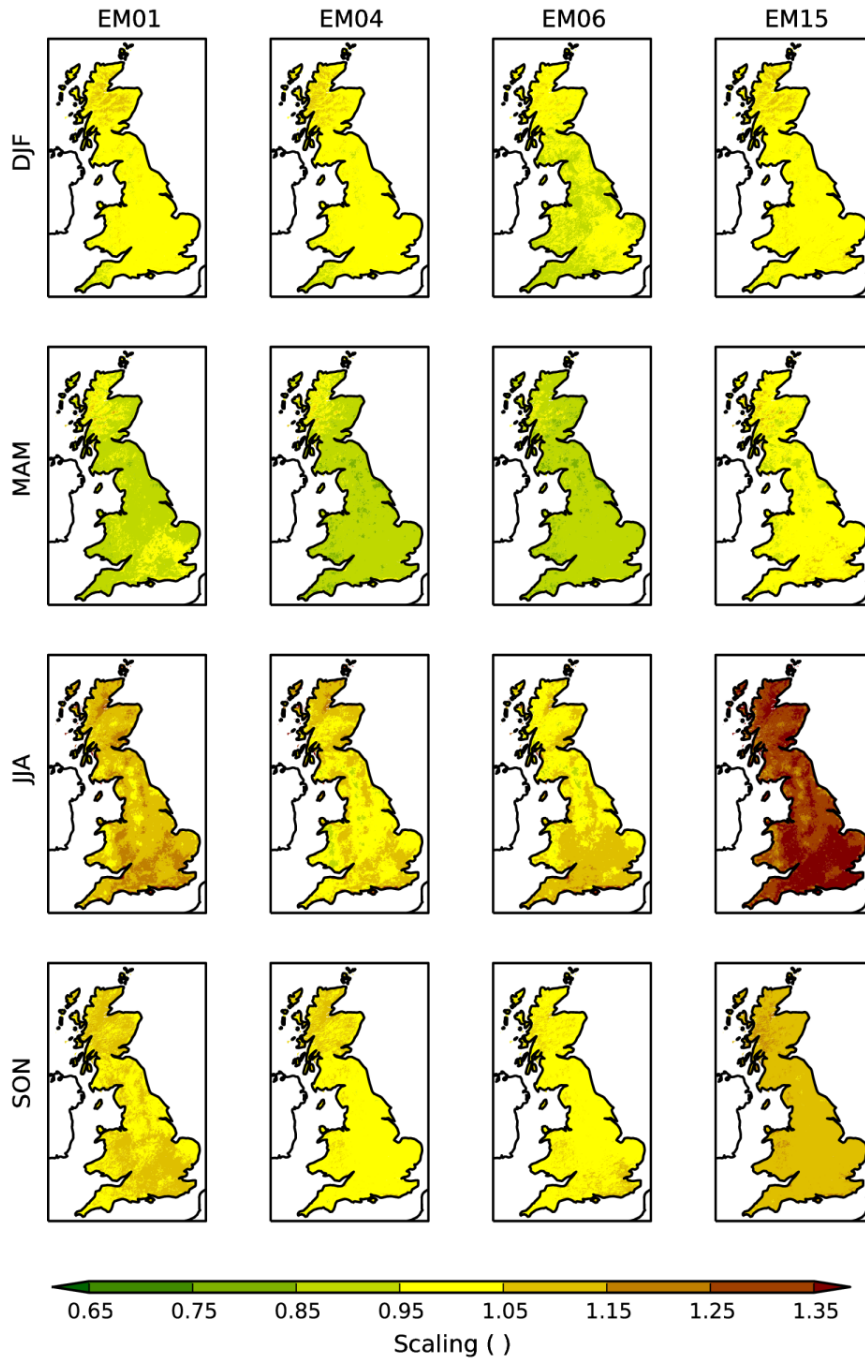
Figure S5: Normalisation parameter for bias correction of downwelling shortwave radiation between the downscaled CHESS-SCAPE data and the historical CHESS-met data, $\mu_{S,2}$, for each season and each ensemble member.
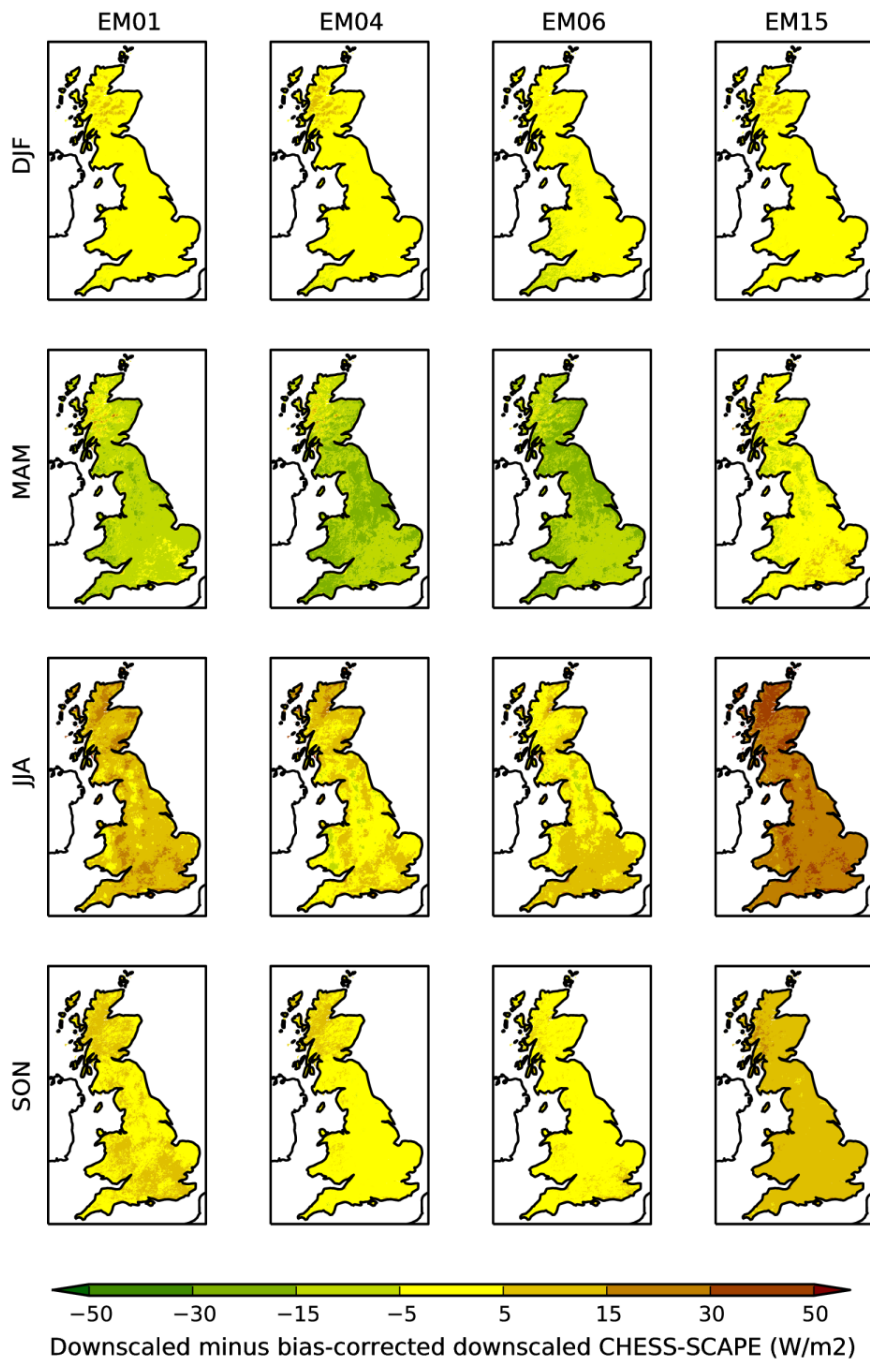
Figure S6: Difference between seasonal mean downwelling shortwave radiation between the downscaled CHESS-SCAPE data and the historical CHESS-met data for each season and each ensemble member.

1.2 Time series

The time series of 20-year seasonal mean over Great Britain at ten year intervals of daily mean air temperature and precipitation are Figs. 5 and 6 in the manuscript. The other variables are shown here in Figs. S7 to S15.
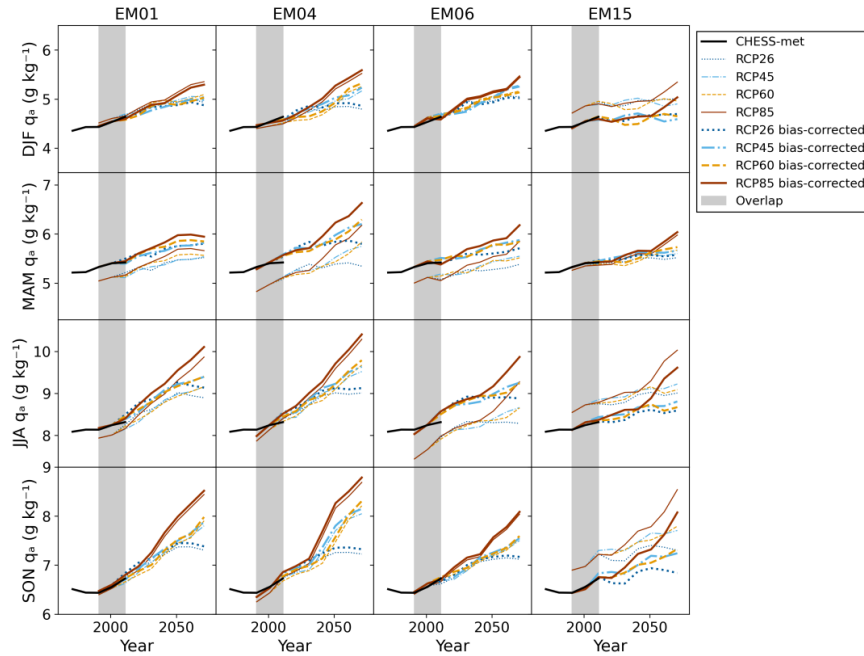
Figure S7: Twenty-year seasonal mean specific humidity averaged over GB for the downscaled-only CHESS-SCAPE data (thin coloured lines), the downscaled and bias-corrected CHESS-SCAPE data (thick coloured lines), and CHESS-met (black solid line). The different RCPs are RCP2.6 (dark blue dotted line), RCP4.5 (light blue dash-dotted line), RCP6.0 (yellow dashed line) and RCP8.5 (brown solid line). The grey region shows the period of overlap 1961–2015.
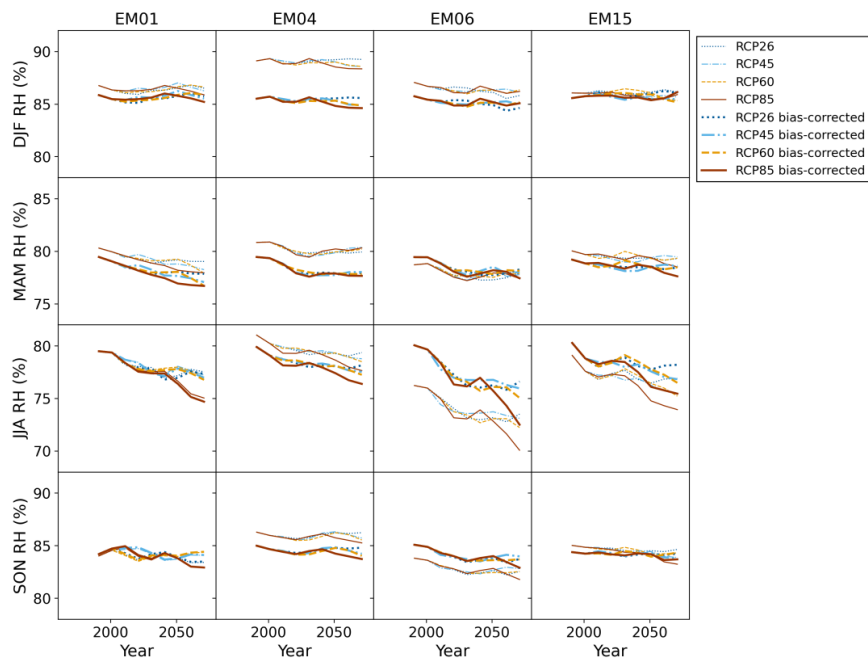
Figure S8: Twenty-year seasonal mean relative humidity averaged over GB for the downscaled-only CHESS-SCAPE data (thin coloured lines), the downscaled and bias-corrected CHESS-SCAPE data (thick coloured lines), and CHESS-met (black solid line). The different RCPs are RCP2.6 (dark blue dotted line), RCP4.5 (light blue dash-dotted line), RCP6.0 (yellow dashed line) and RCP8.5 (brown solid line). The grey region shows the period of overlap 1961–2015.
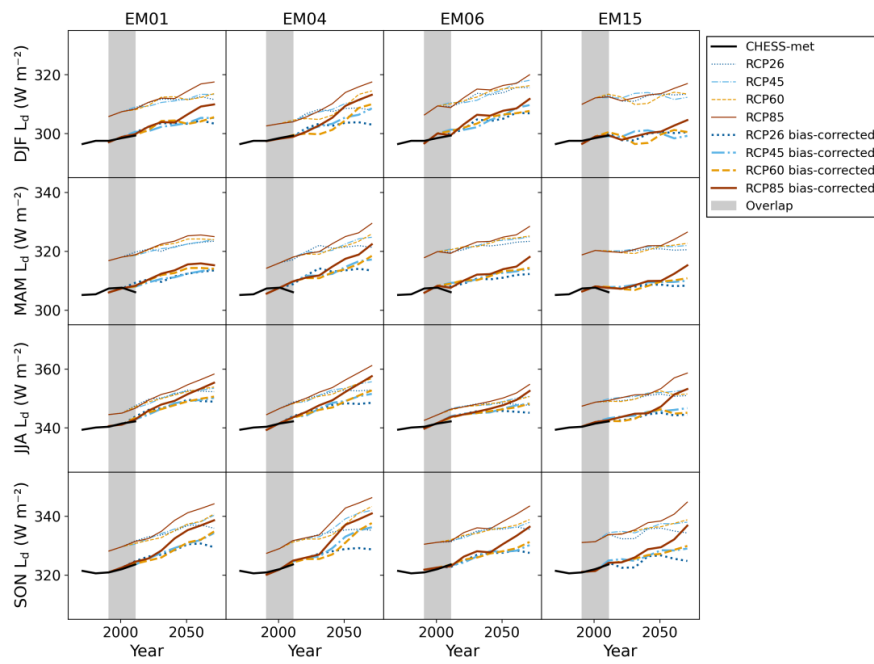
Figure S9: Twenty-year seasonal mean downwelling longwave radiation averaged over GB for the downscaled-only CHESS-SCAPE data (thin coloured lines), the downscaled and bias-corrected CHESS-SCAPE data (thick coloured lines), and CHESS-met (black solid line). The different RCPs are RCP2.6 (dark blue dotted line), RCP4.5 (light blue dash-dotted line), RCP6.0 (yellow dashed line) and RCP8.5 (brown solid line). The grey region shows the period of overlap 1961–2015.
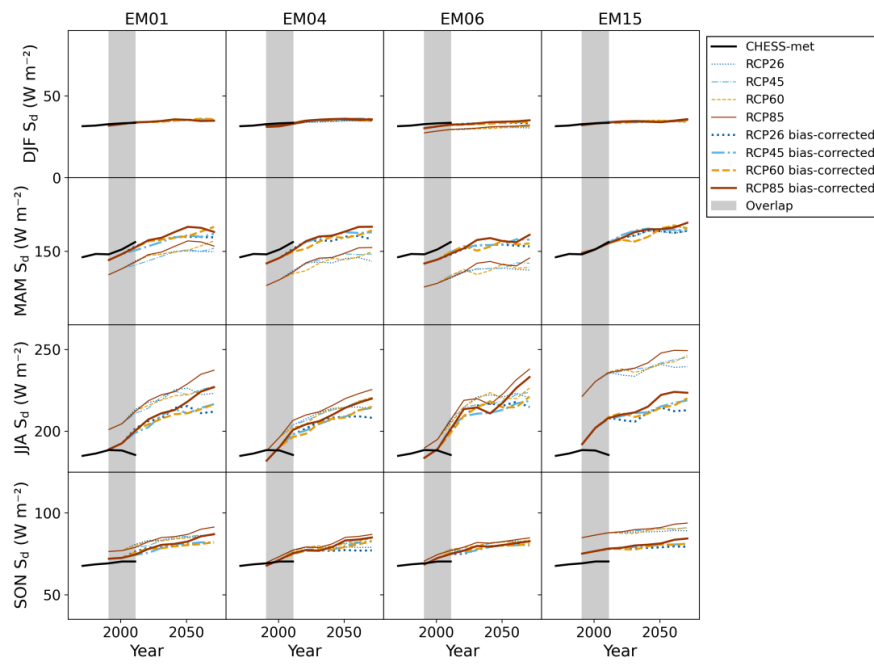
Figure S10: Twenty-year seasonal mean downwelling shortwave radiation averaged over GB for the downscaled-only CHESS-SCAPE data (thin coloured lines), the downscaled and bias-corrected CHESS-SCAPE data (thick coloured lines), and CHESS-met (black solid line). The different RCPs are RCP2.6 (dark blue dotted line), RCP4.5 (light blue dash-dotted line), RCP6.0 (yellow dashed line) and RCP8.5 (brown solid line). The grey region shows the period of overlap 1961–2015.
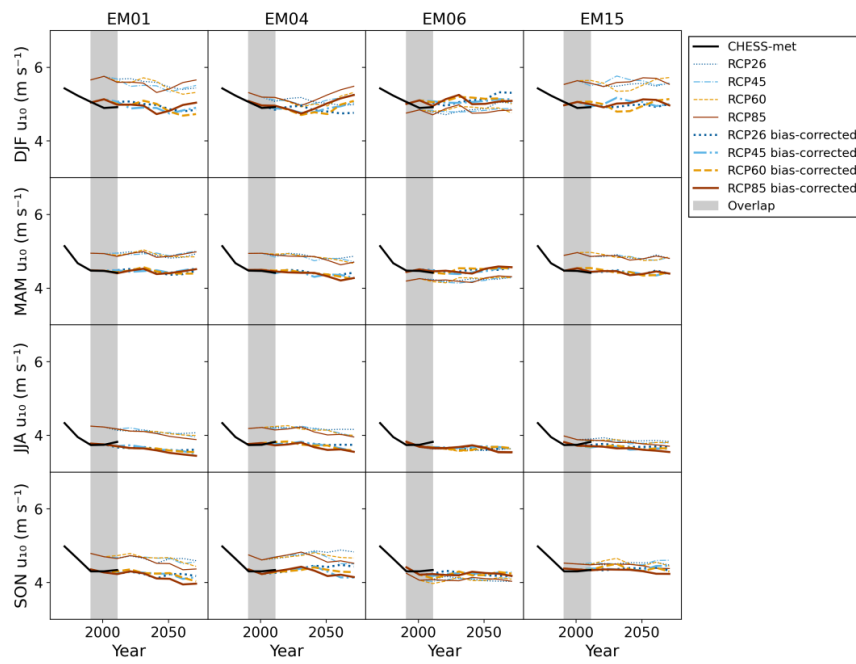
Figure S11: Twenty-year seasonal mean wind speed averaged over GB for the downscaled-only CHESS-SCAPE data (thin coloured lines), the downscaled and bias-corrected CHESS-SCAPE data (thick coloured lines), and CHESS-met (black solid line). The different RCPs are RCP2.6 (dark blue dotted line), RCP4.5 (light blue dash-dotted line), RCP6.0 (yellow dashed line) and RCP8.5 (brown solid line). The grey region shows the period of overlap 1961–2015.
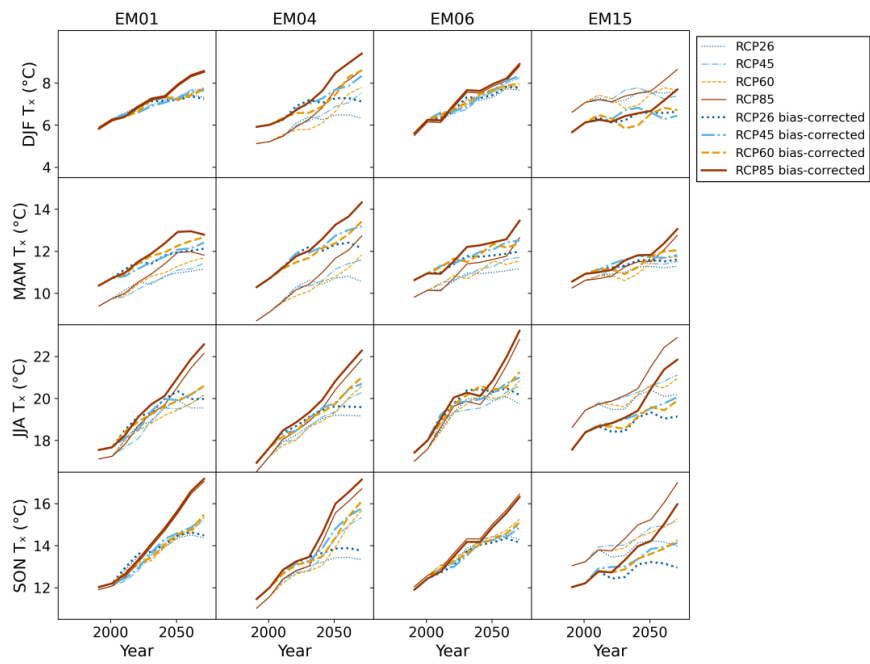
Figure S12: Twenty-year seasonal mean daily maximum air temperature averaged over GB for the downscaled-only CHESS-SCAPE data (thin coloured lines), the downscaled and bias-corrected CHESS-SCAPE data (thick coloured lines), and CHESS-met (black solid line). The different RCPs are RCP2.6 (dark blue dotted line), RCP4.5 (light blue dash-dotted line), RCP6.0 (yellow dashed line) and RCP8.5 (brown solid line). The grey region shows the period of overlap 1961–2015.
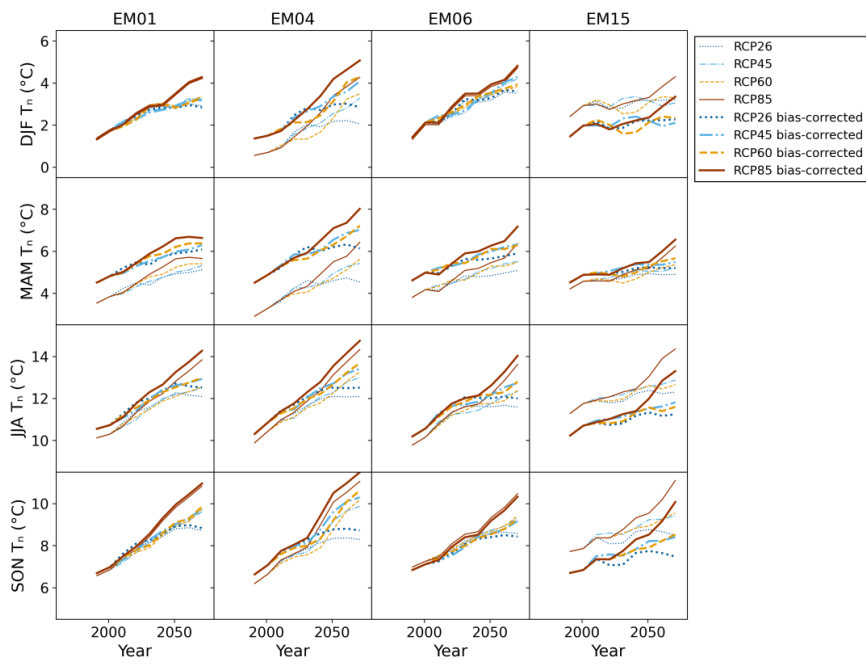
Figure S13: Twenty-year seasonal mean daily minimum air temperature averaged over GB for the downscaled-only CHESS-SCAPE data (thin coloured lines), the downscaled and bias-corrected CHESS-SCAPE data (thick coloured lines), and CHESS-met (black solid line). The different RCPs are RCP2.6 (dark blue dotted line), RCP4.5 (light blue dash-dotted line), RCP6.0 (yellow dashed line) and RCP8.5 (brown solid line). The grey region shows the period of overlap 1961–2015.
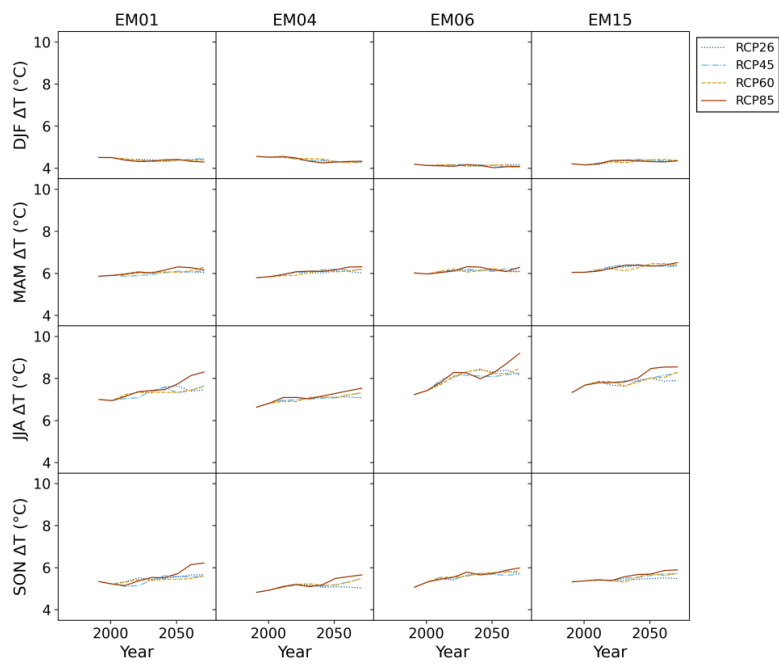
Figure S14: Twenty-year seasonal mean daily air temperature range averaged over GB for the downscaled-only CHESS-SCAPE data. The different RCPs are RCP2.6 (dark blue dotted line), RCP4.5 (light blue dash-dotted line), RCP6.0 (yellow dashed line) and RCP8.5 (brown solid line).
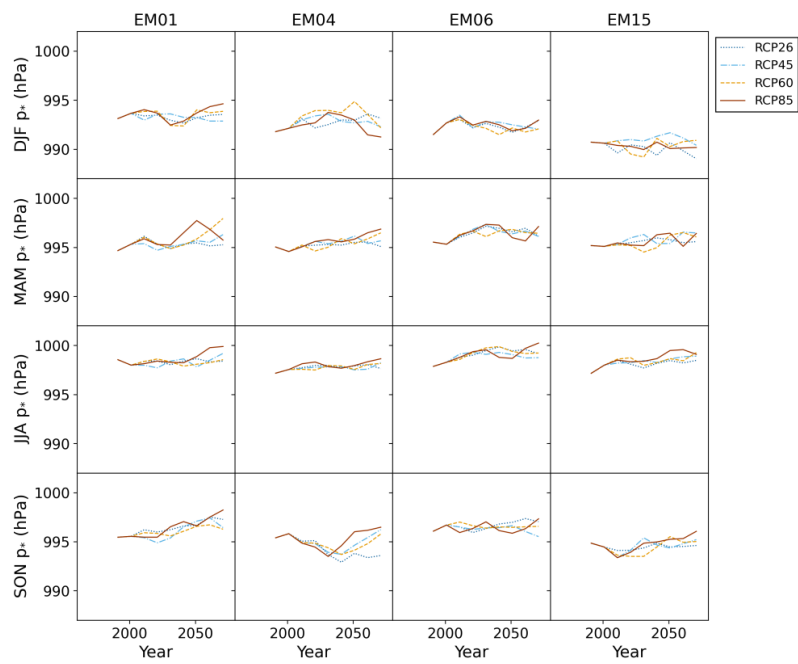
Figure S15: Twenty-year seasonal mean air pressure averaged over GB for the downscaled-only CHESS-SCAPE data. The different RCPs are RCP2.6 (dark blue dotted line), RCP4.5 (light blue dash-dotted line), RCP6.0 (yellow dashed line) and RCP8.5 (brown solid line).

2 Pattern scaling

The linear fit of seasonal mean air temperature and precipitation to global annual mean air temperature can be seen in Figs. 7 and 8 of the manuscript. The other variables are shown in Figs. S16 to S22
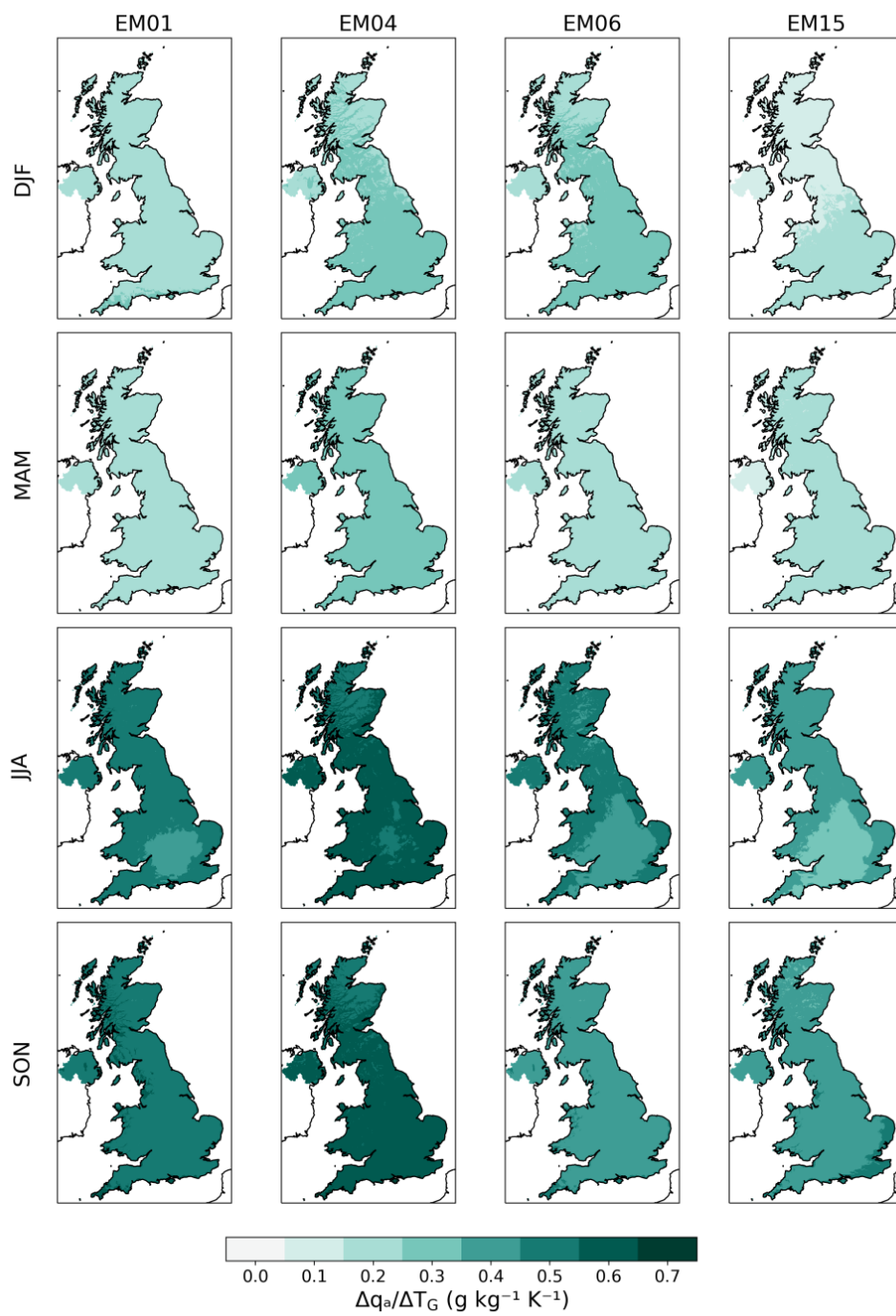
Figure S16: Linear fit of seasonal mean specific humidity to global annual mean air temperature for each 1 km pixel in CHESS-SCAPE RCP8.5.
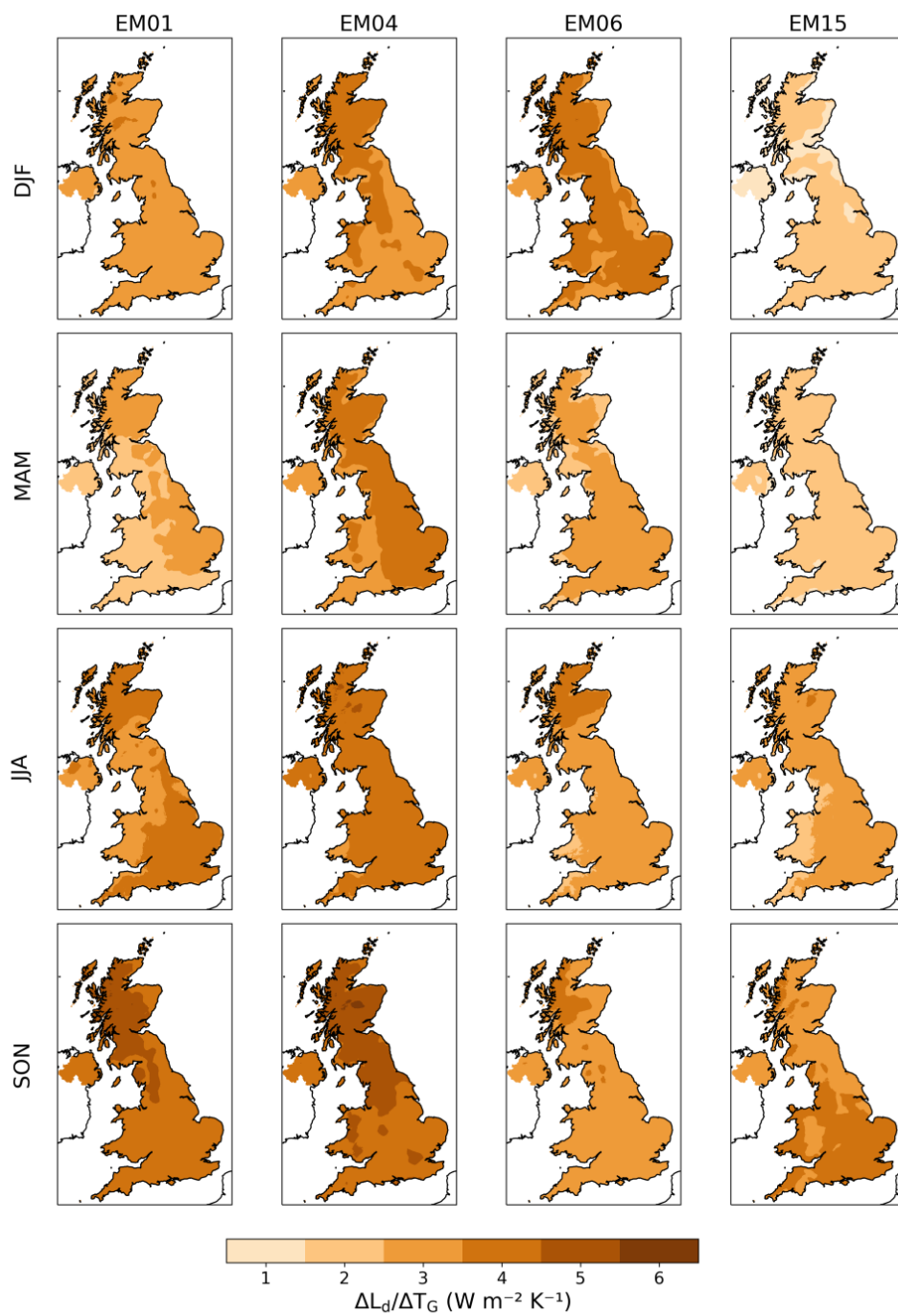
Figure S17: Linear fit of seasonal mean downwelling longwave radiation to global annual mean air temperature for each 1 km pixel in CHESS-SCAPE RCP8.5.
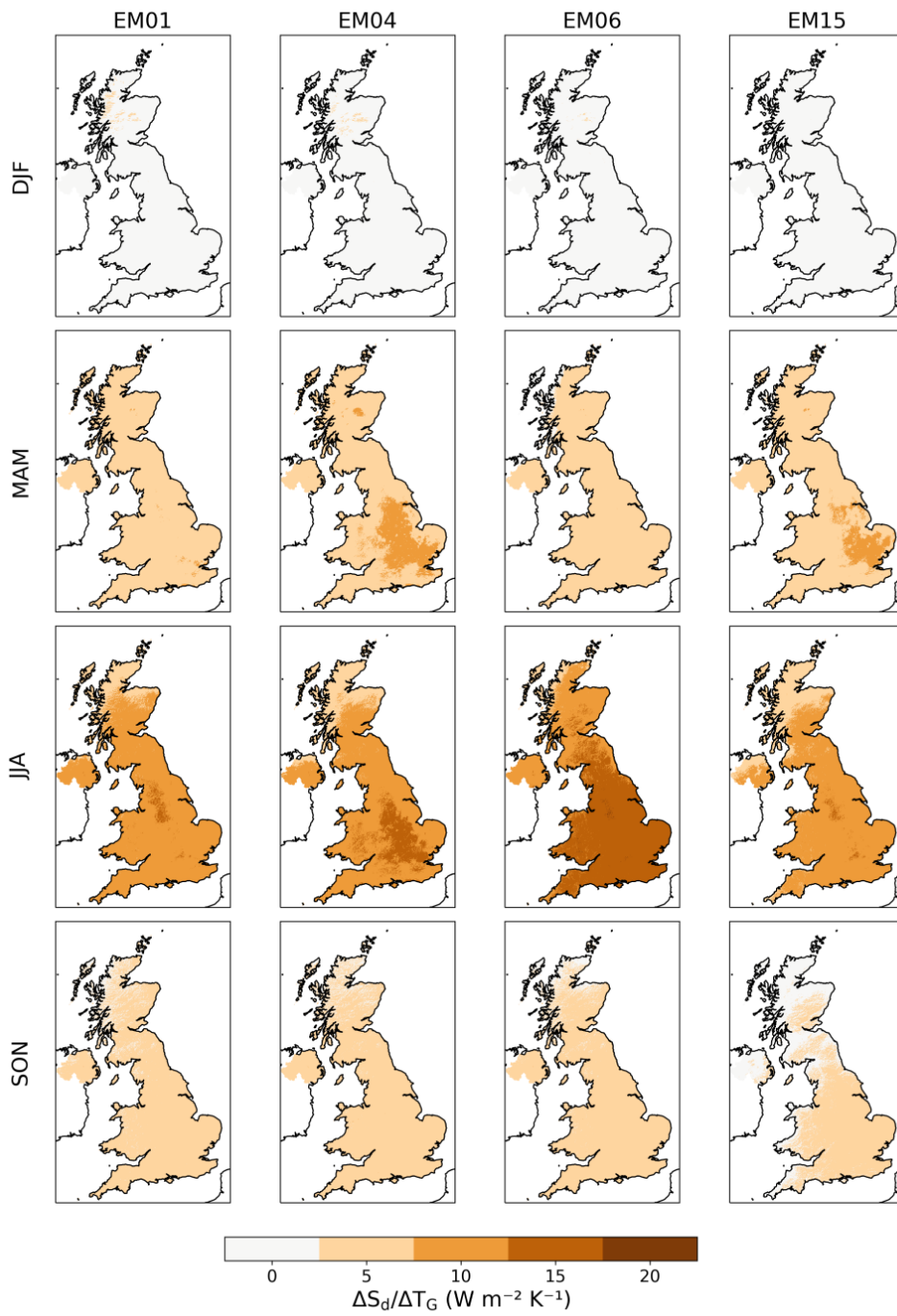
Figure S18: Linear fit of seasonal mean downwelling shortwave radiation to global annual mean air temperature for each 1 km pixel in CHESS-SCAPE RCP8.5.
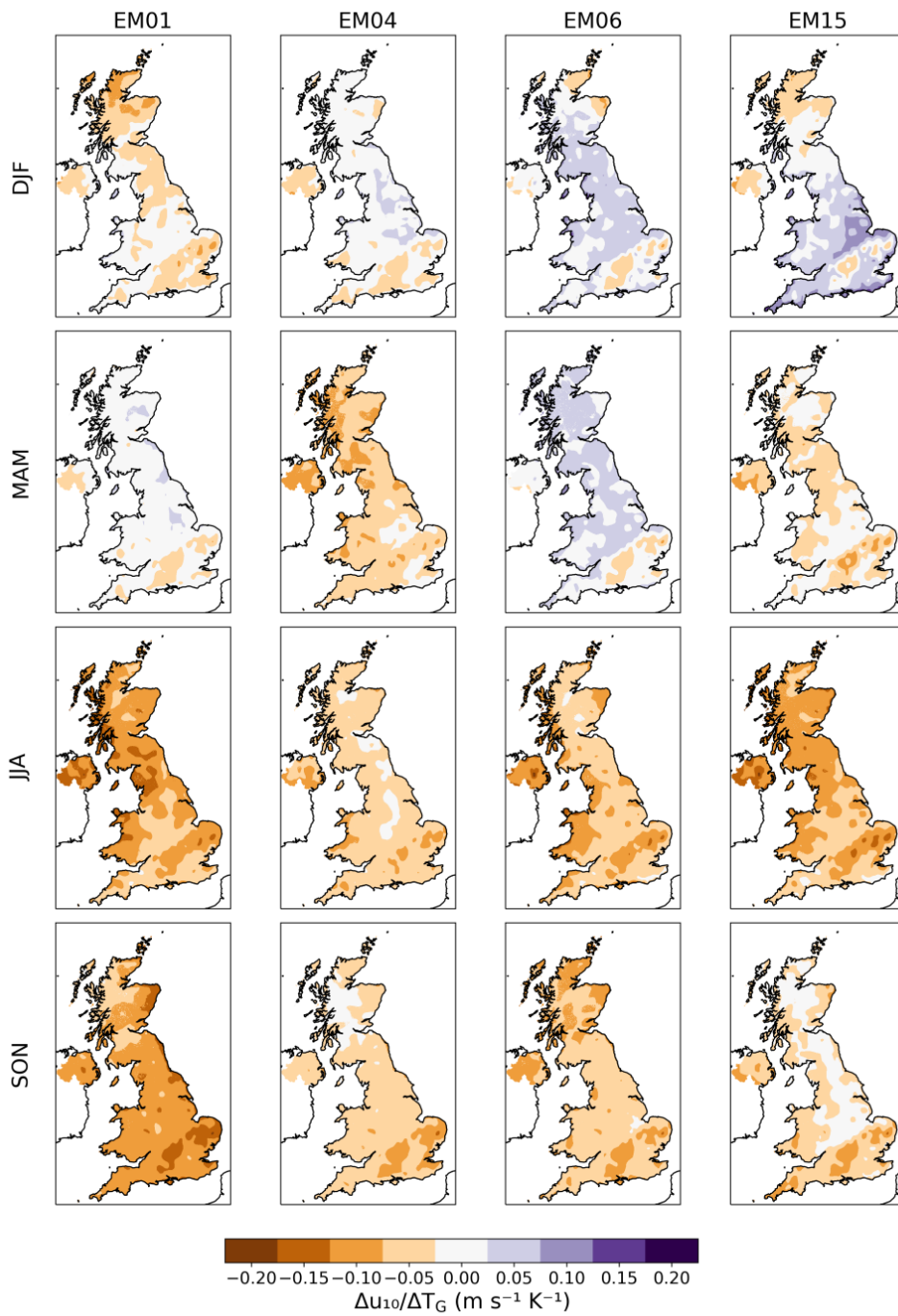
Figure S19: Linear fit of seasonal mean wind speed to global annual mean air temperature for each 1 km pixel in CHESS-SCAPE RCP8.5.
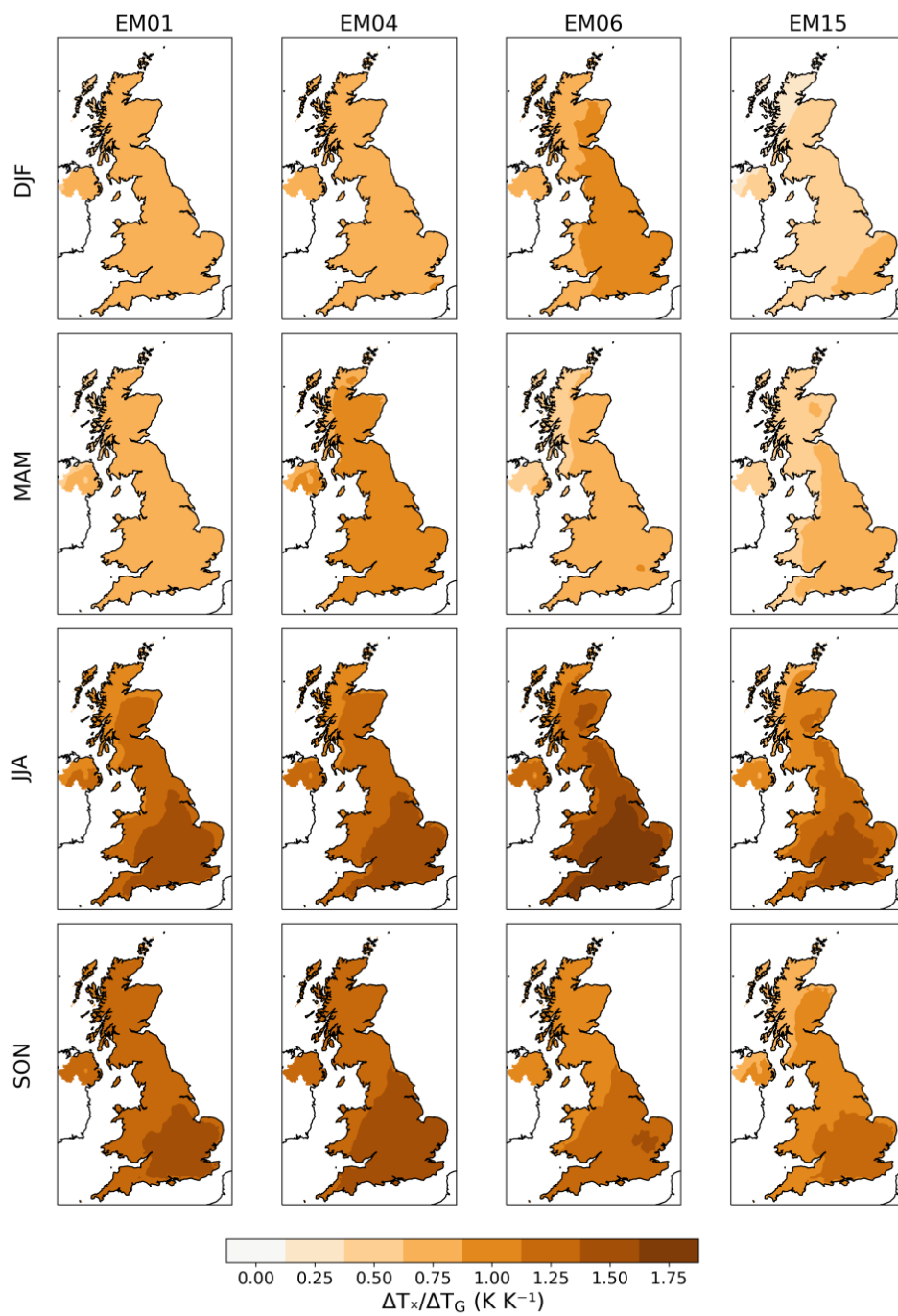
Figure S20: Linear fit of seasonal mean daily maximum air temperature to global annual mean air temperature for each 1 km pixel in CHESS-SCAPE RCP8.5.
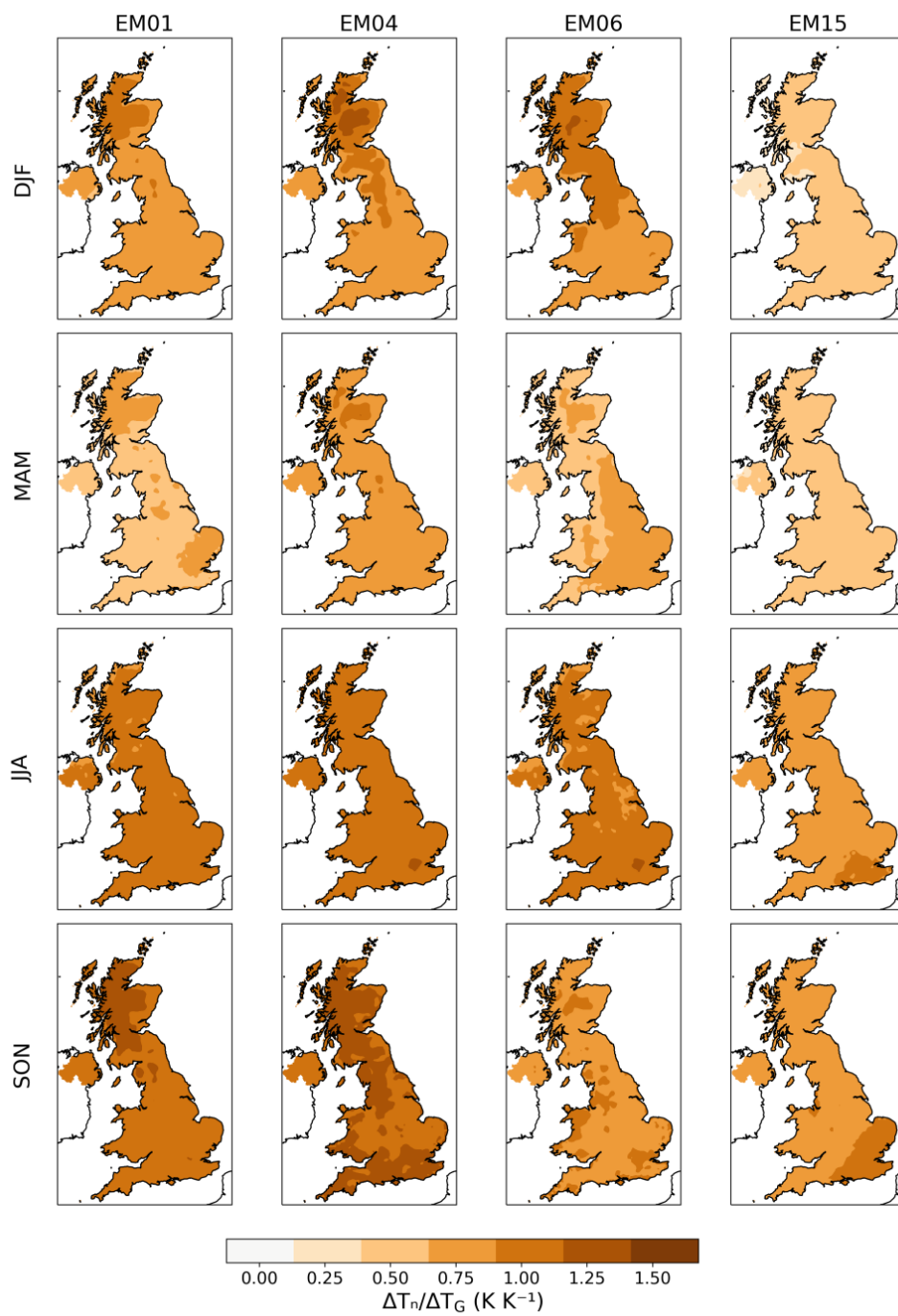
Figure S21: Linear fit of seasonal mean daily minimum air temperature to global annual mean air temperature for each 1 km pixel in CHESS-SCAPE RCP8.5.
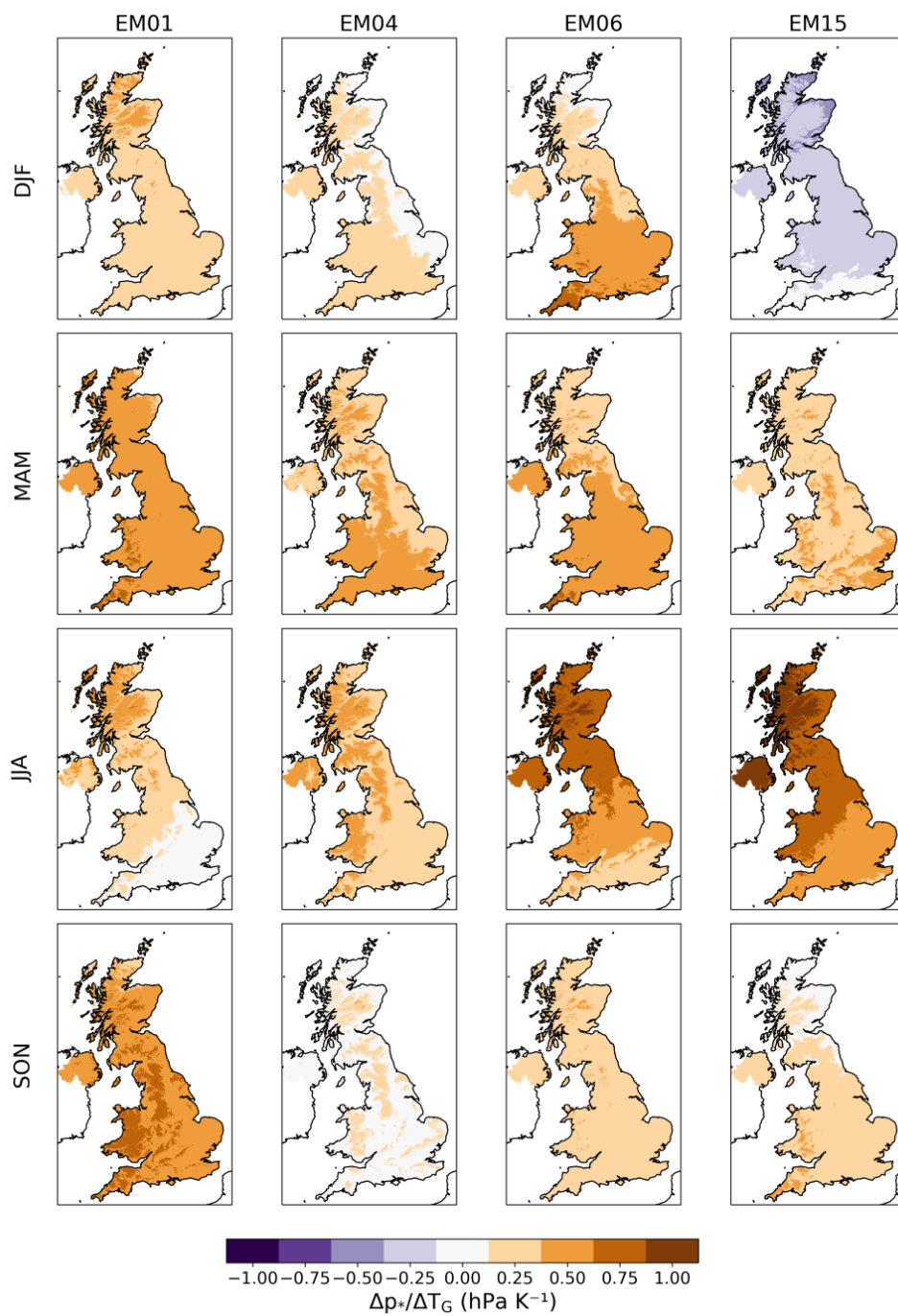
Figure S22: Linear fit of seasonal mean surface air pressure to global annual mean air temperature for each 1 km pixel in CHESS-SCAPE RCP8.5.

3 Baseline 1980–2000

Maps of the seasonal mean air temperature and precipitation for the 1980–2000 baseline of the bias-corrected data can be seen in Figs. 9 and 10 of the manuscript. Here we present the other bias-corrected variables (Figs. S23 to S29), followed by all variables from the downscaled-only ensemble members (Figs. S30 to S40).

3.1 Bias-corrected
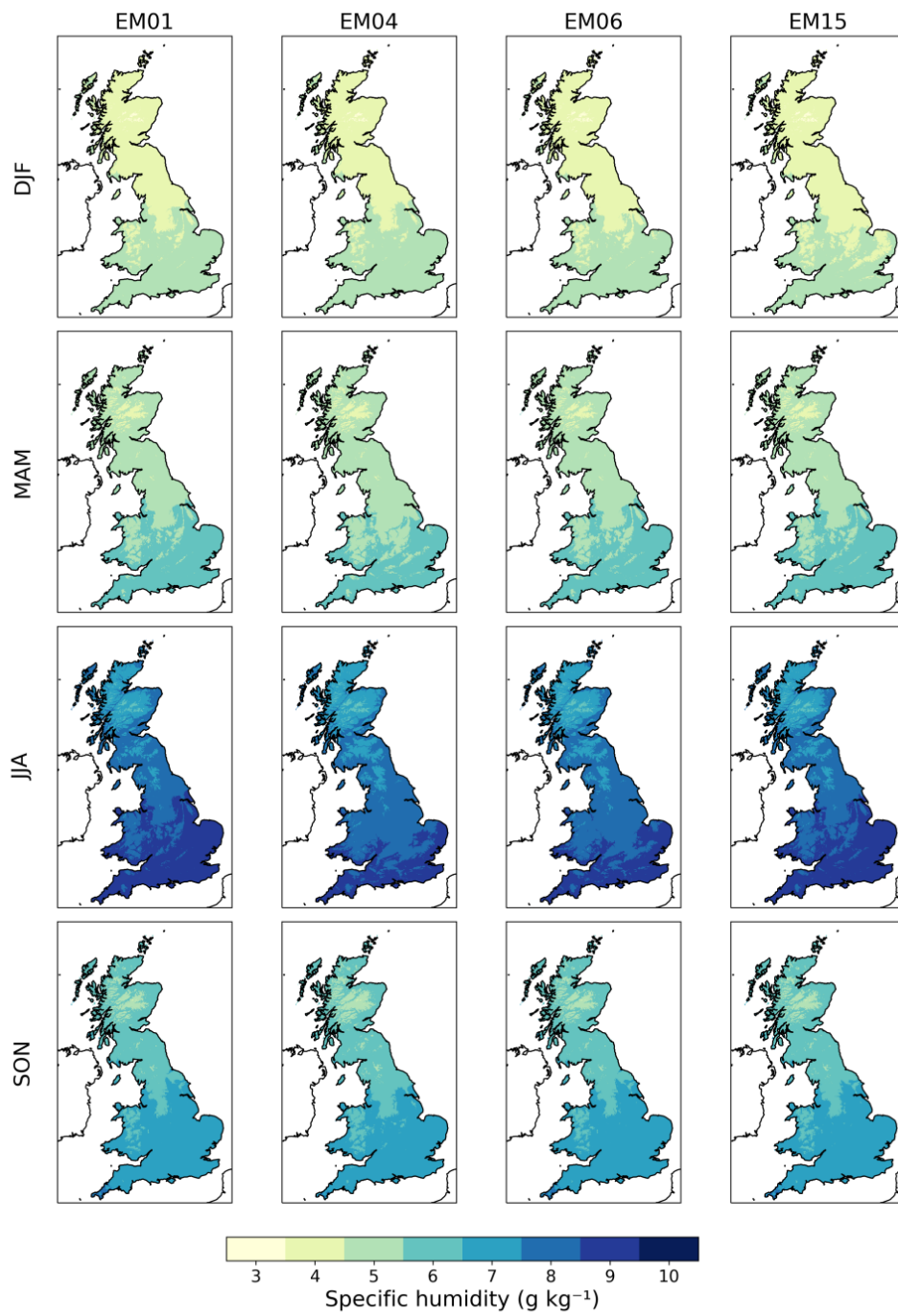
Figure S23: Seasonal mean bias-corrected specific humidity 1980–2000.
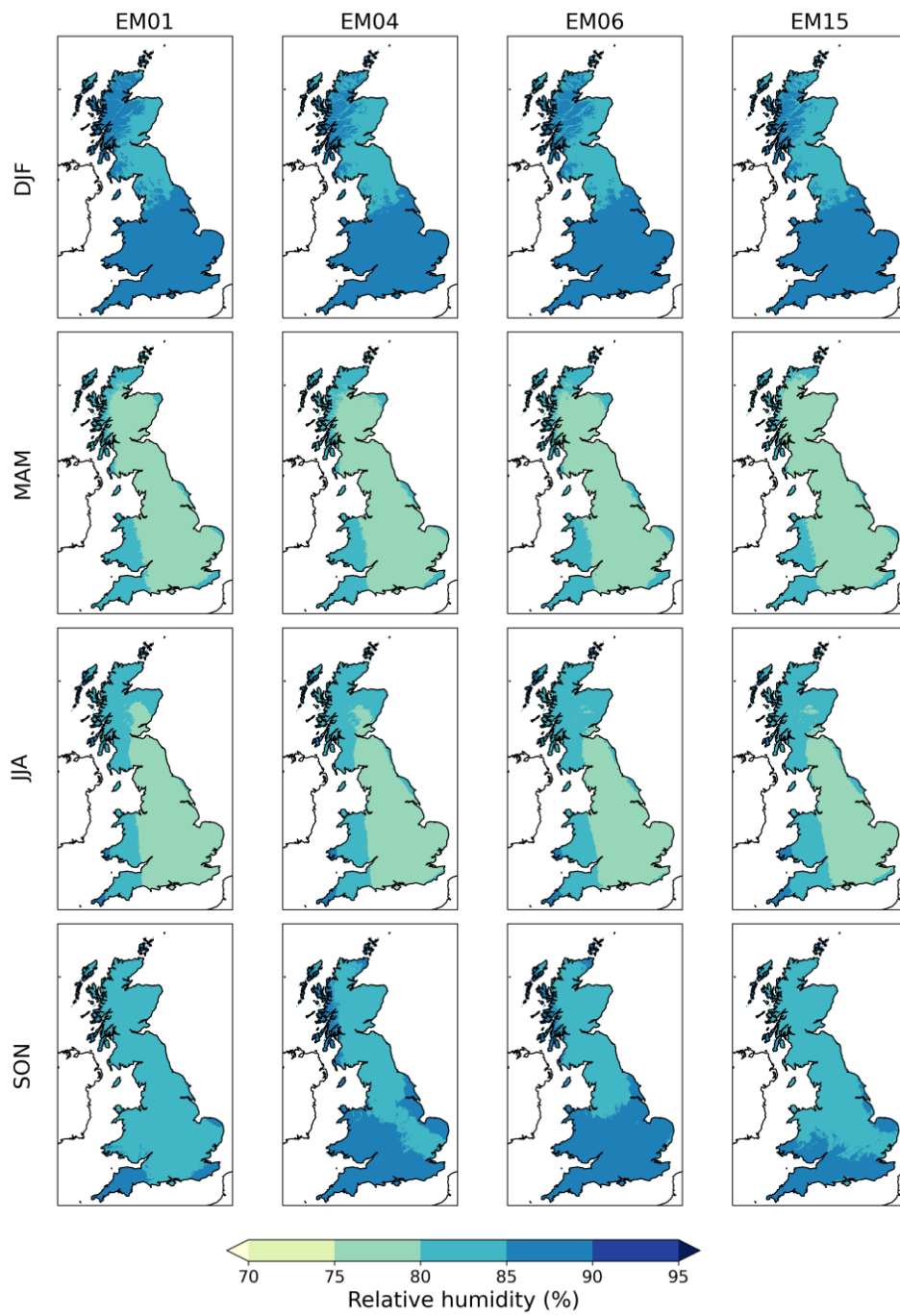
Figure S24: Seasonal mean bias-corrected relative humidity 1980–2000.
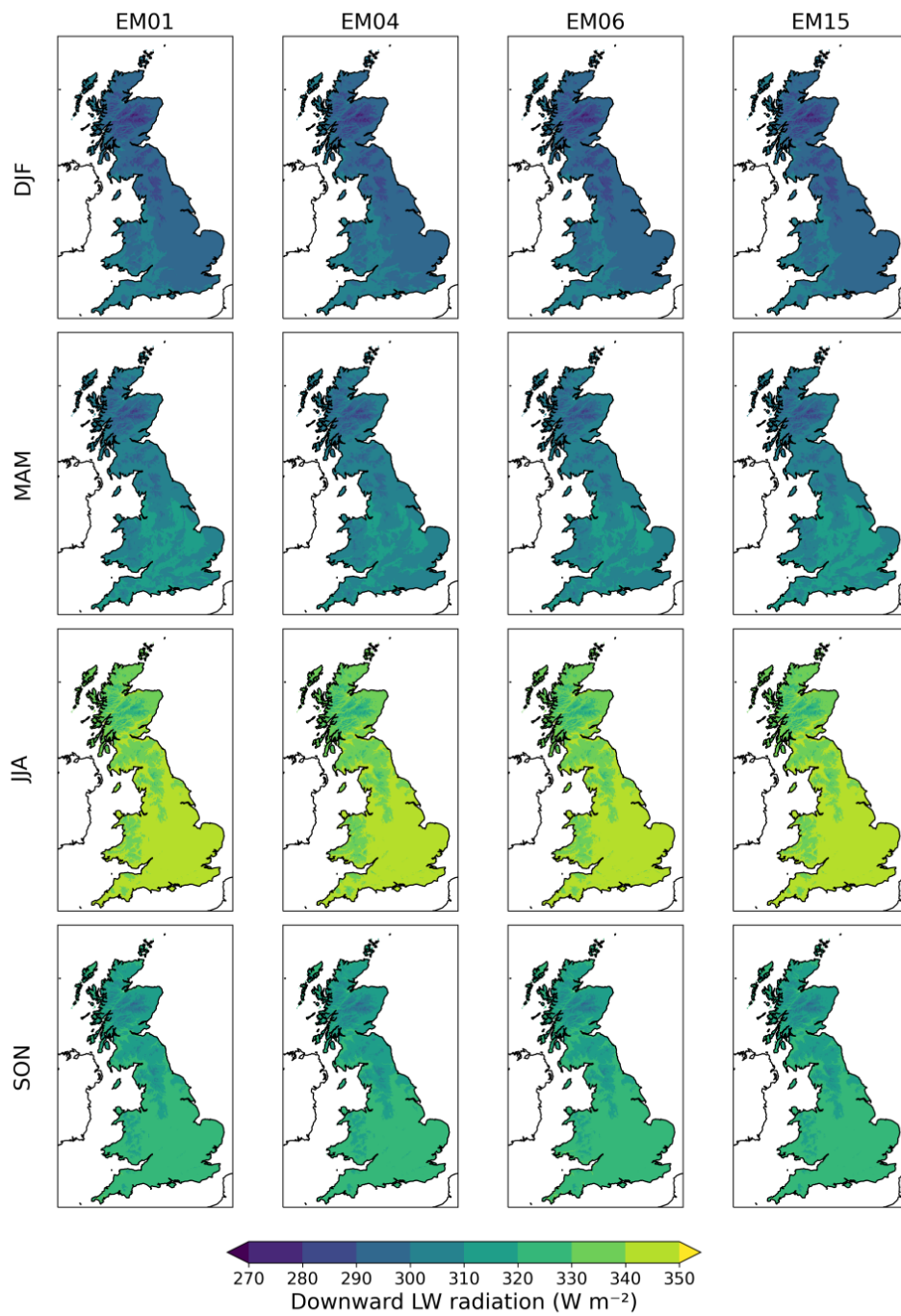
Figure S25: Seasonal mean bias-corrected downwelling LW radiation 1980–2000.
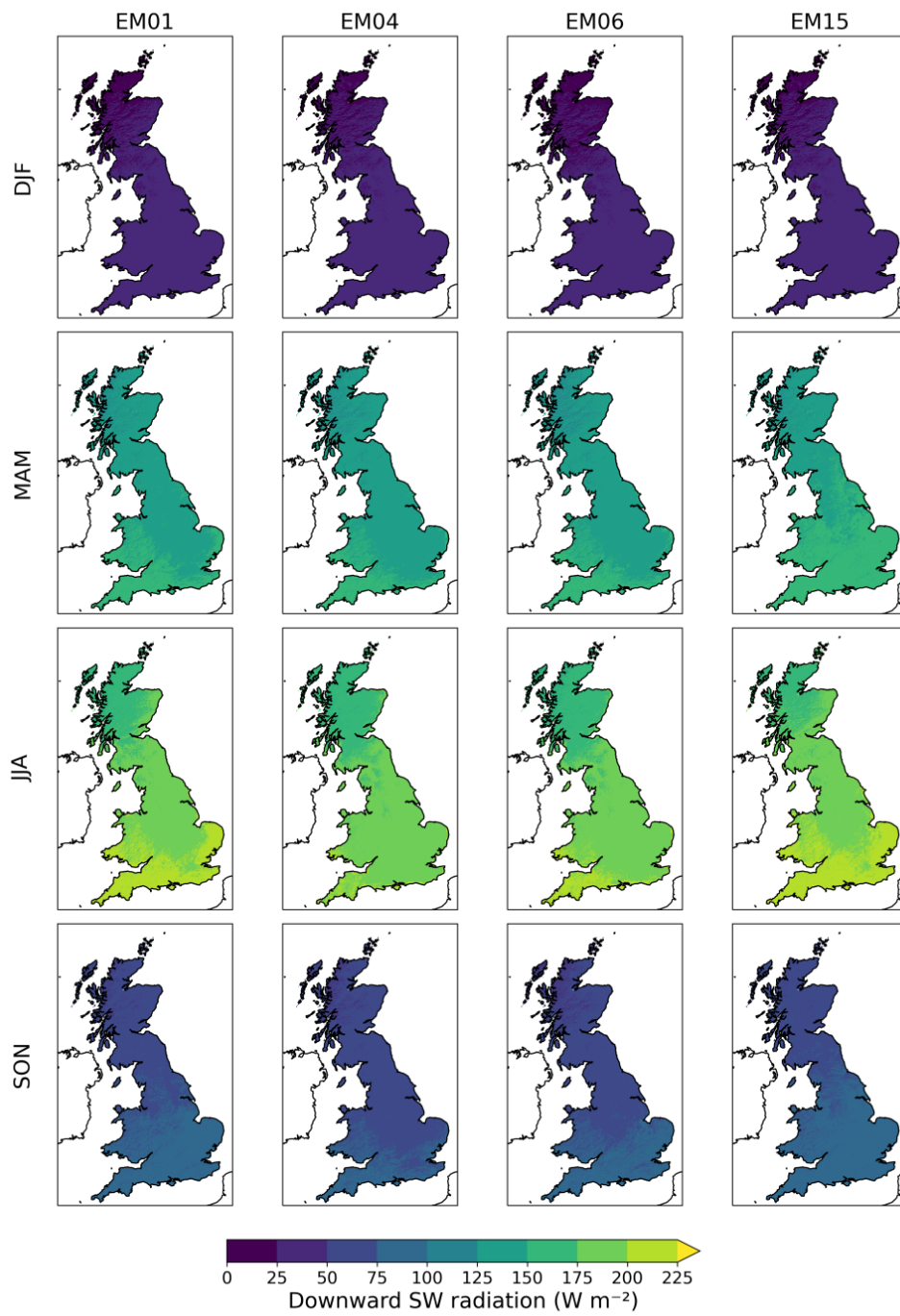
Figure S26: Seasonal mean bias-corrected downwelling SW radiation 1980–2000.
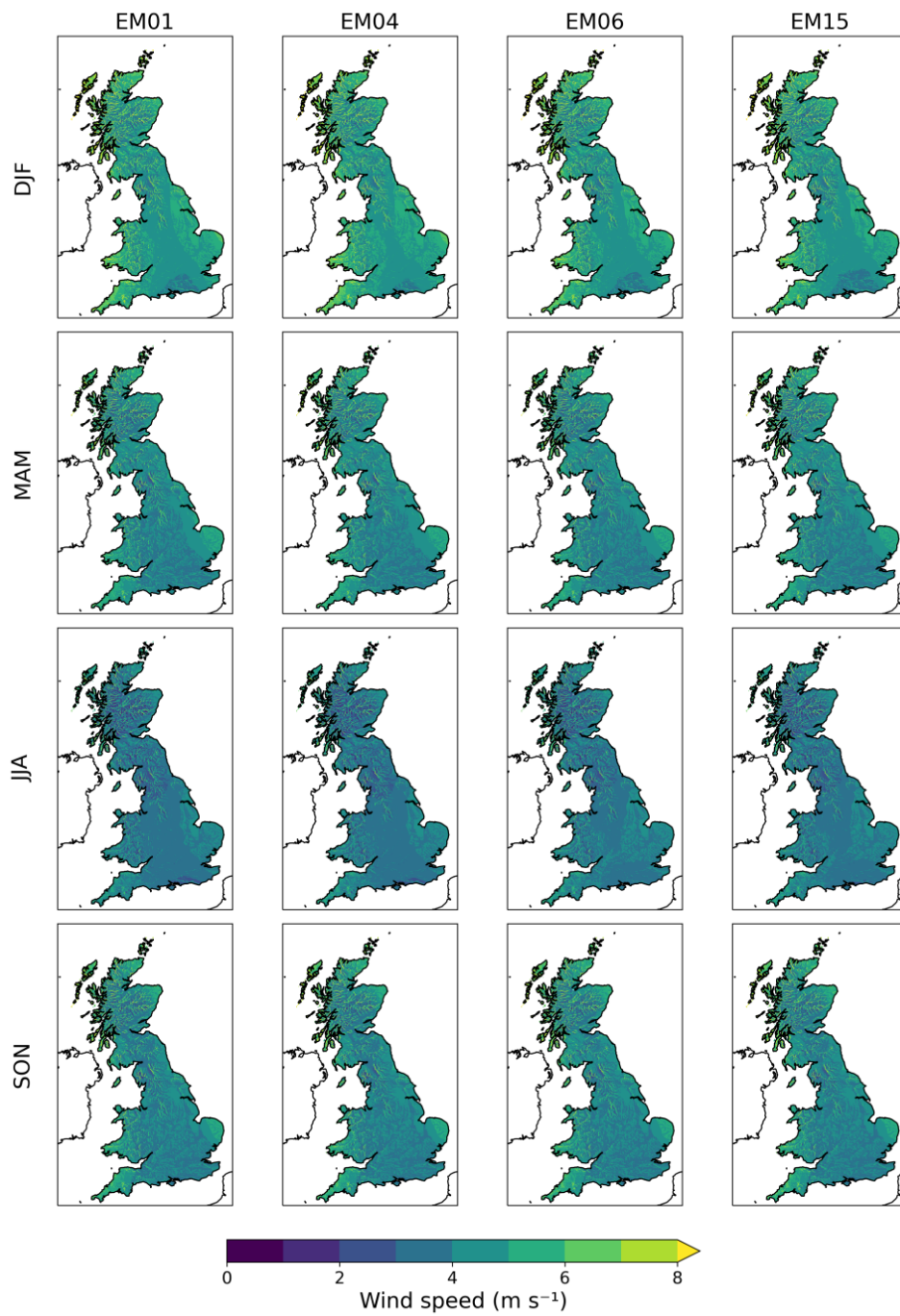
Figure S27: Seasonal mean bias-corrected wind speed 1980–2000.
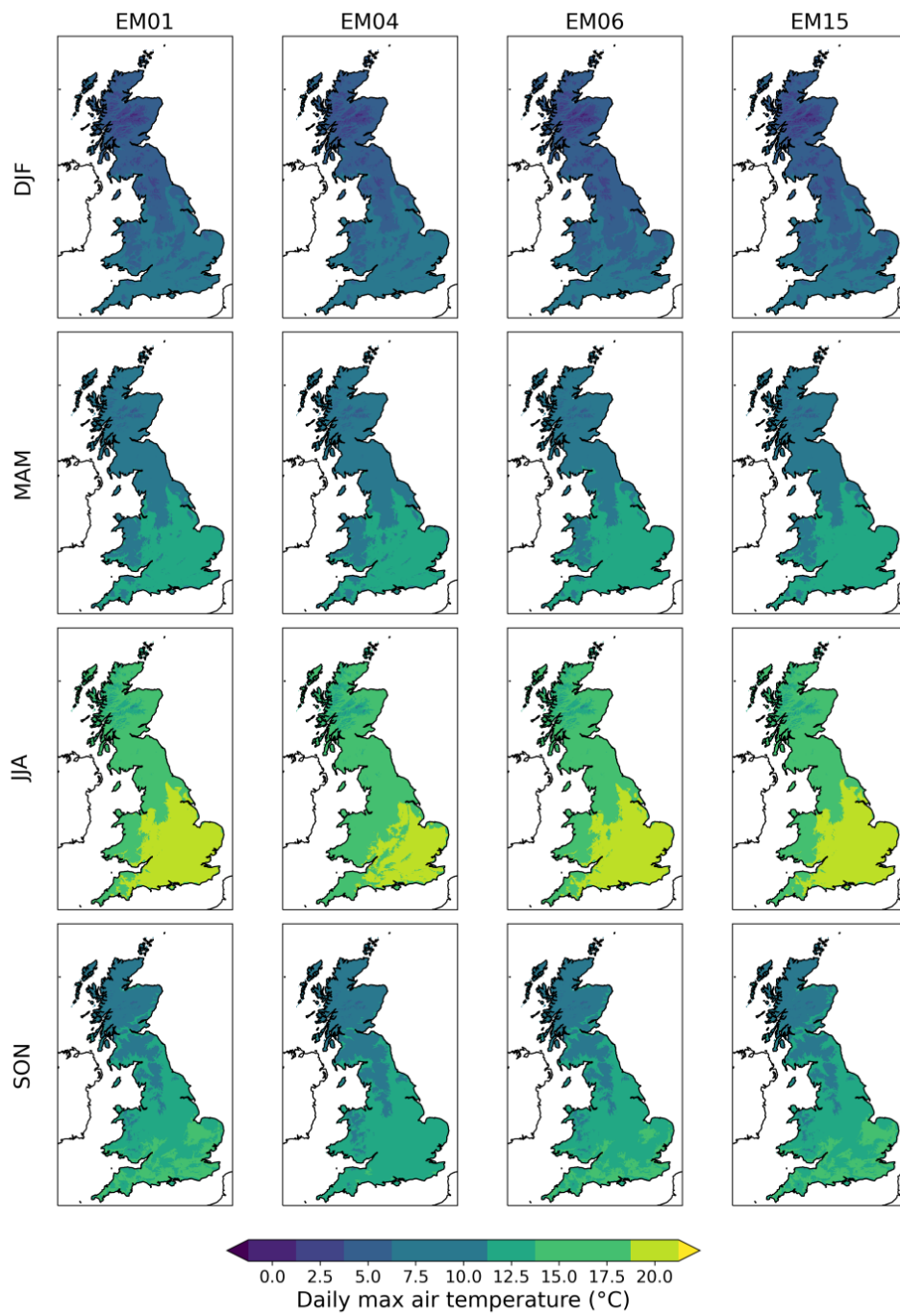
Figure S28: Seasonal mean bias-corrected daily maximum air temperature 1980–2000.
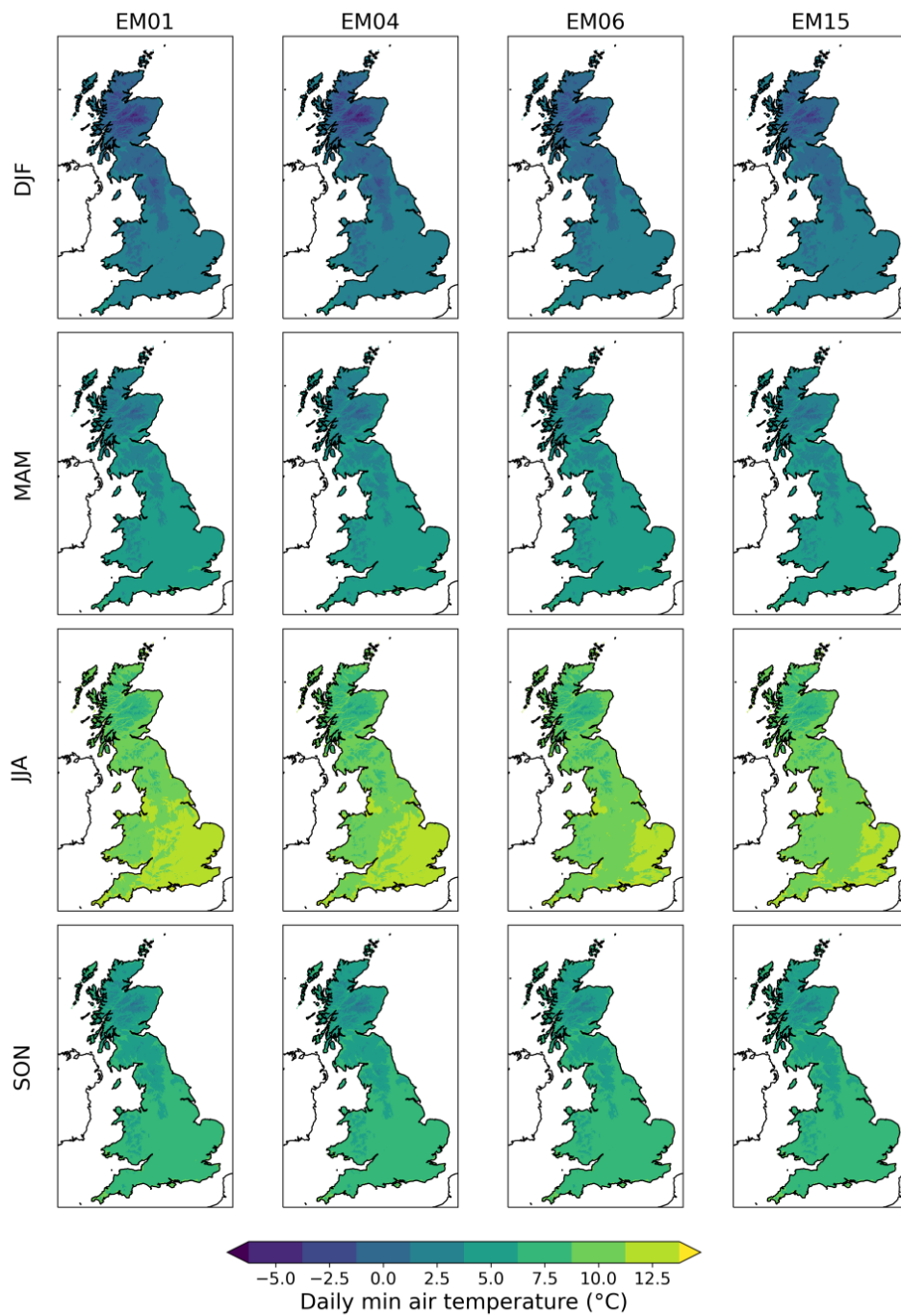
Figure S29: Seasonal mean bias-corrected daily minimum air temperature 1980–2000.

3.2 Downscaled-only
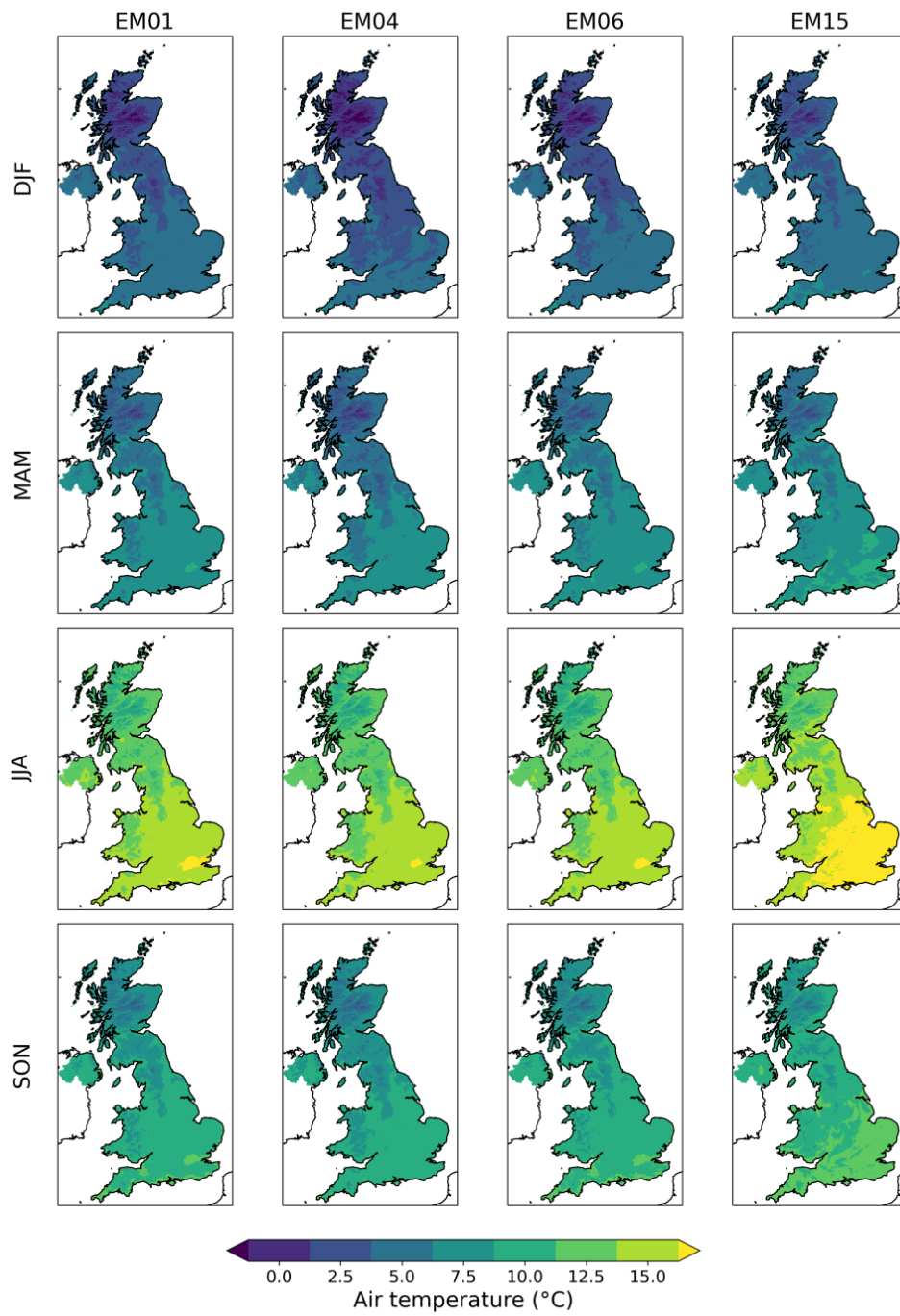
Figure S30: Seasonal mean downscaled-only air temperature 1980–2000.
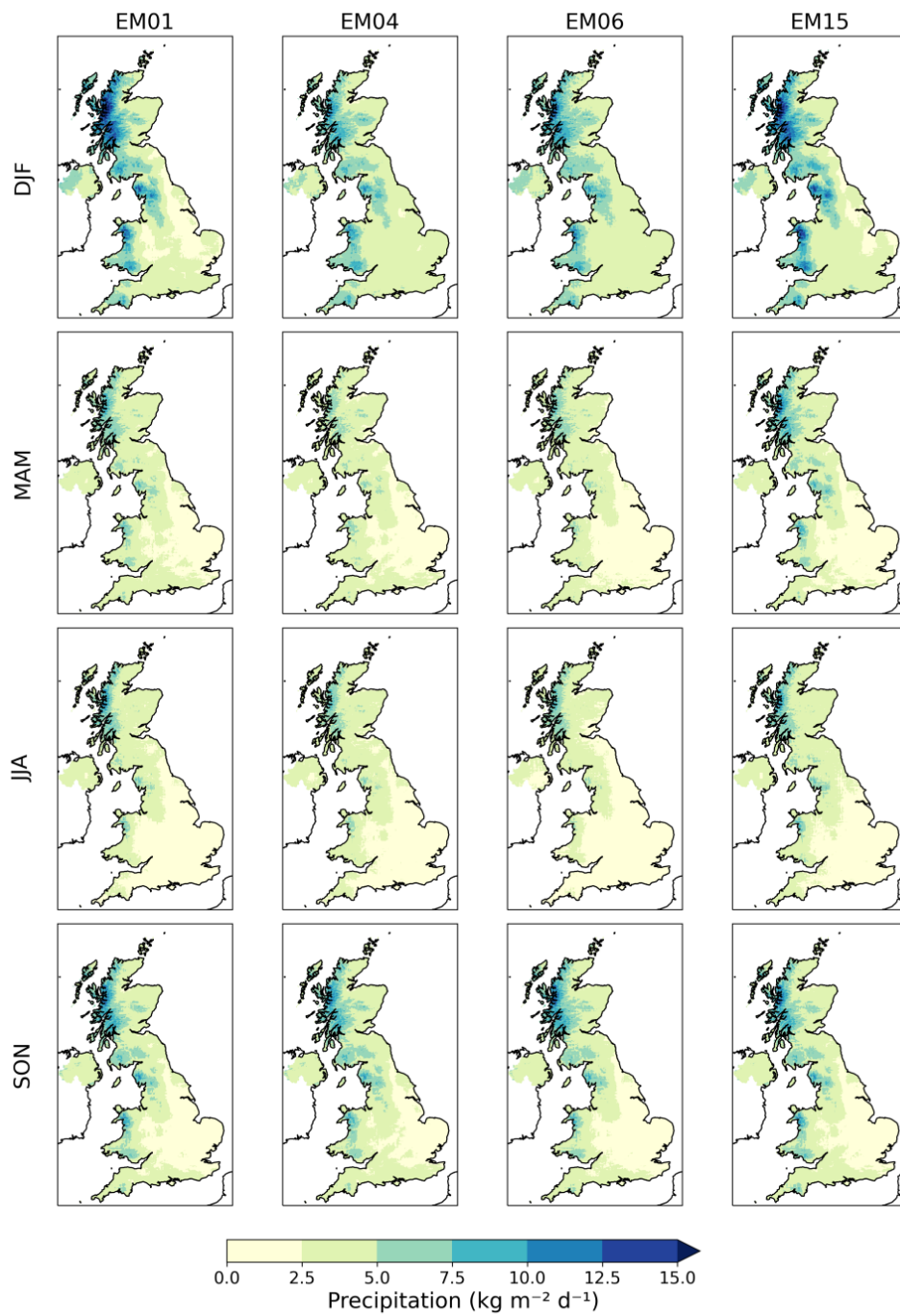
Figure S31: Seasonal mean downscaled-only precipitation 1980–2000.
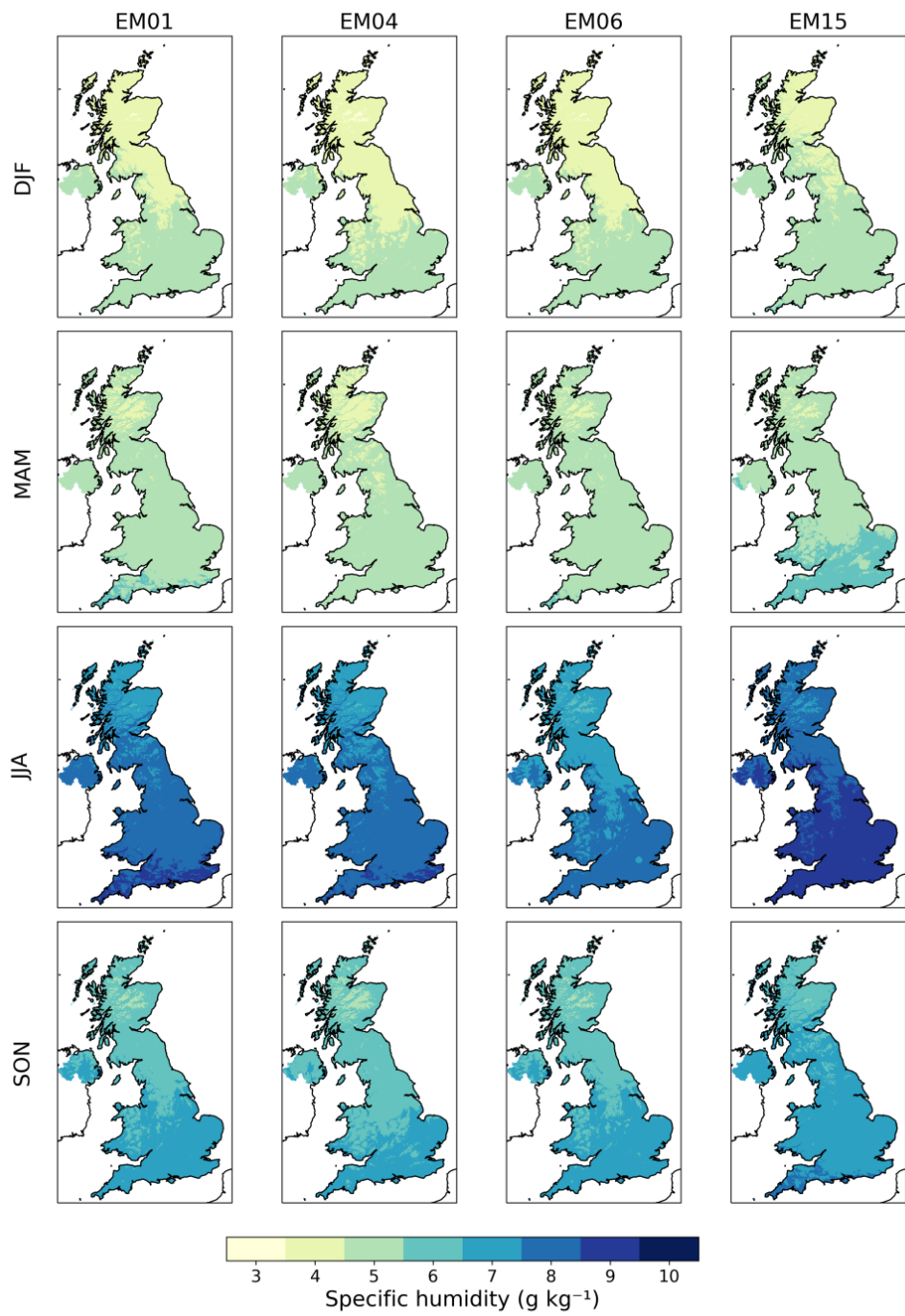
Figure S32: Seasonal mean downscaled-only specific humidity 1980–2000.
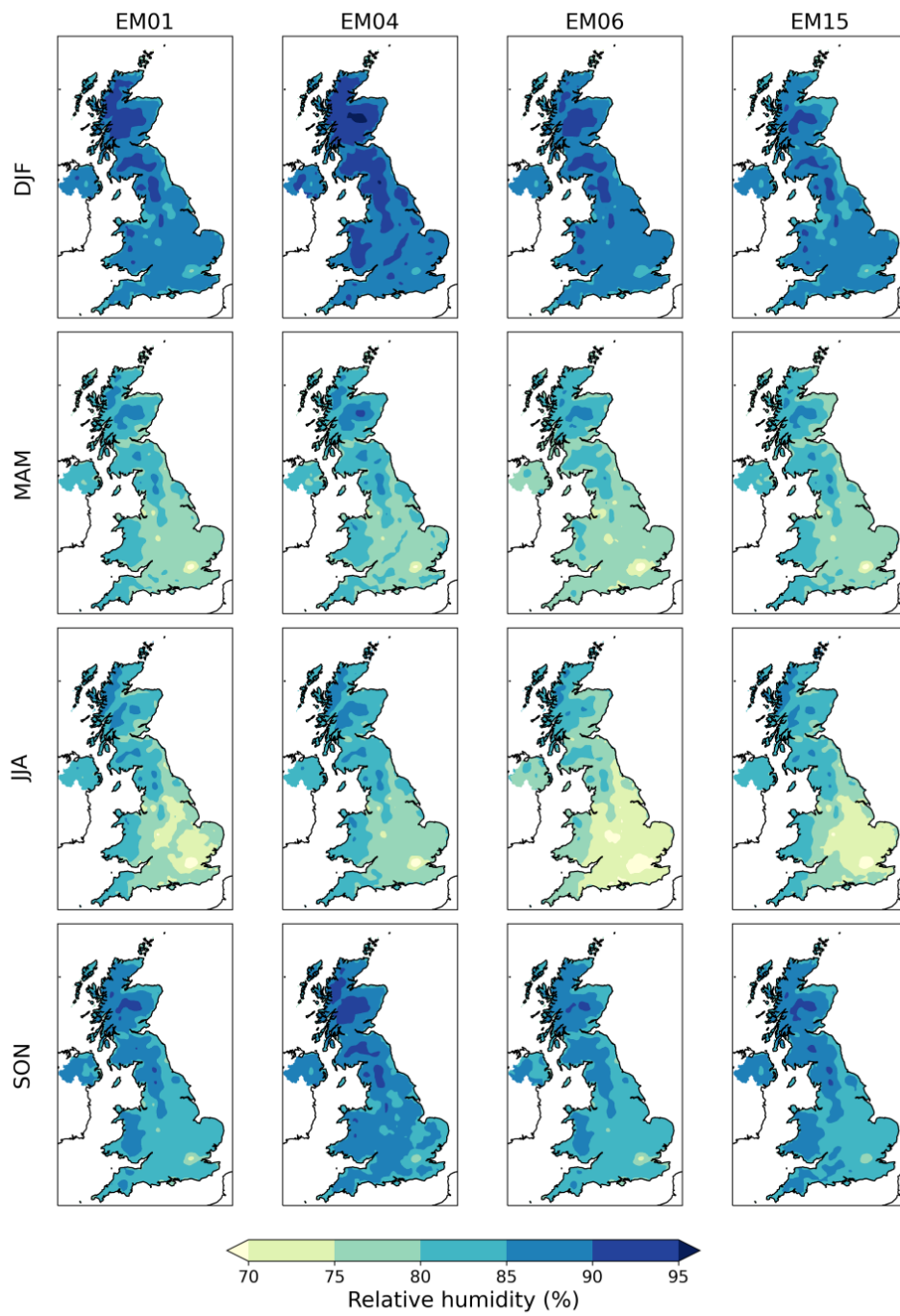
Figure S33: Seasonal mean downscaled-only relative humidity 1980–2000.
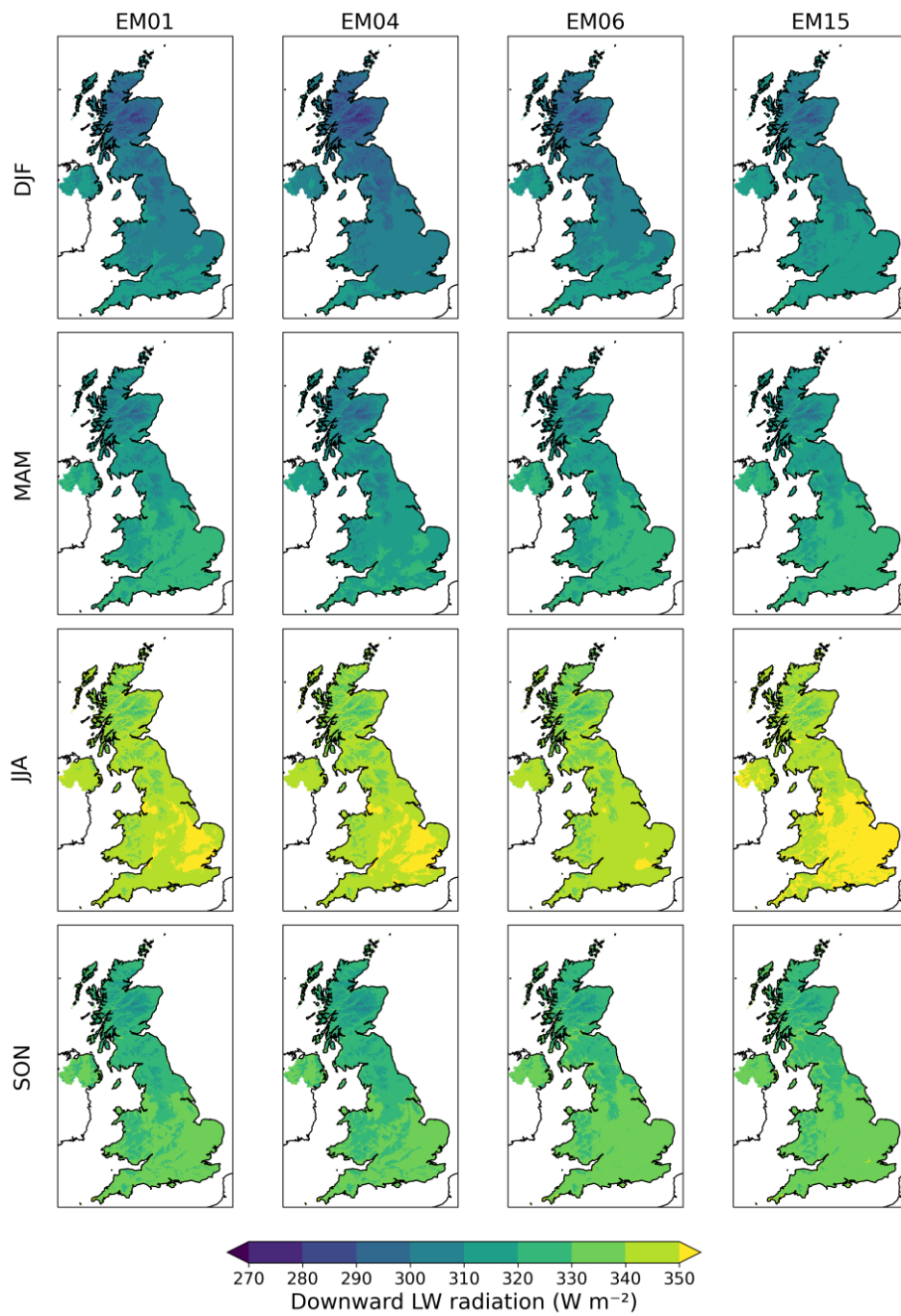
Figure S34: Seasonal mean downscaled-only downwelling LW radiation 1980–2000.
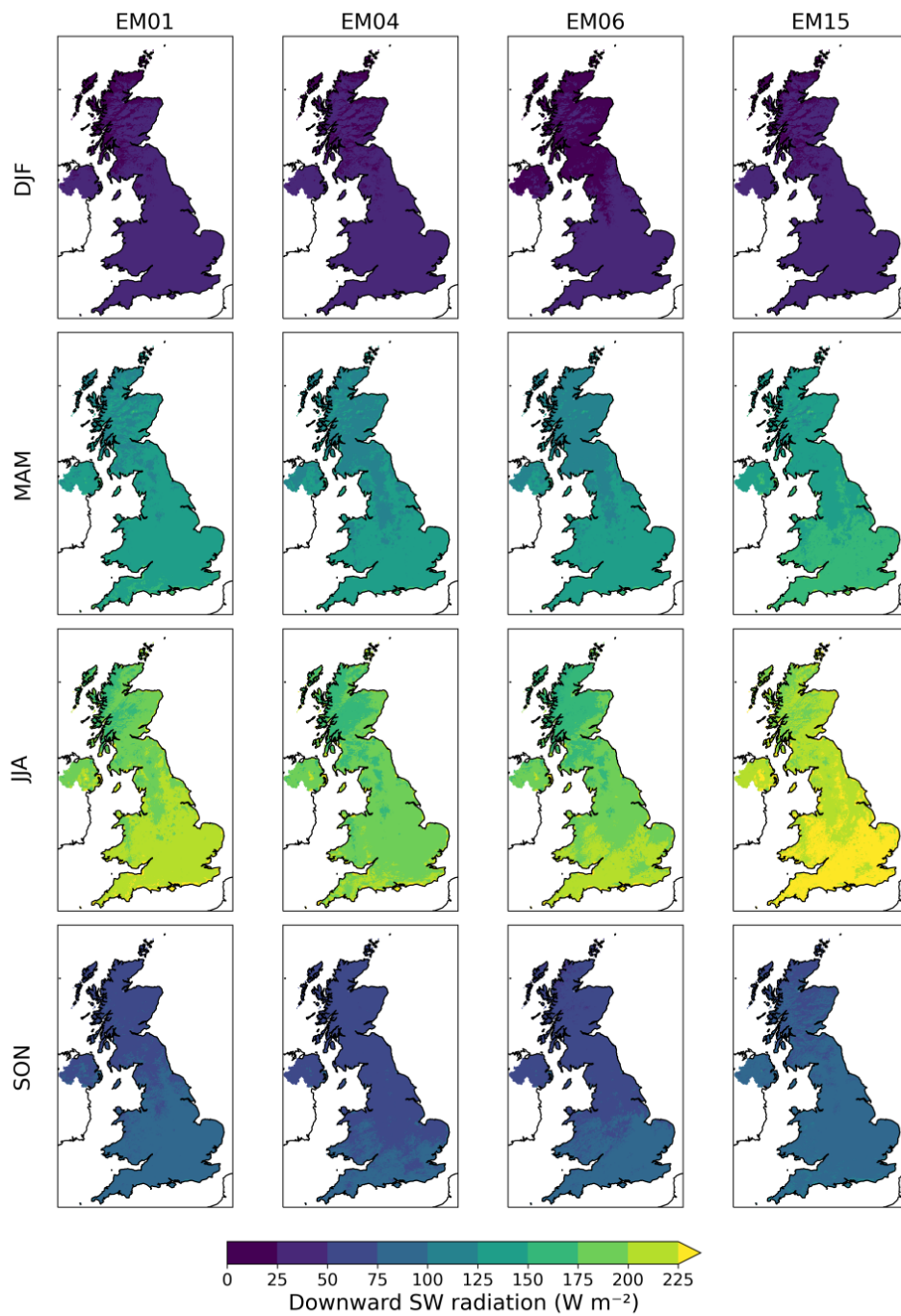
Figure S35: Seasonal mean downscaled-only downwelling SW radiation 1980–2000.
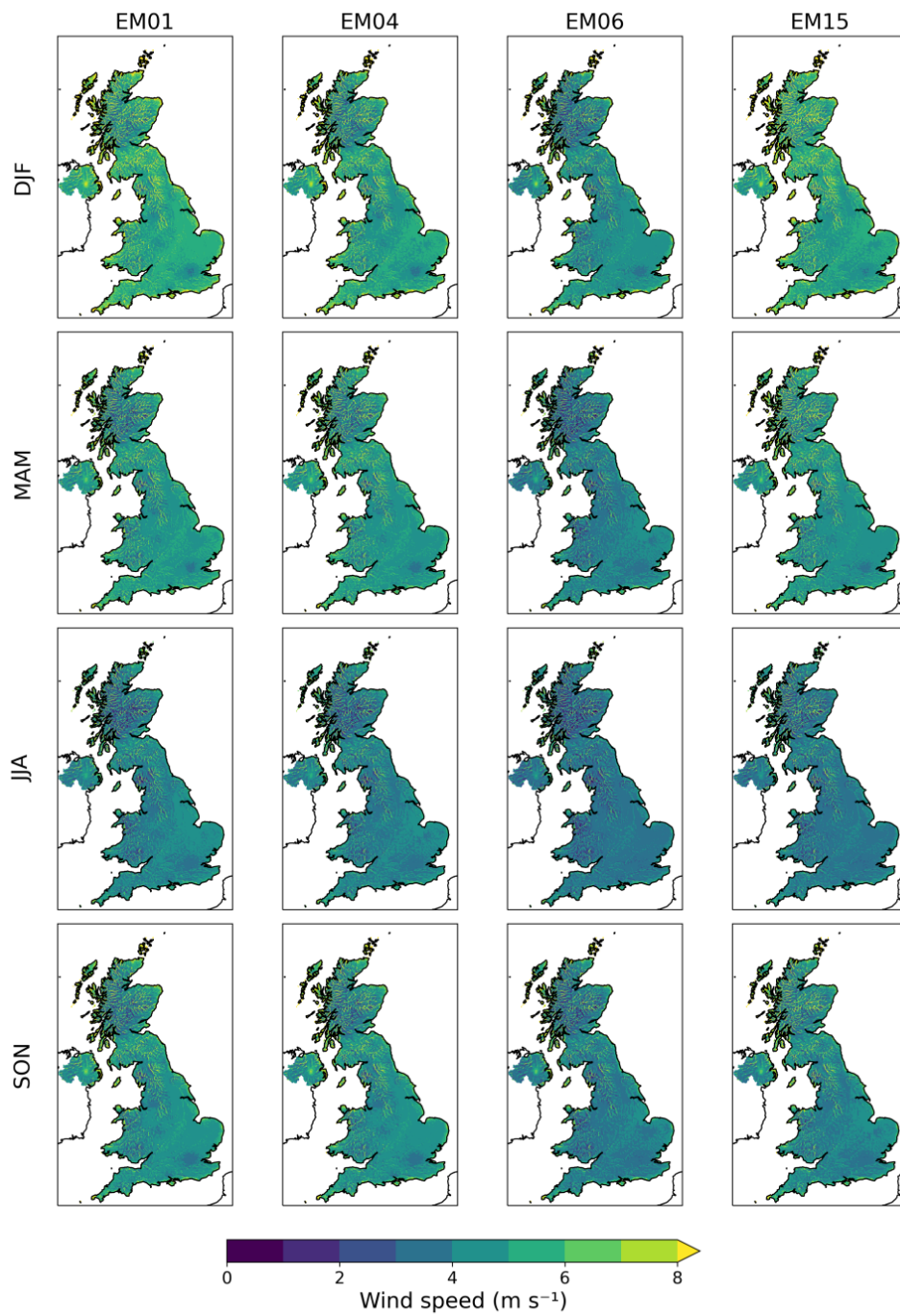
Figure S36: Seasonal mean downscaled-only wind speed 1980–2000.
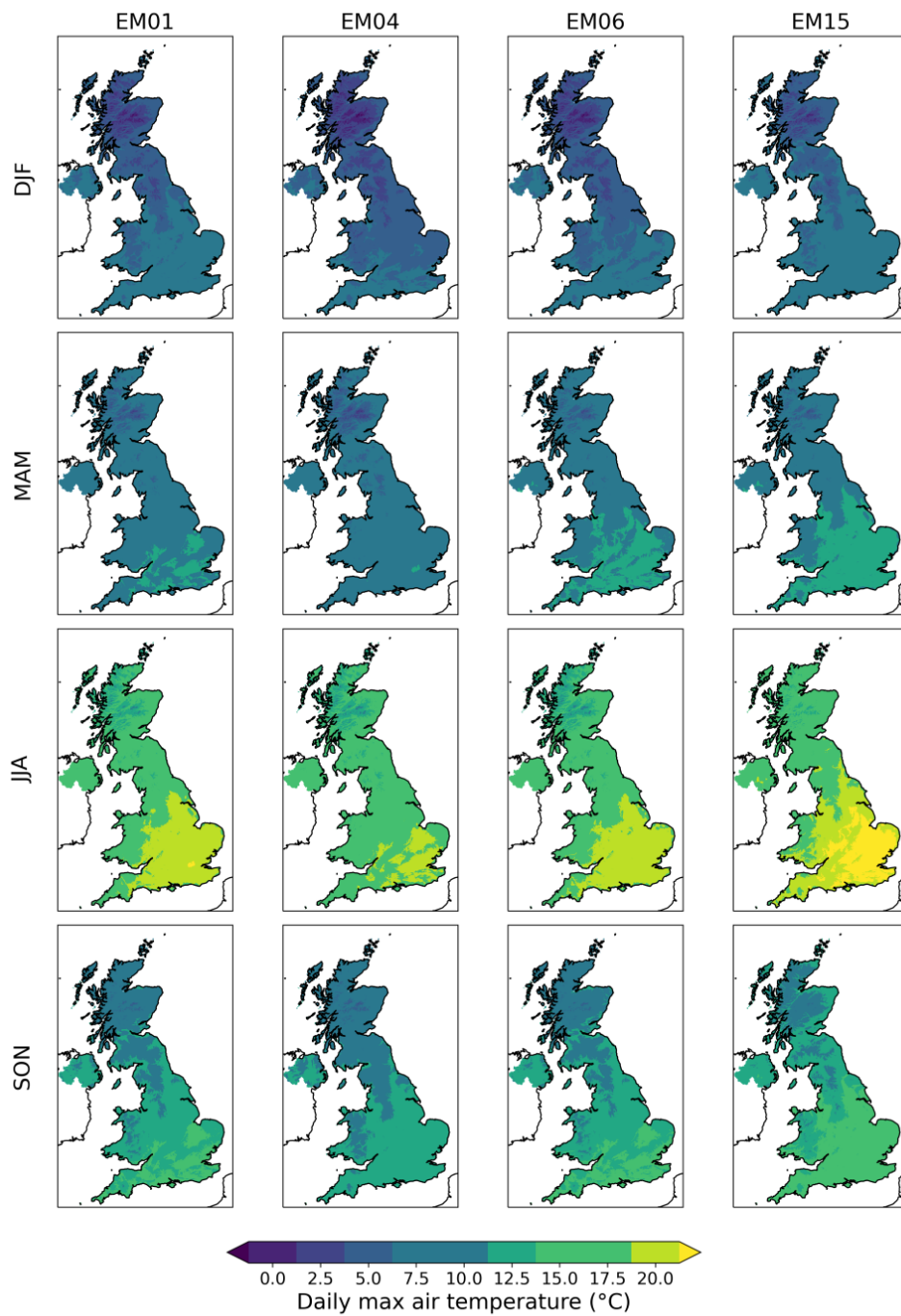
Figure S37: Seasonal mean downscaled-only daily maximum air temperature 1980–2000.
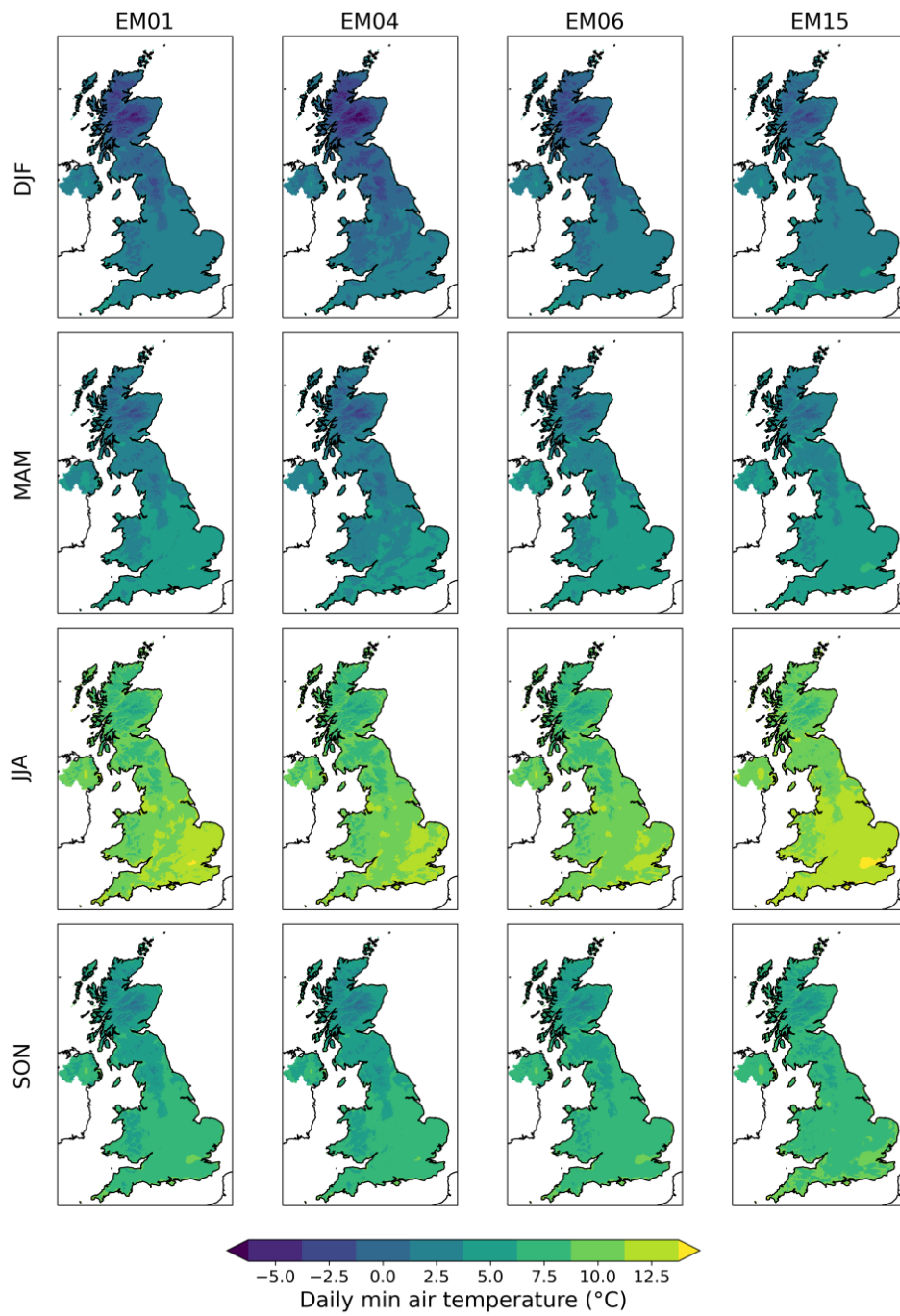
Figure S38: Seasonal mean downscaled-only daily minimum air temperature 1980–2000.
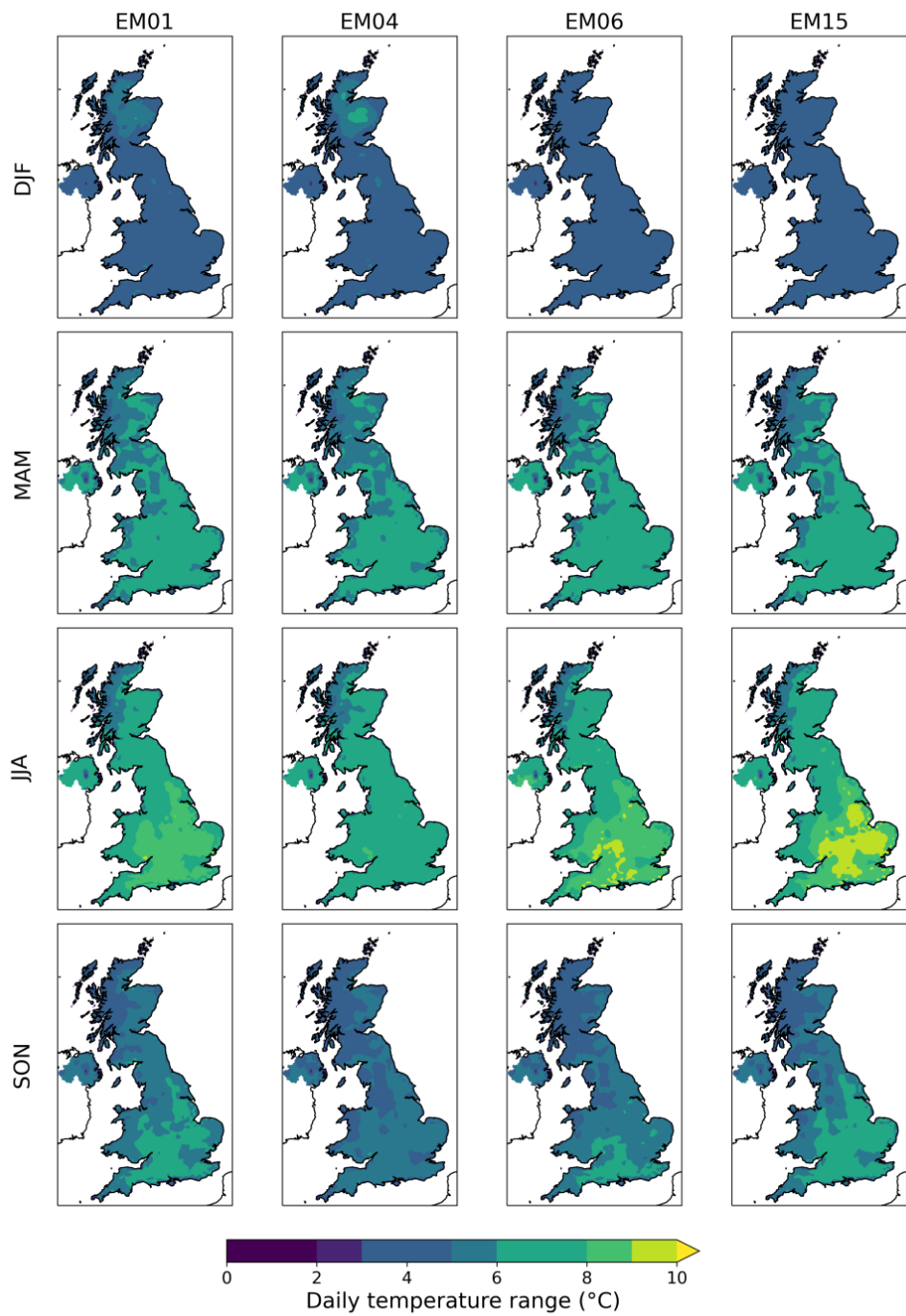
Figure S39: Seasonal mean downscaled-only daily air temperature range 1980–2000.
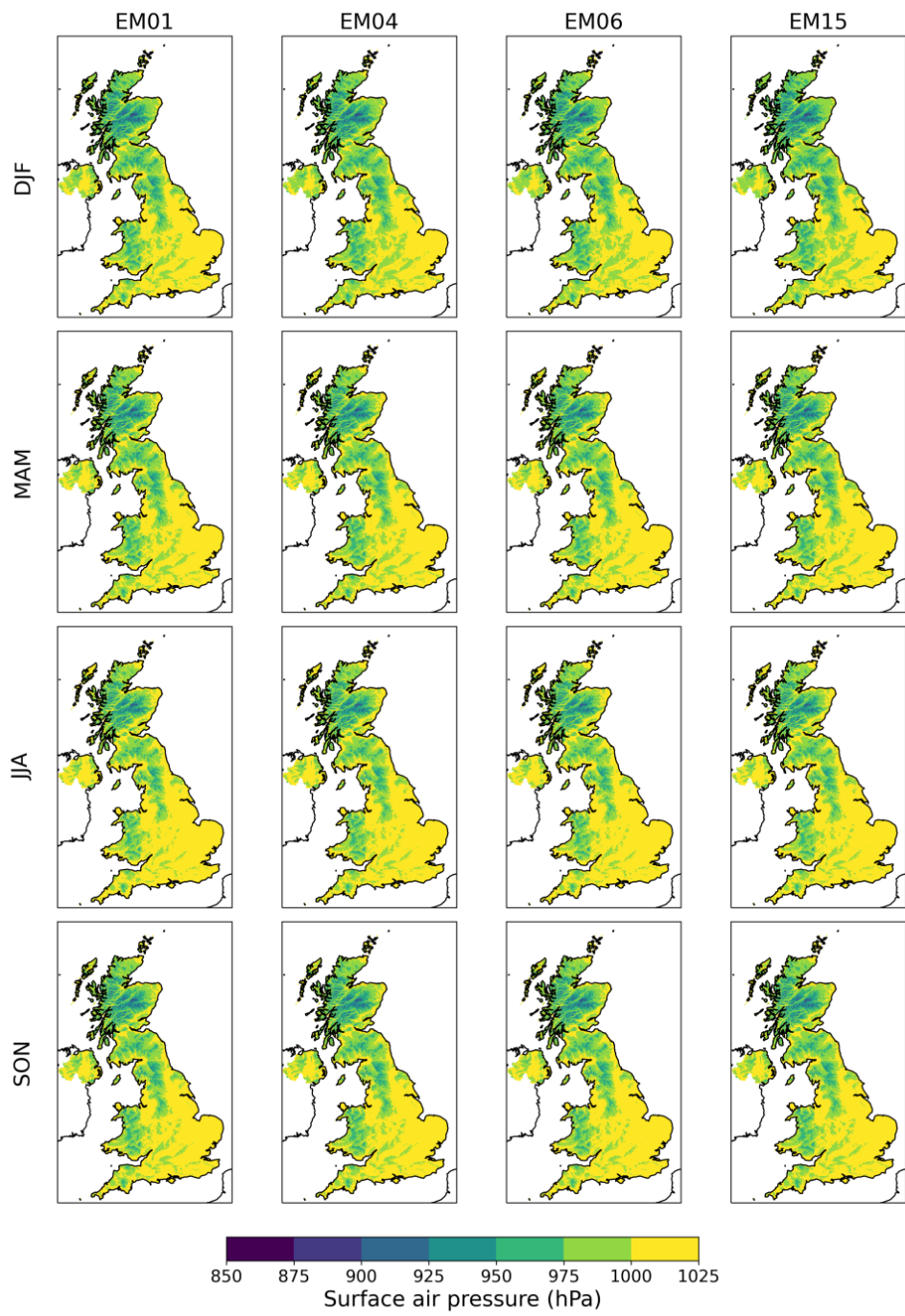
Figure S40: Seasonal mean downscaled-only surface air pressure 1980–2000.

4 Climate change 2060–2080

The UK mean 2060–2080 anomalies of air temperature and precipitation are given in Tables 6 and 7 of the manuscript. Here we present the other variables in Tables S1 to S9. Maps of the RCP8.5 2060–2080 anomalies of the downscaled-only air temperature and precipitation, with respect to the 1980–2000 baseline are shown in Figs. 11 and 12 of the manuscript. We show the anomalies of the air temperature and precipitation for the other RCPs in Figs. S41 to S46 and for all the other variables for all RCPs in Figs. S47 to S78.

Table S1: 2060–2080 specific humidity anomaly with respect to the baseline period 1980–2000 for each CHESS-SCAPE ensemble member and scenario for the downscaled-only data (averaged over the whole UK) and the downscaled and bias-corrected data (averaged over GB only).

Ensemble member	RCP	Specific humidity anomaly (g kg^{-1})					Bias-corrected Specific humidity anomaly (g kg^{-1})				
		Annual	DJF	MAM	JJA	SON	Annual	DJF	MAM	JJA	SON
01	2.6	0.7	0.4	0.5	1.0	0.9	0.7	0.4	0.5	1.0	0.9
01	4.5	0.9	0.5	0.5	1.2	1.4	0.9	0.5	0.5	1.2	1.4
01	6.0	1.0	0.6	0.5	1.2	1.5	1.0	0.6	0.5	1.2	1.5
01	8.5	1.4	0.8	0.6	1.9	2.0	1.4	0.8	0.6	1.9	2.0
04	2.6	0.8	0.4	0.5	1.1	1.0	0.8	0.4	0.5	1.1	1.0
04	4.5	1.3	0.8	0.9	1.6	1.8	1.3	0.8	0.9	1.6	1.8
04	6.0	1.4	0.9	1.0	1.8	2.0	1.4	0.9	1.0	1.8	2.0
04	8.5	1.8	1.1	1.3	2.4	2.4	1.8	1.1	1.3	2.4	2.4
06	2.6	0.6	0.6	0.4	0.8	0.7	0.6	0.6	0.4	0.8	0.7
06	4.5	0.9	0.8	0.5	1.2	1.1	0.9	0.8	0.5	1.2	1.1
06	6.0	0.9	0.7	0.5	1.2	1.1	0.9	0.7	0.5	1.2	1.1
06	8.5	1.3	1.0	0.8	1.8	1.6	1.3	1.0	0.9	1.8	1.6
15	2.6	0.3	0.3	0.2	0.5	0.4	0.4	0.3	0.3	0.5	0.4
15	4.5	0.5	0.2	0.3	0.7	0.8	0.5	0.2	0.3	0.7	0.8
15	6.0	0.5	0.2	0.4	0.5	0.9	0.5	0.2	0.4	0.5	0.9
15	8.5	1.1	0.6	0.7	1.5	1.6	1.1	0.6	0.7	1.5	1.6

Table S2: 2060–2080 relative humidity anomaly with respect to the baseline period 1980–2000 for each CHESS-SCAPE ensemble member and scenario for the downscaled-only data (averaged over the whole UK) and the downscaled and bias-corrected data (averaged over GB only). Note that this is the absolute anomaly in the percentage relative humidity, not the relative anomaly.

Ensemble member	RCP	Relative humidity anomaly (%)					Bias-corrected Relative humidity anomaly (%)				
		Annual	DJF	MAM	JJA	SON	Annual	DJF	MAM	JJA	SON
01	2.6	-1.0	-0.3	-1.3	-1.8	-0.6	-1.1	-0.1	-1.6	-2.1	-0.7
01	4.5	-1.2	-0.5	-2.0	-2.2	0.1	-1.3	-0.3	-2.4	-2.5	-0.1
01	6.0	-1.1	-0.2	-2.4	-2.4	0.4	-1.3	0.0	-2.7	-2.7	0.2
01	8.5	-2.1	-0.9	-2.3	-4.3	-1.0	-2.4	-0.6	-2.8	-4.8	-1.3
04	2.6	-0.6	0.1	-0.9	-1.6	0.0	-0.8	0.1	-1.5	-1.7	-0.2
04	4.5	-0.9	-0.5	-0.4	-2.2	-0.5	-1.3	-0.6	-1.4	-2.4	-0.8
04	6.0	-1.1	-0.5	-0.6	-2.4	-0.7	-1.5	-0.7	-1.6	-2.6	-1.0
04	8.5	-1.4	-0.7	-0.5	-3.3	-0.9	-1.9	-0.9	-1.8	-3.5	-1.3
06	2.6	-1.4	-1.2	-0.8	-2.6	-1.2	-1.8	-1.1	-1.2	-3.4	-1.4
06	4.5	-1.4	-0.9	-0.9	-3.0	-0.9	-1.8	-0.8	-1.4	-4.1	-1.1
06	6.0	-1.6	-0.7	-0.8	-3.8	-1.2	-2.1	-0.6	-1.3	-5.0	-1.4
06	8.5	-2.5	-0.9	-1.3	-5.9	-1.9	-3.1	-0.7	-2.0	-7.6	-2.2
15	2.6	-0.8	0.1	-0.7	-2.1	-0.4	-0.6	0.5	-0.8	-2.1	-0.1
15	4.5	-1.4	-0.4	-0.6	-3.5	-1.1	-1.2	-0.1	-0.6	-3.5	-0.5
15	6.0	-1.5	-0.7	-0.7	-3.8	-0.7	-1.2	-0.4	-0.7	-3.8	0.0
15	8.5	-2.1	-0.1	-1.5	-5.0	-1.7	-1.6	0.6	-1.6	-4.8	-0.7

Table S3: 2060–2080 downwelling longwave radiation anomaly with respect to the baseline period 1980–2000 for each CHESS-SCAPE ensemble member and scenario for the downscaled-only data (averaged over the whole UK) and the downscaled and bias-corrected data (averaged over GB only).

Ensemble member	RCP	Downwelling LW anomaly (W m^{-2})					Bias-corrected Downwelling LW anomaly (W m^{-2})				
		Annual	DJF	MAM	JJA	SON	Annual	DJF	MAM	JJA	SON
01	2.6	7	6	7	8	8	8	6	7	8	9
01	4.5	9	7	7	9	12	10	8	8	10	13
01	6.0	9	8	7	9	13	10	8	8	10	14
01	8.5	12	12	8	14	16	14	13	9	15	18
04	2.6	7	5	7	8	8	8	6	8	9	9
04	4.5	12	10	10	11	15	13	11	12	12	16
04	6.0	13	12	12	12	16	14	13	13	13	18
04	8.5	16	15	15	17	19	18	16	17	18	21
06	2.6	6	9	5	5	5	7	10	6	5	6
06	4.5	9	12	7	8	7	9	13	8	8	8
06	6.0	8	10	7	8	8	9	11	8	8	9
06	8.5	12	14	11	12	13	14	15	12	13	15
15	2.6	3	3	2	4	3	3	4	2	4	4
15	4.5	4	2	3	5	7	5	3	4	6	8
15	6.0	5	3	4	4	8	5	4	4	5	9
15	8.5	10	7	8	11	14	11	8	9	13	16

Table S4: 2060–2080 downwelling shortwave radiation anomaly with respect to the baseline period 1980–2000 for each CHESS-SCAPE ensemble member and scenario for the downscaled-only data (averaged over the whole UK) and the downscaled and bias-corrected data (averaged over GB only).

Ensemble member	RCP	Downwelling SW anomaly (W m^{-2})					Bias-corrected Downwelling SW anomaly (W m^{-2})				
		Annual	DJF	MAM	JJA	SON	Annual	DJF	MAM	JJA	SON
01	2.6	12	3	14	22	10	13	3	14	23	10
01	4.5	14	3	16	26	10	14	3	16	28	10
01	6.0	15	4	20	26	10	15	4	20	28	10
01	8.5	18	3	17	36	15	18	3	17	38	15
04	2.6	13	4	15	26	9	14	4	15	26	9
04	4.5	17	4	19	31	15	18	4	19	32	15
04	6.0	18	4	20	32	15	18	4	20	33	15
04	8.5	20	4	23	37	17	20	4	22	38	17
06	2.6	14	3	10	30	12	14	3	10	31	12
06	4.5	16	4	14	34	12	16	4	15	35	12
06	6.0	16	4	12	36	13	17	4	12	37	13
06	8.5	21	5	17	48	14	21	5	18	49	14
15	2.6	9	2	13	18	4	10	2	13	21	4
15	4.5	11	2	14	23	6	12	2	14	27	6
15	6.0	12	2	15	25	6	13	2	15	28	6
15	8.5	14	3	18	28	9	16	3	18	31	9

Table S5: 2060–2080 wind speed anomaly with respect to the baseline period 1980–2000 for each CHESS-SCAPE ensemble member and scenario for the downscaled-only data (averaged over the whole UK) and the downscaled and bias-corrected data (averaged over GB only).

Ensemble member	RCP	Wind speed anomaly (m s^{-1})					Bias-corrected Wind speed anomaly (m s^{-1})				
		Annual	DJF	MAM	JJA	SON	Annual	DJF	MAM	JJA	SON
01	2.6	-0.2	-0.2	0.0	-0.2	-0.2	-0.1	-0.2	0.0	-0.2	-0.2
01	4.5	-0.2	-0.2	0.1	-0.3	-0.2	-0.1	-0.1	0.1	-0.3	-0.2
01	6.0	-0.3	-0.3	-0.1	-0.3	-0.4	-0.2	-0.3	-0.1	-0.2	-0.3
01	8.5	-0.2	0.0	0.0	-0.4	-0.4	-0.2	0.0	0.0	-0.3	-0.4
04	2.6	-0.1	-0.3	-0.1	0.0	0.1	-0.1	-0.3	-0.1	0.0	0.1
04	4.5	-0.2	0.0	-0.2	-0.2	-0.2	-0.2	0.0	-0.2	-0.2	-0.2
04	6.0	-0.1	0.0	-0.3	-0.2	-0.1	-0.1	0.0	-0.3	-0.2	-0.1
04	8.5	-0.1	0.2	-0.2	-0.2	-0.2	-0.1	0.2	-0.2	-0.2	-0.2
06	2.6	0.0	0.3	0.1	-0.2	-0.2	0.0	0.3	0.1	-0.2	-0.2
06	4.5	0.0	0.1	0.1	-0.2	-0.1	0.0	0.1	0.1	-0.2	-0.1
06	6.0	-0.1	0.0	0.1	-0.2	-0.2	-0.1	0.0	0.1	-0.2	-0.2
06	8.5	-0.1	0.1	0.1	-0.3	-0.2	-0.1	0.1	0.1	-0.3	-0.2
15	2.6	-0.1	0.0	-0.1	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	-0.1
15	4.5	0.0	0.0	-0.1	-0.2	0.1	0.0	0.0	0.0	-0.2	0.1
15	6.0	0.0	0.2	0.0	-0.2	-0.1	0.0	0.2	0.0	-0.2	-0.1
15	8.5	-0.1	0.0	-0.1	-0.3	-0.2	-0.1	0.0	-0.1	-0.3	-0.1

Table S6: 2060–2080 daily maximum air temperature anomaly with respect to the baseline period 1980–2000 for each CHESS-SCAPE ensemble member and scenario for the downscaled-only data (averaged over the whole UK) and the downscaled and bias-corrected data (averaged over GB only).

Ensemble member	RCP	Daily max. air temp. anomaly (K)					Bias-corrected Daily max. air temp. anomaly (K)				
		Annual	DJF	MAM	JJA	SON	Annual	DJF	MAM	JJA	SON
01	2.6	2.0	1.4	1.7	2.4	2.5	2.0	1.4	1.8	2.4	2.5
01	4.5	2.5	1.8	2.0	3.0	3.3	2.5	1.8	2.0	3.0	3.3
01	6.0	2.6	1.9	2.3	3.0	3.4	2.7	1.9	2.3	3.0	3.4
01	8.5	3.8	2.7	2.4	5.0	5.1	3.8	2.7	2.4	5.0	5.1
04	2.6	2.0	1.2	1.8	2.6	2.3	2.0	1.2	1.9	2.6	2.3
04	4.5	3.3	2.4	2.9	3.7	4.3	3.3	2.4	2.9	3.8	4.3
04	6.0	3.6	2.7	3.1	4.0	4.6	3.6	2.7	3.1	4.1	4.7
04	8.5	4.6	3.5	4.0	5.3	5.6	4.6	3.5	4.0	5.3	5.7
06	2.6	2.1	2.1	1.3	2.7	2.2	2.1	2.2	1.4	2.7	2.2
06	4.5	2.8	2.7	1.9	3.5	2.9	2.8	2.7	1.9	3.6	3.0
06	6.0	2.8	2.3	1.7	3.8	3.2	2.8	2.4	1.7	3.8	3.2
06	8.5	4.0	3.3	2.8	5.7	4.4	4.1	3.3	2.8	5.8	4.4
15	2.6	1.1	1.0	1.0	1.6	0.9	1.1	1.0	1.0	1.6	0.9
15	4.5	1.6	0.8	1.2	2.5	2.1	1.7	0.8	1.3	2.5	2.1
15	6.0	1.7	1.0	1.5	2.3	2.2	1.8	1.0	1.5	2.3	2.2
15	8.5	3.2	2.0	2.5	4.2	3.9	3.2	2.0	2.5	4.3	3.9

Table S7: 2060–2080 daily minimum air temperature anomaly with respect to the baseline period 1980–2000 for each CHESS-SCAPE ensemble member and scenario for the downscaled-only data (averaged over the whole UK) and the downscaled and bias-corrected data (averaged over GB only).

Ensemble member	RCP	Daily min. air temp. anomaly (K)					Bias-corrected Daily min. air temp. anomaly (K)				
		Annual	DJF	MAM	JJA	SON	Annual	DJF	MAM	JJA	SON
01	2.6	1.8	1.5	1.6	2.0	2.1	1.8	1.5	1.6	2.0	2.1
01	4.5	2.3	1.8	1.8	2.4	3.0	2.3	1.9	1.8	2.4	3.0
01	6.0	2.4	2.0	1.9	2.4	3.2	2.4	2.0	1.9	2.4	3.2
01	8.5	3.2	2.9	2.1	3.7	4.3	3.3	2.9	2.1	3.7	4.3
04	2.6	1.8	1.5	1.6	2.2	2.1	1.9	1.5	1.6	2.2	2.1
04	4.5	3.0	2.7	2.5	3.1	3.7	3.0	2.7	2.5	3.1	3.7
04	6.0	3.2	2.9	2.7	3.4	4.0	3.3	2.9	2.7	3.4	4.0
04	8.5	4.1	3.7	3.5	4.4	4.8	4.1	3.7	3.5	4.4	4.9
06	2.6	1.7	2.2	1.3	1.8	1.6	1.7	2.2	1.3	1.8	1.6
06	4.5	2.3	2.8	1.7	2.5	2.3	2.4	2.9	1.7	2.5	2.3
06	6.0	2.3	2.5	1.7	2.6	2.4	2.3	2.5	1.7	2.6	2.4
06	8.5	3.3	3.4	2.5	3.8	3.5	3.3	3.4	2.6	3.8	3.5
15	2.6	0.8	0.8	0.7	1.0	0.8	0.8	0.8	0.7	1.0	0.8
15	4.5	1.2	0.6	1.0	1.6	1.7	1.2	0.6	1.0	1.6	1.7
15	6.0	1.3	0.9	1.1	1.3	1.8	1.3	0.9	1.1	1.4	1.8
15	8.5	2.6	1.9	2.0	3.0	3.4	2.6	1.9	2.0	3.1	3.4

Table S8: 2060–2080 daily temperature range anomaly with respect to the baseline period 1980–2000 for each CHESS-SCAPE ensemble member and scenario for the downscaled-only data (averaged over the whole UK).

Ensemble member	RCP	Daily temperature range anomaly (K)				
		Annual	DJF	MAM	JJA	SON
01	2.6	0.2	-0.1	0.2	0.4	0.3
01	4.5	0.3	0.0	0.3	0.6	0.2
01	6.0	0.3	-0.1	0.4	0.6	0.3
01	8.5	0.6	-0.2	0.3	1.3	0.9
04	2.6	0.1	-0.3	0.2	0.4	0.2
04	4.5	0.3	-0.3	0.4	0.6	0.6
04	6.0	0.4	-0.2	0.4	0.7	0.7
04	8.5	0.5	-0.2	0.5	0.9	0.8
06	2.6	0.4	0.0	0.1	0.9	0.6
06	4.5	0.4	-0.1	0.2	1.0	0.6
06	6.0	0.5	-0.1	0.1	1.2	0.7
06	8.5	0.7	-0.1	0.3	1.9	0.9
15	2.6	0.3	0.2	0.3	0.6	0.1
15	4.5	0.4	0.1	0.3	0.9	0.4
15	6.0	0.5	0.2	0.3	0.9	0.4
15	8.5	0.6	0.1	0.5	1.2	0.5

Table S9: 2060–2080 surface air pressure anomaly with respect to the baseline period 1980–2000 for each CHESS-SCAPE ensemble member and scenario for the downscaled-only data (averaged over the whole UK).

Ensemble member	RCP	Air pressure anomaly (hPa)				
		Annual	DJF	MAM	JJA	SON
01	2.6	0.7	0.4	0.6	-0.1	1.8
01	4.5	0.7	-0.3	1.6	0.7	1.0
01	6.0	1.2	0.7	3.3	0.0	0.8
01	8.5	1.7	1.5	1.1	1.4	2.8
04	2.6	0.0	1.4	0.0	0.5	-1.8
04	4.5	0.8	0.5	0.6	1.1	0.8
04	6.0	0.8	0.4	1.5	1.0	0.3
04	8.5	1.0	-0.5	1.8	1.5	1.1
06	2.6	1.1	1.4	0.6	1.3	1.0
06	4.5	0.4	0.5	0.6	0.9	-0.6
06	6.0	0.8	0.5	0.9	1.4	0.5
06	8.5	1.7	1.5	1.6	2.4	1.3
15	2.6	0.0	-1.7	0.4	1.3	-0.2
15	4.5	0.8	-0.3	1.3	1.8	0.3
15	6.0	0.8	0.2	0.9	2.2	0.2
15	8.5	1.0	-0.6	1.2	2.0	1.2
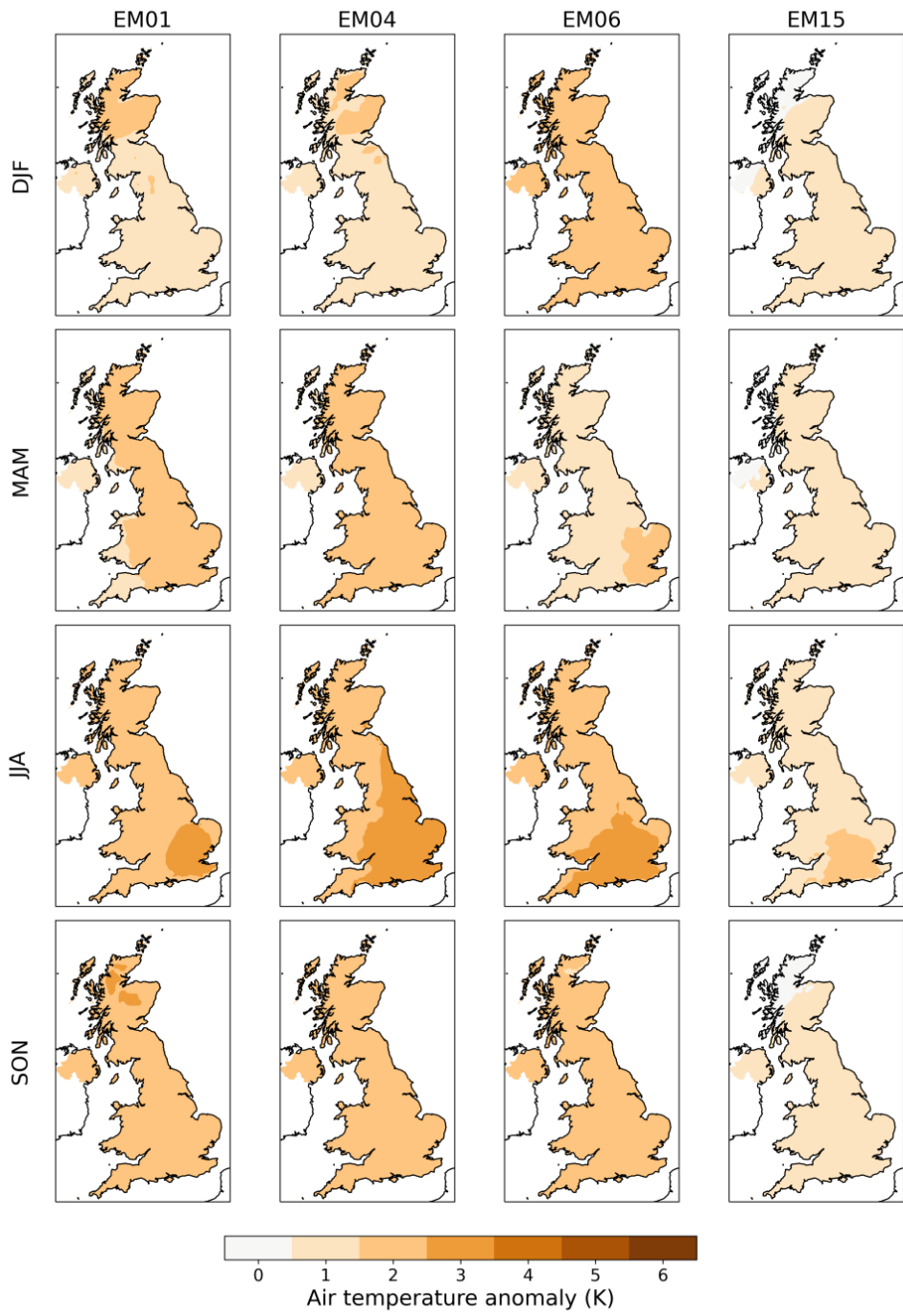
Figure S41: Seasonal air temperature anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
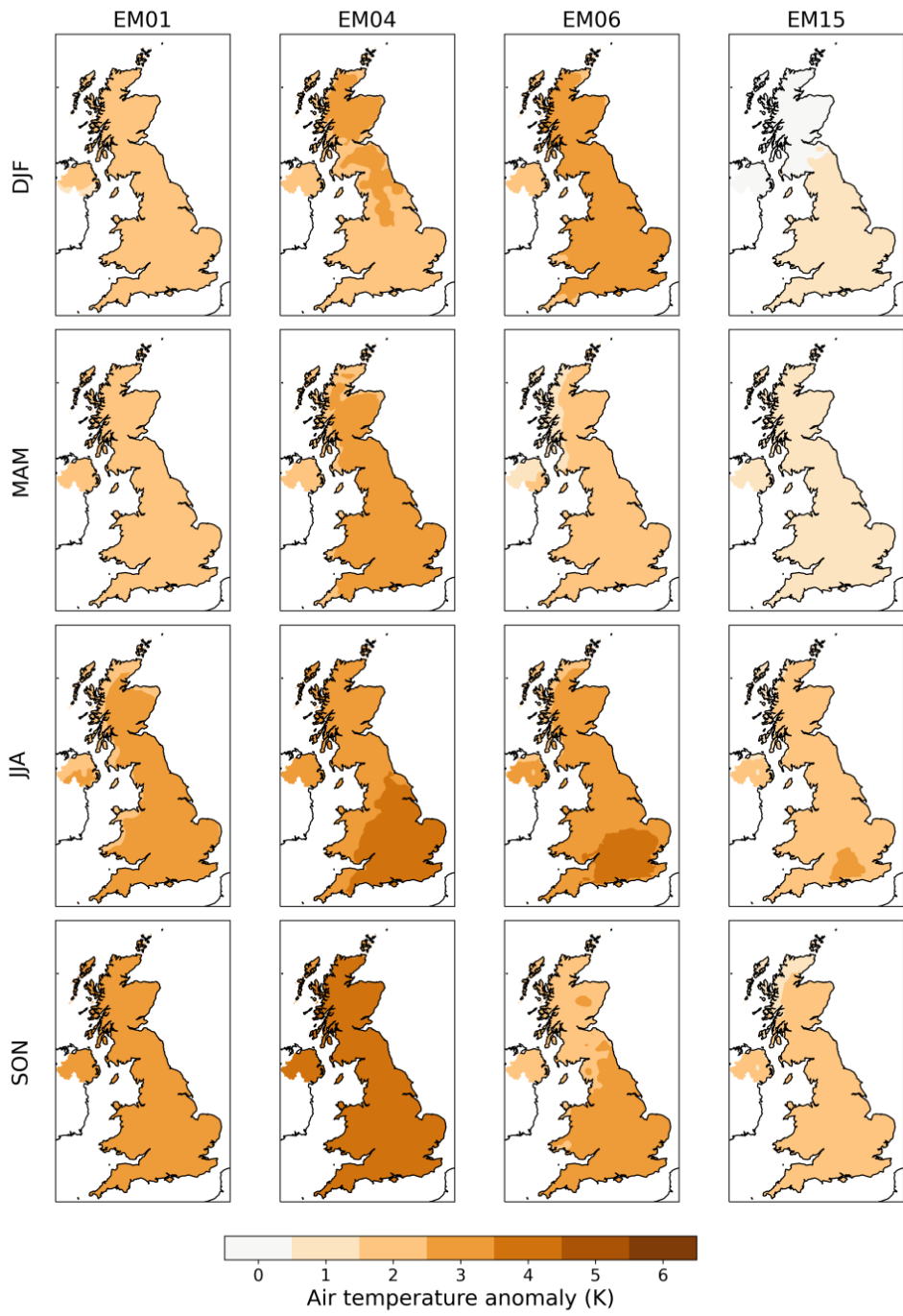
Figure S42: Seasonal air temperature anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
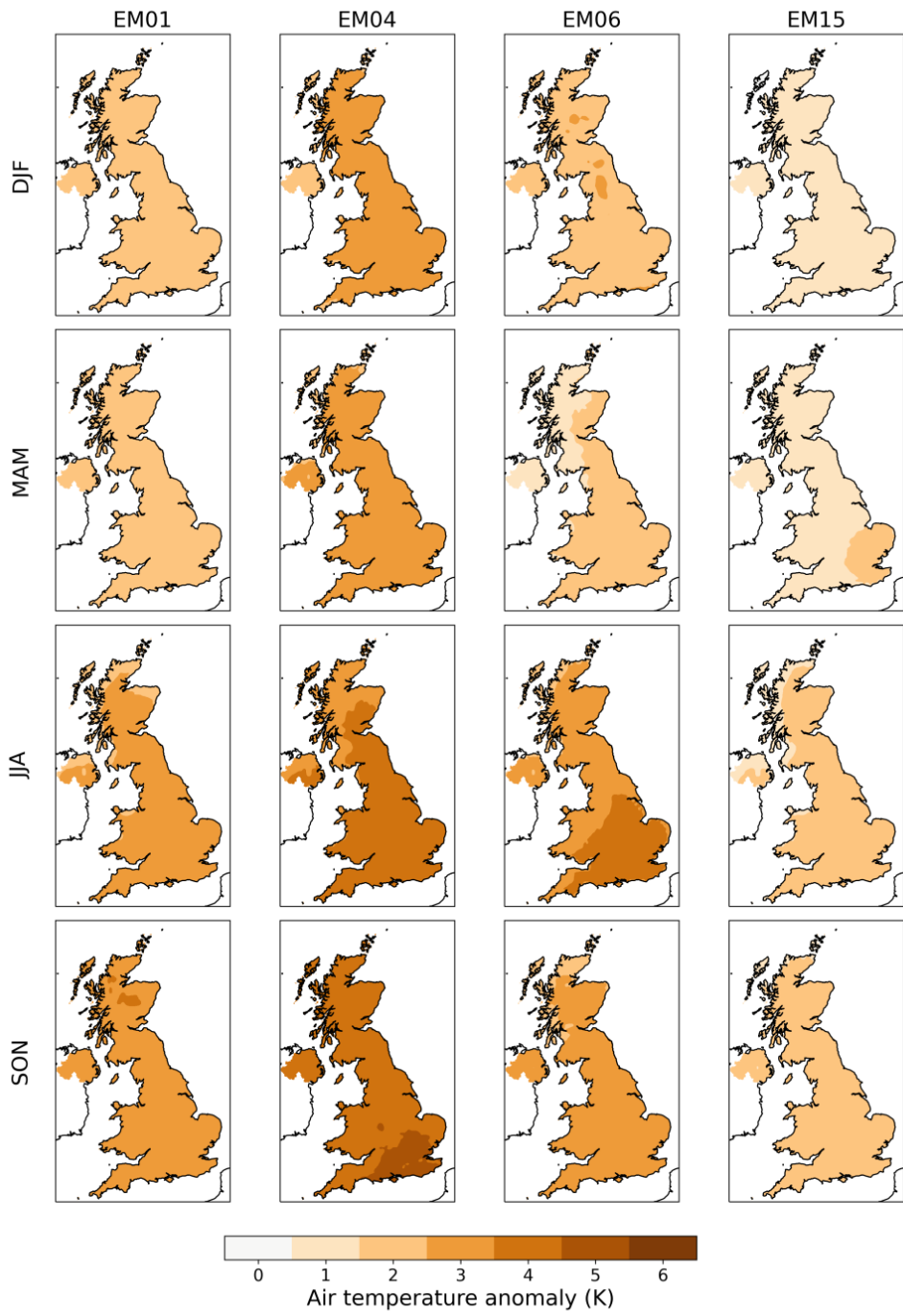
Figure S43: Seasonal air temperature anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
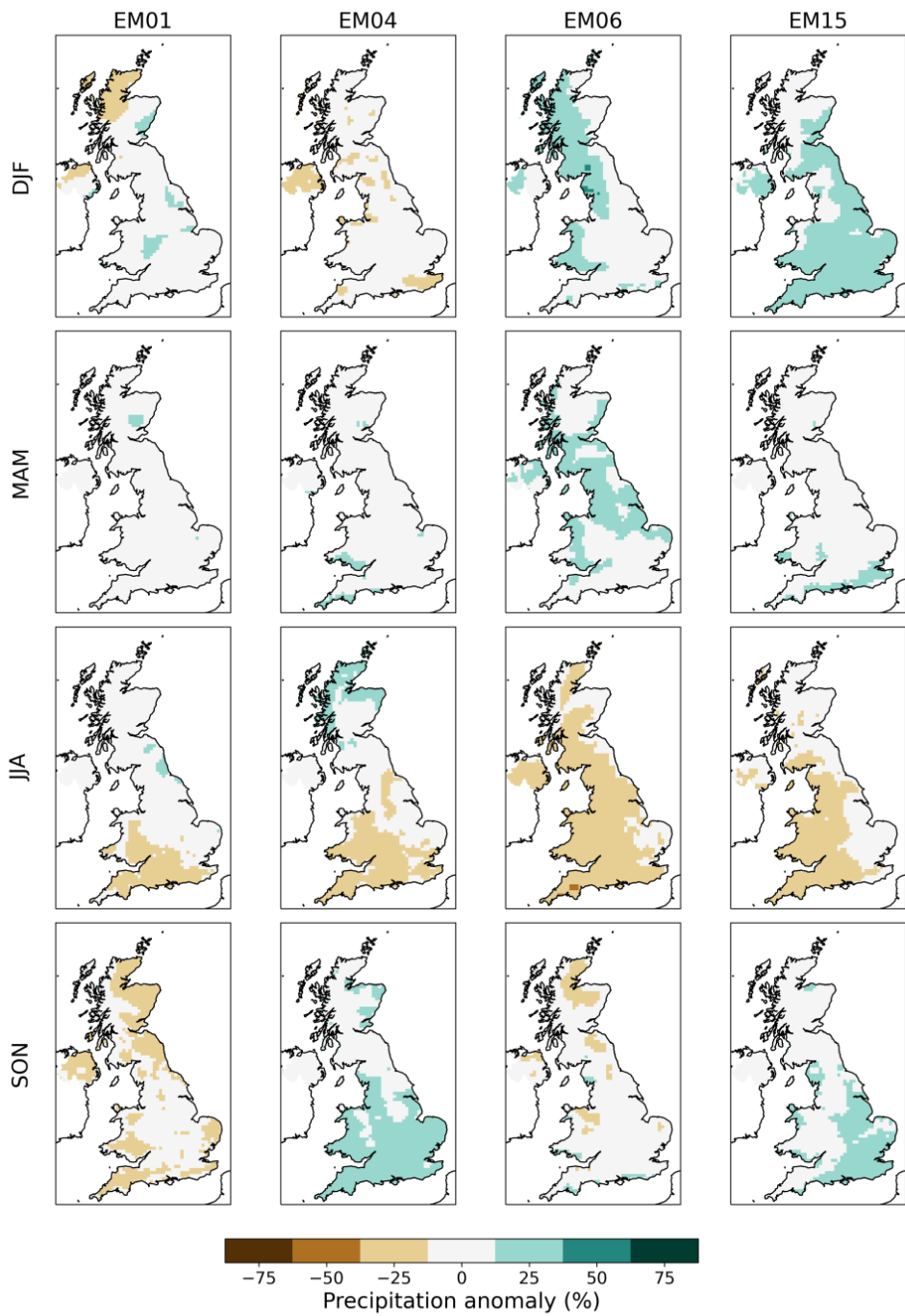
Figure S44: Seasonal precipitation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
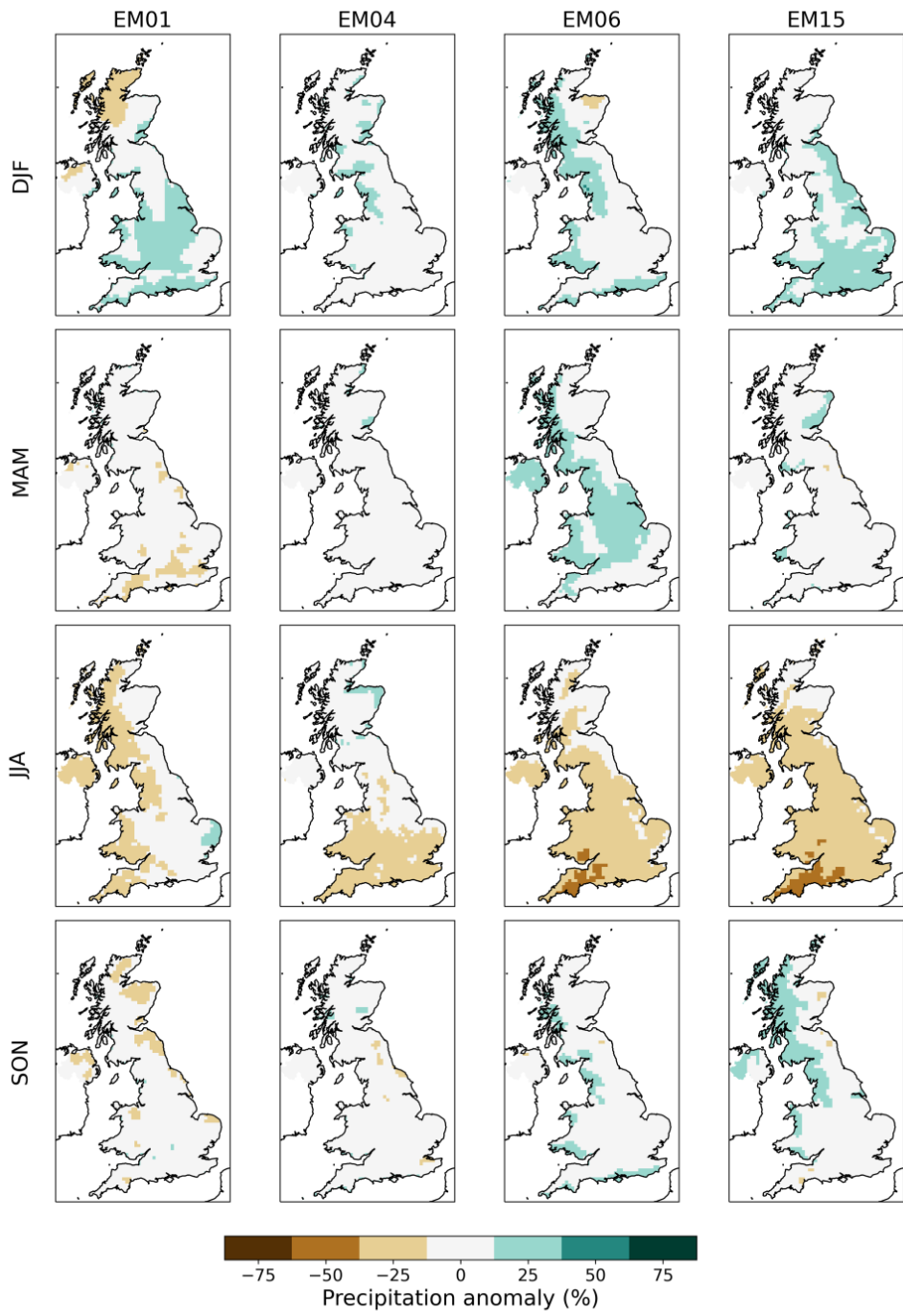
Figure S45: Seasonal precipitation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
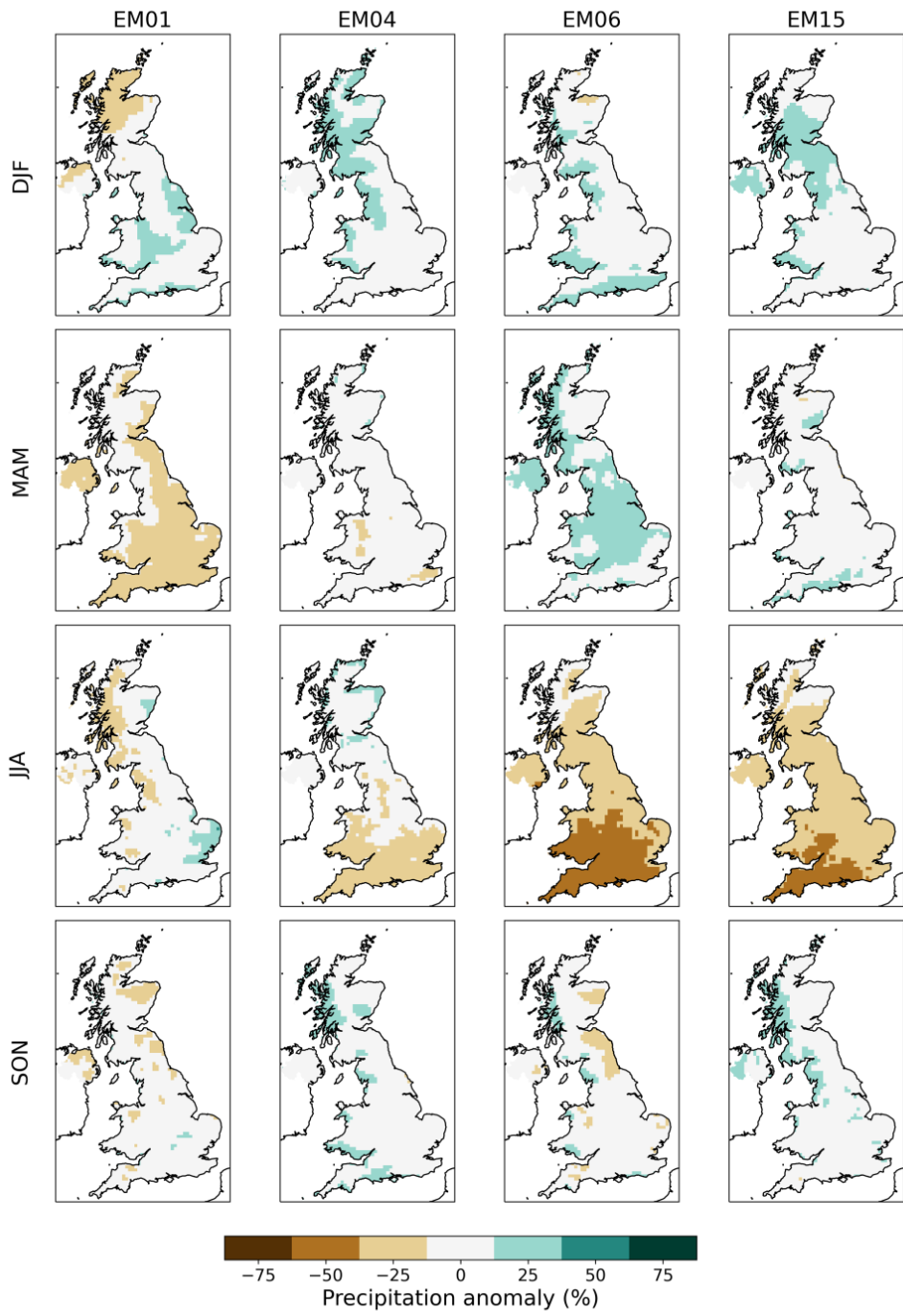
Figure S46: Seasonal precipitation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
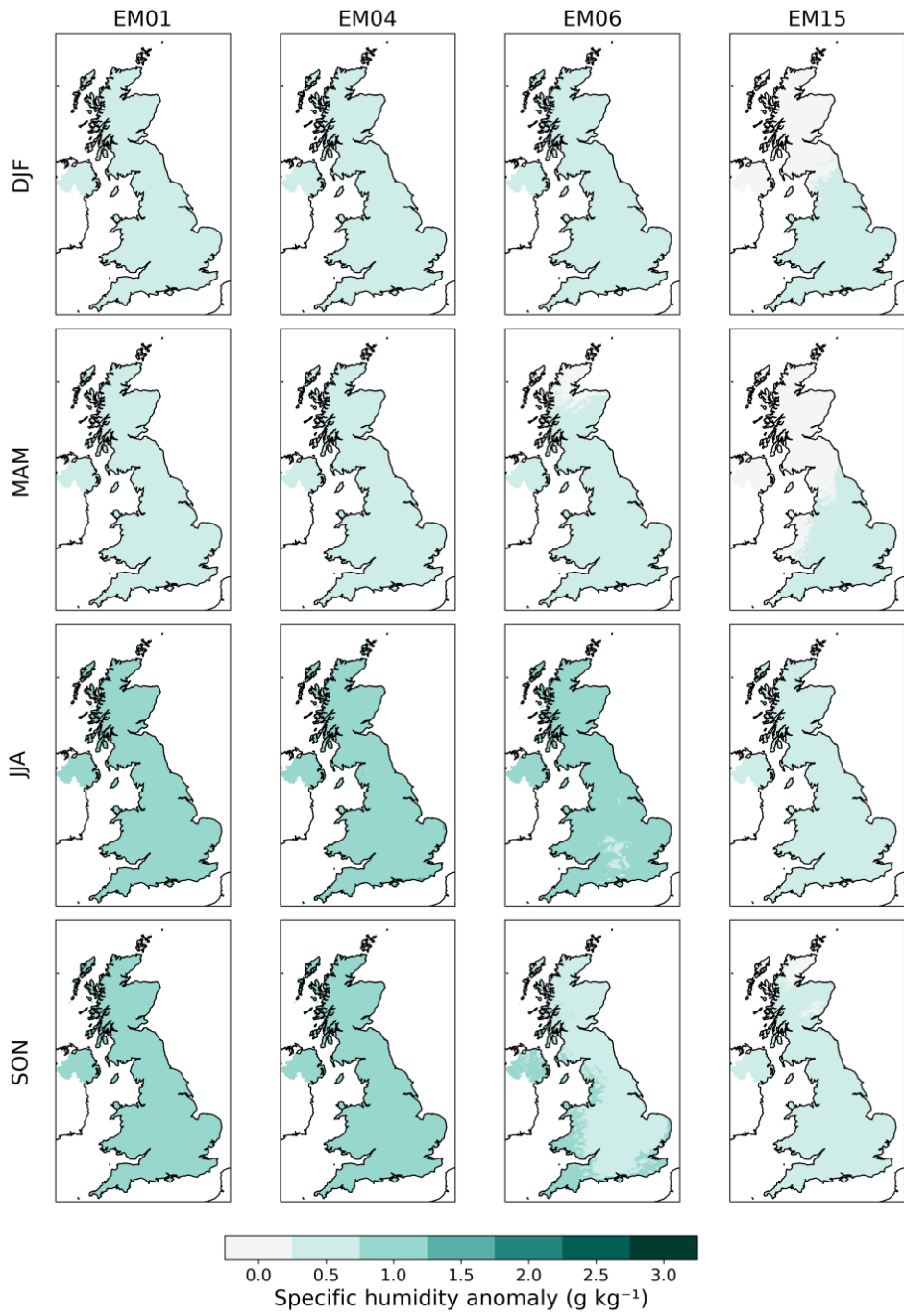
Figure S47: Seasonal specific humidity anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
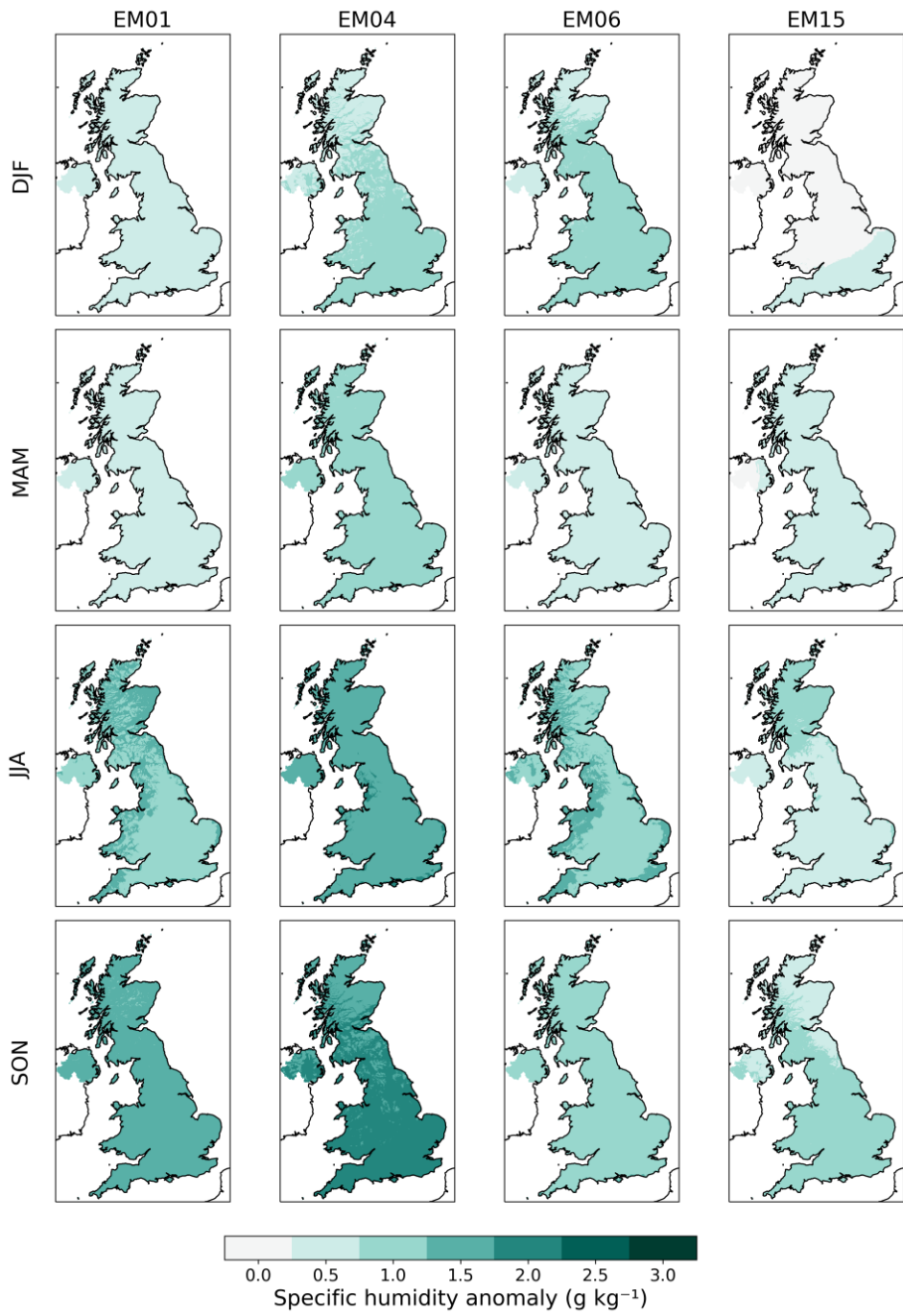
Figure S48: Seasonal specific humidity anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
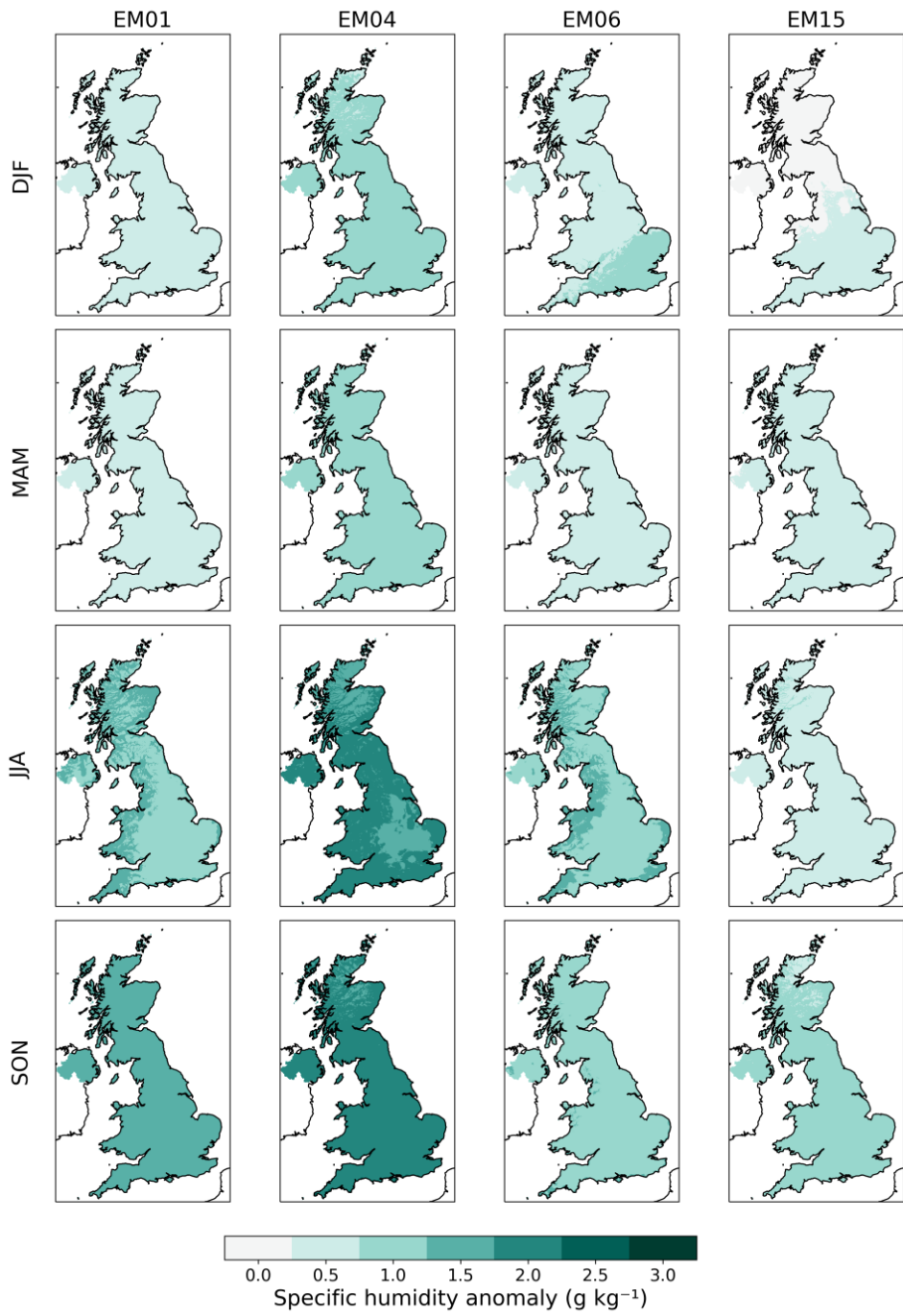
Figure S49: Seasonal specific humidity anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
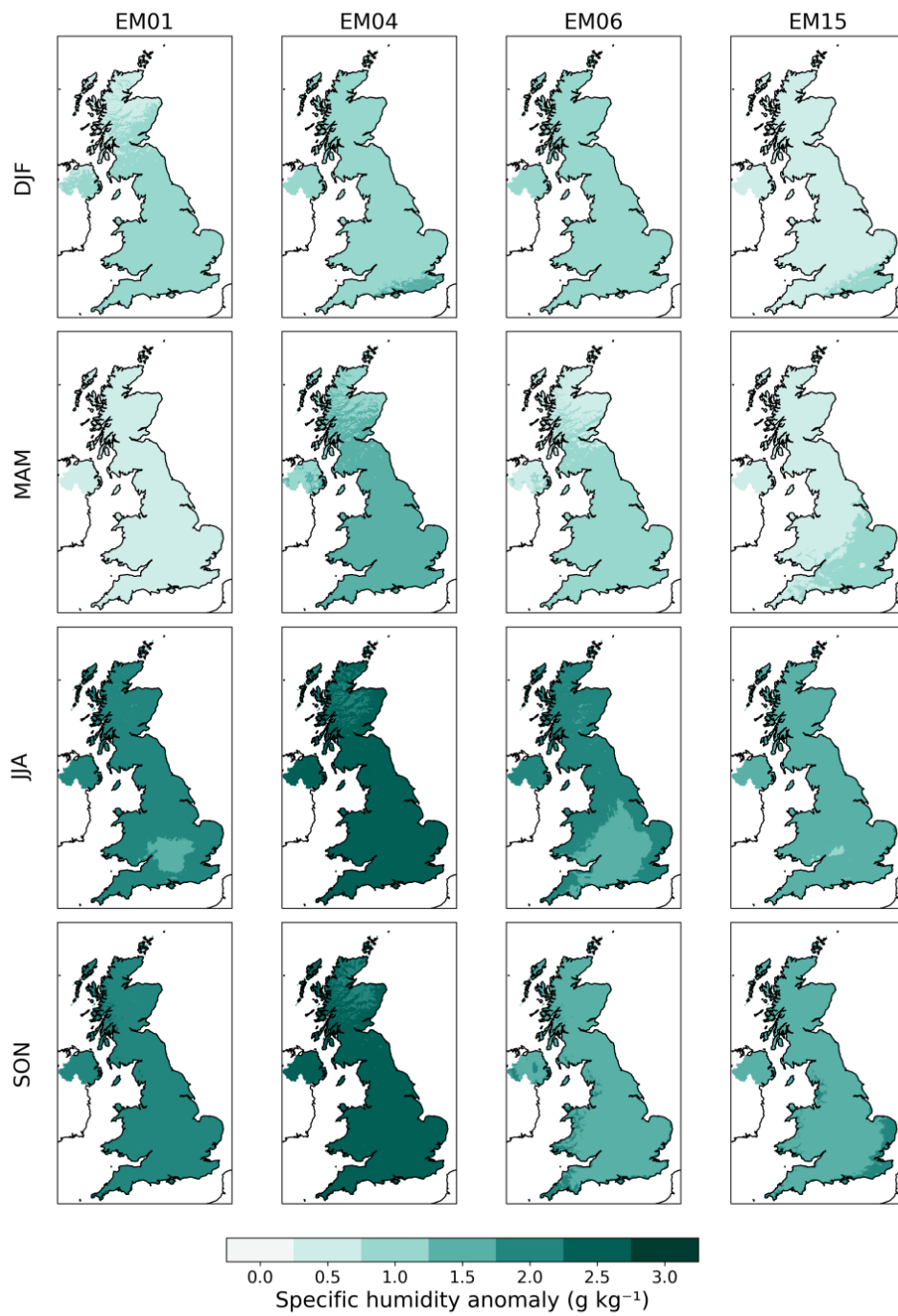
Figure S50: Seasonal specific humidity anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP8.5.
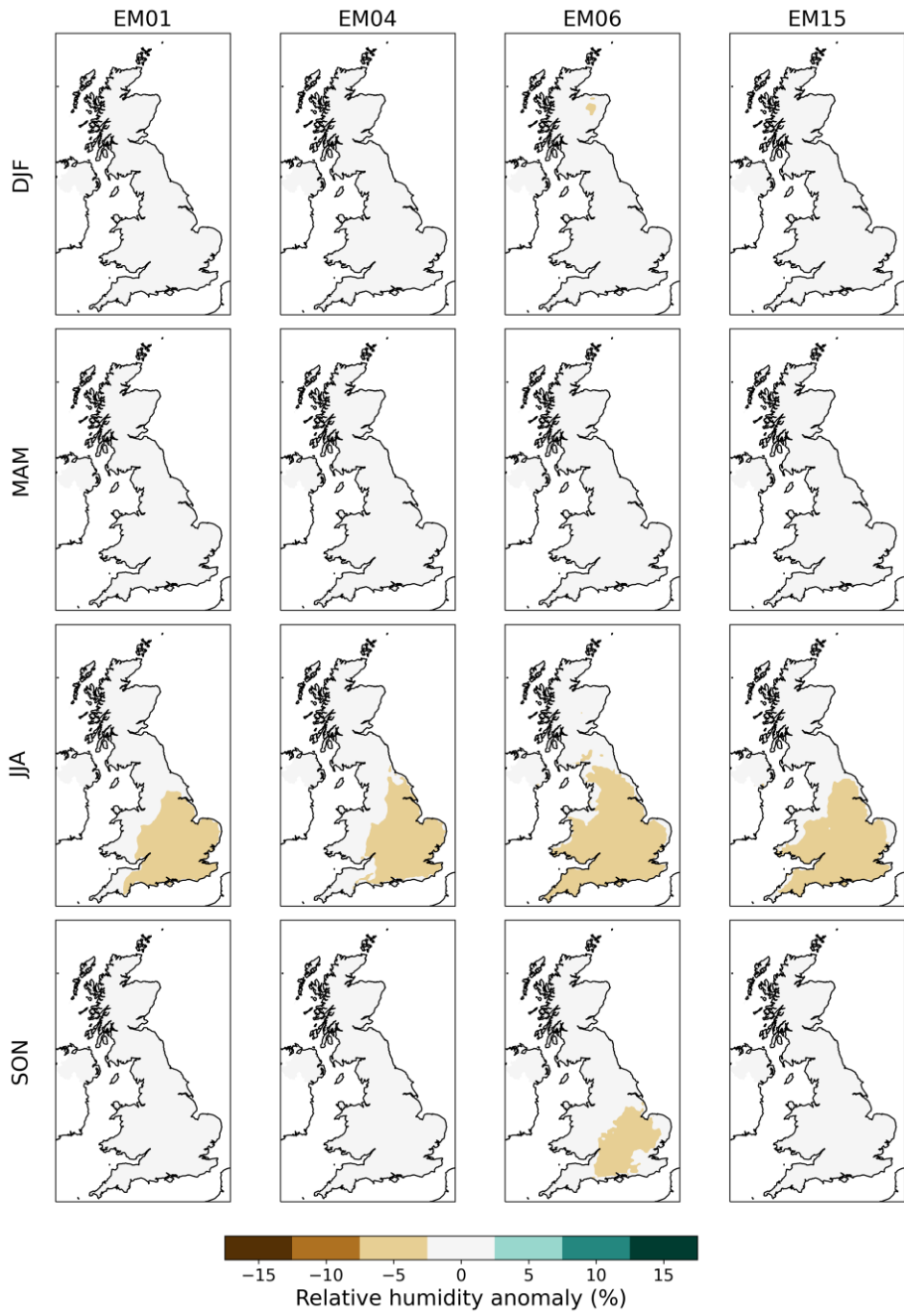
Figure S51: Seasonal relative humidity anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
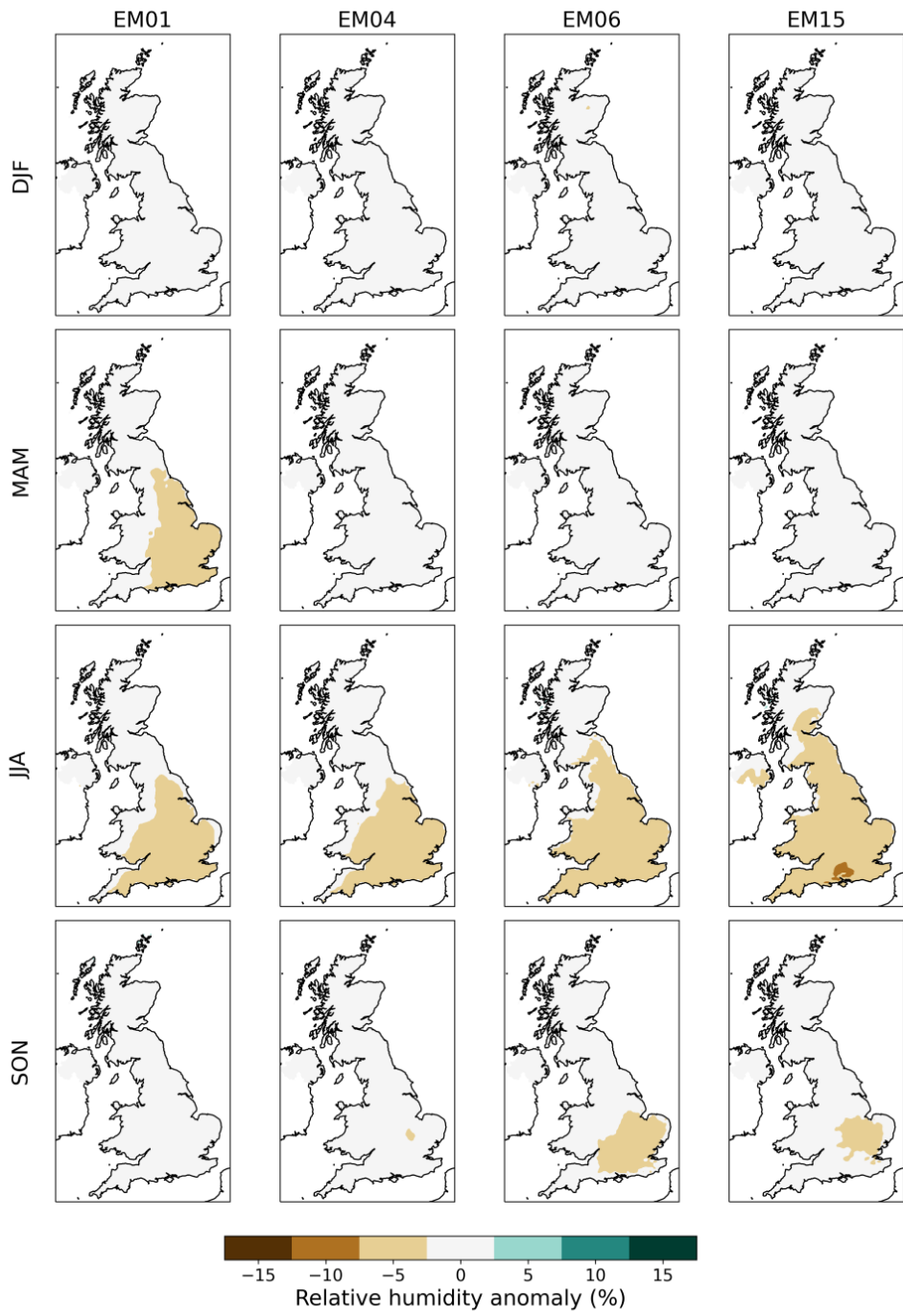
Figure S52: Seasonal relative humidity anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
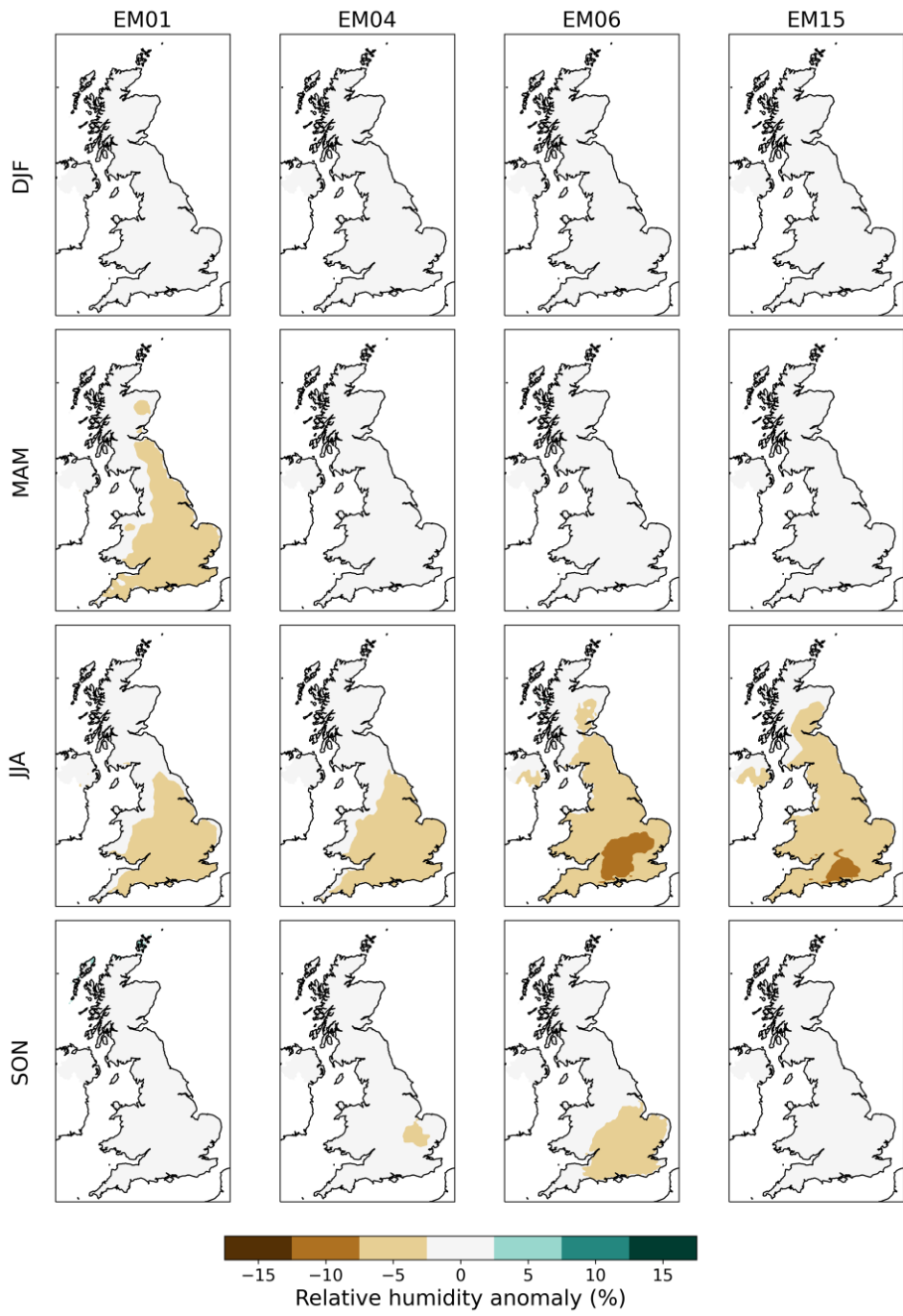
Figure S53: Seasonal relative humidity anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
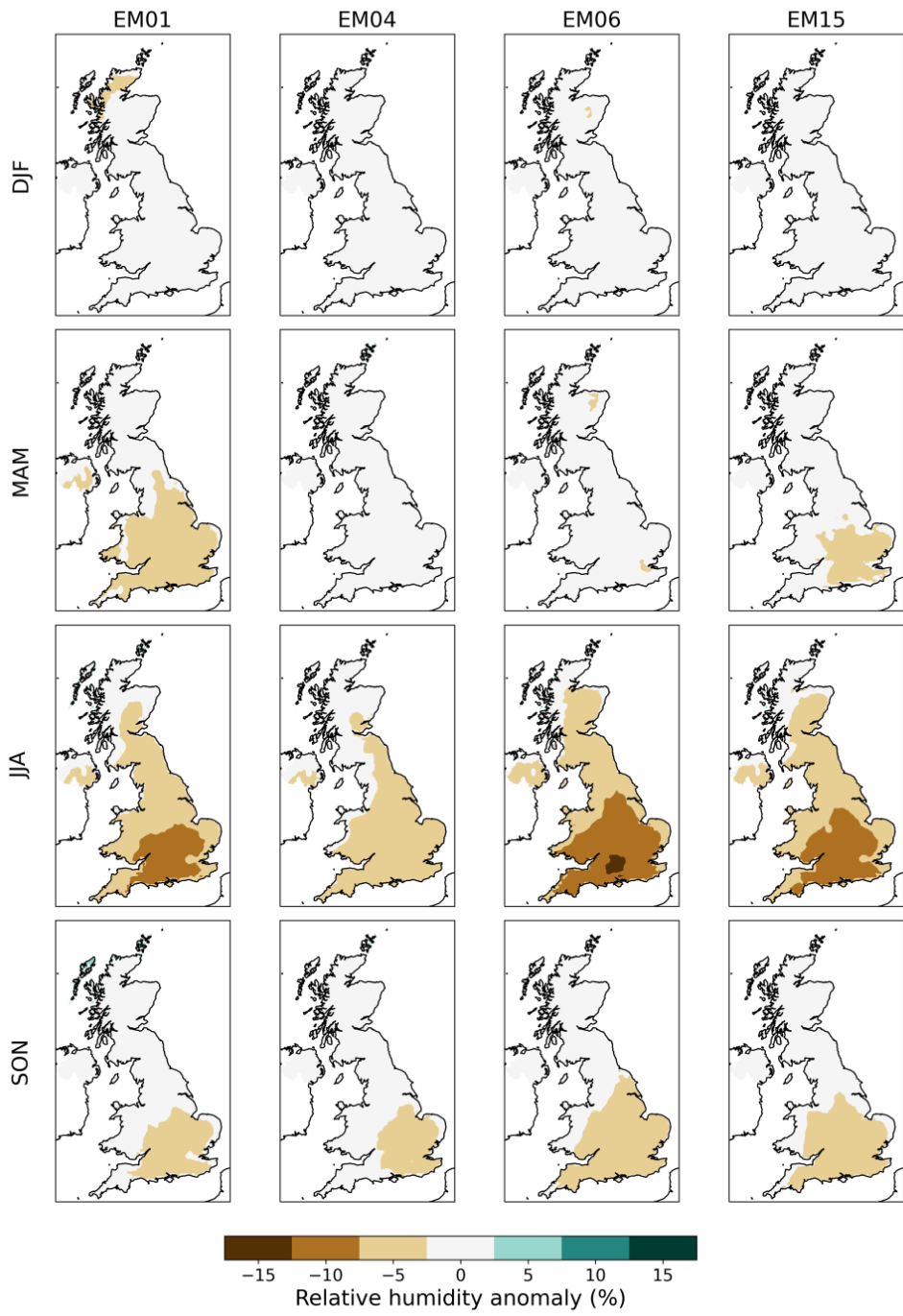
Figure S54: Seasonal relative humidity anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP8.5.
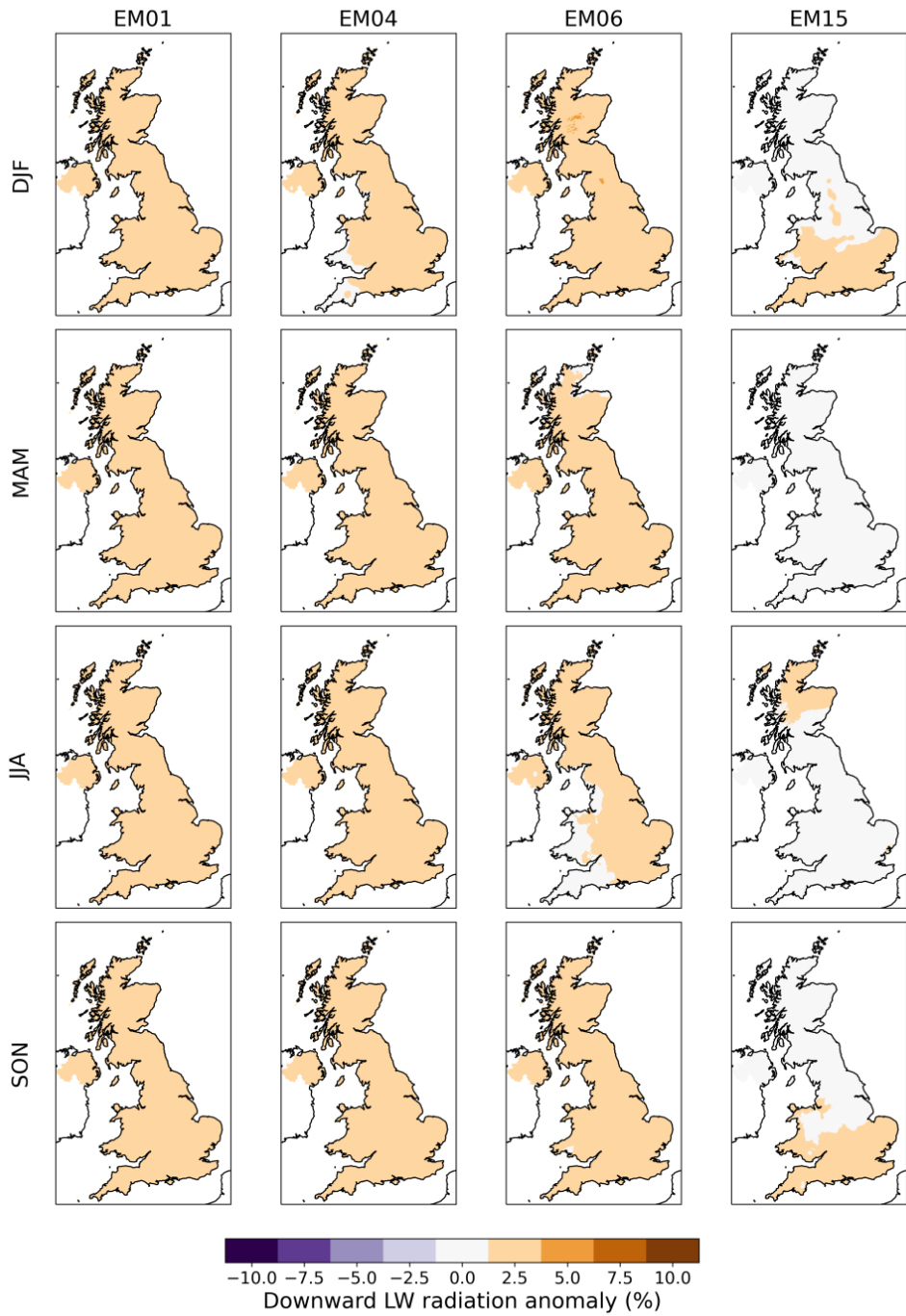
Figure S55: Seasonal downwelling longwave radiation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
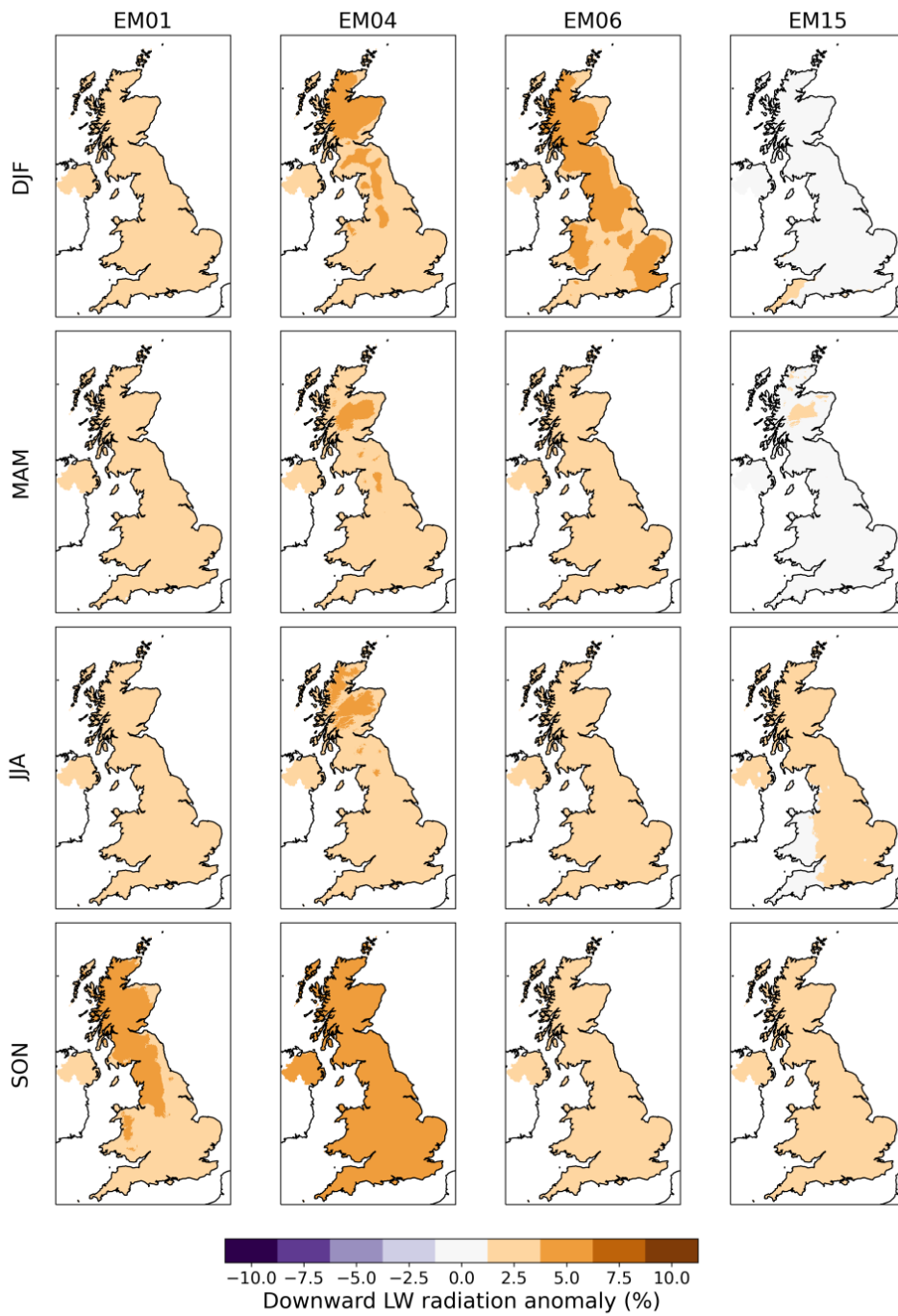
Figure S56: Seasonal downwelling longwave radiation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
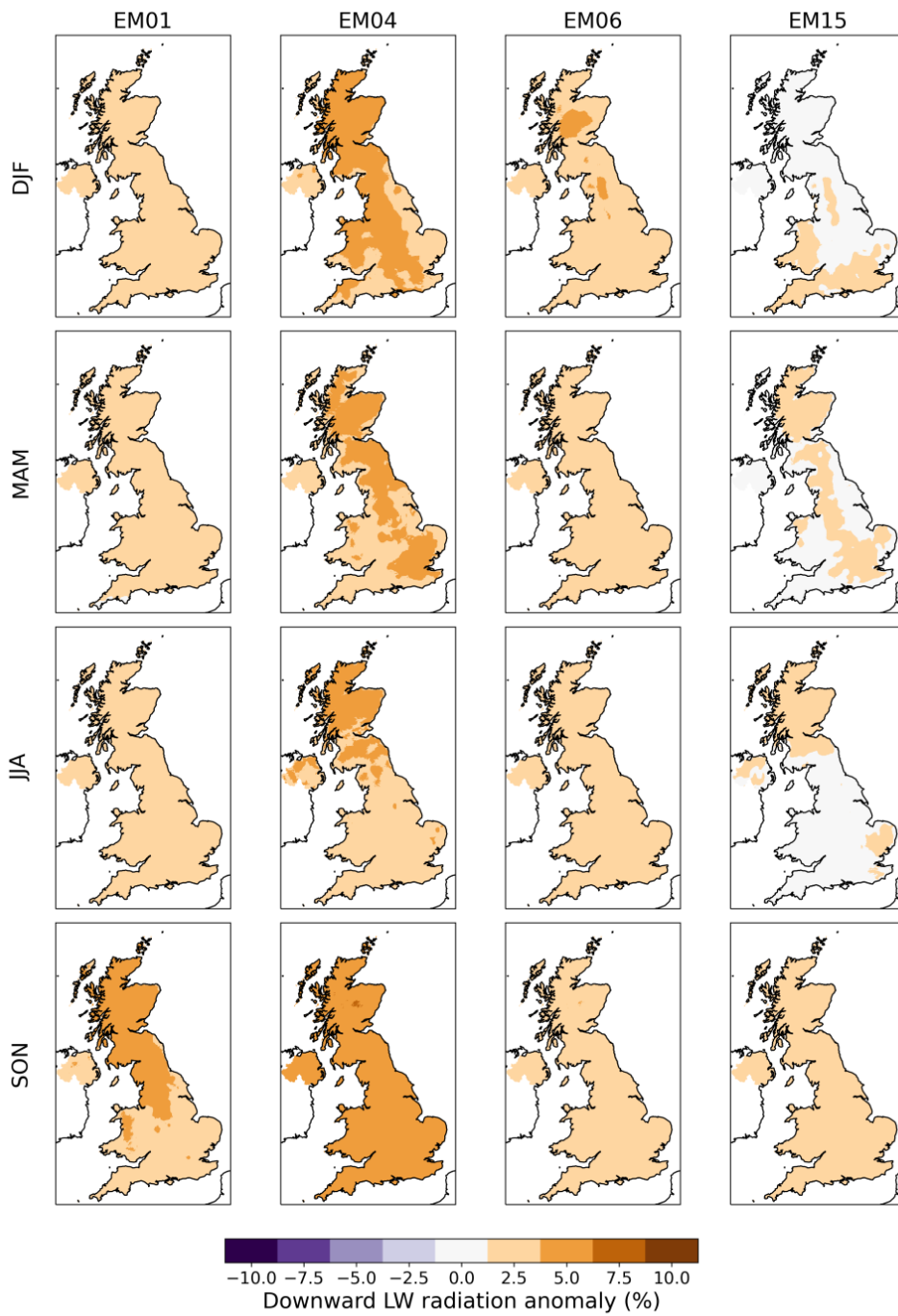
Figure S57: Seasonal downwelling longwave radiation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
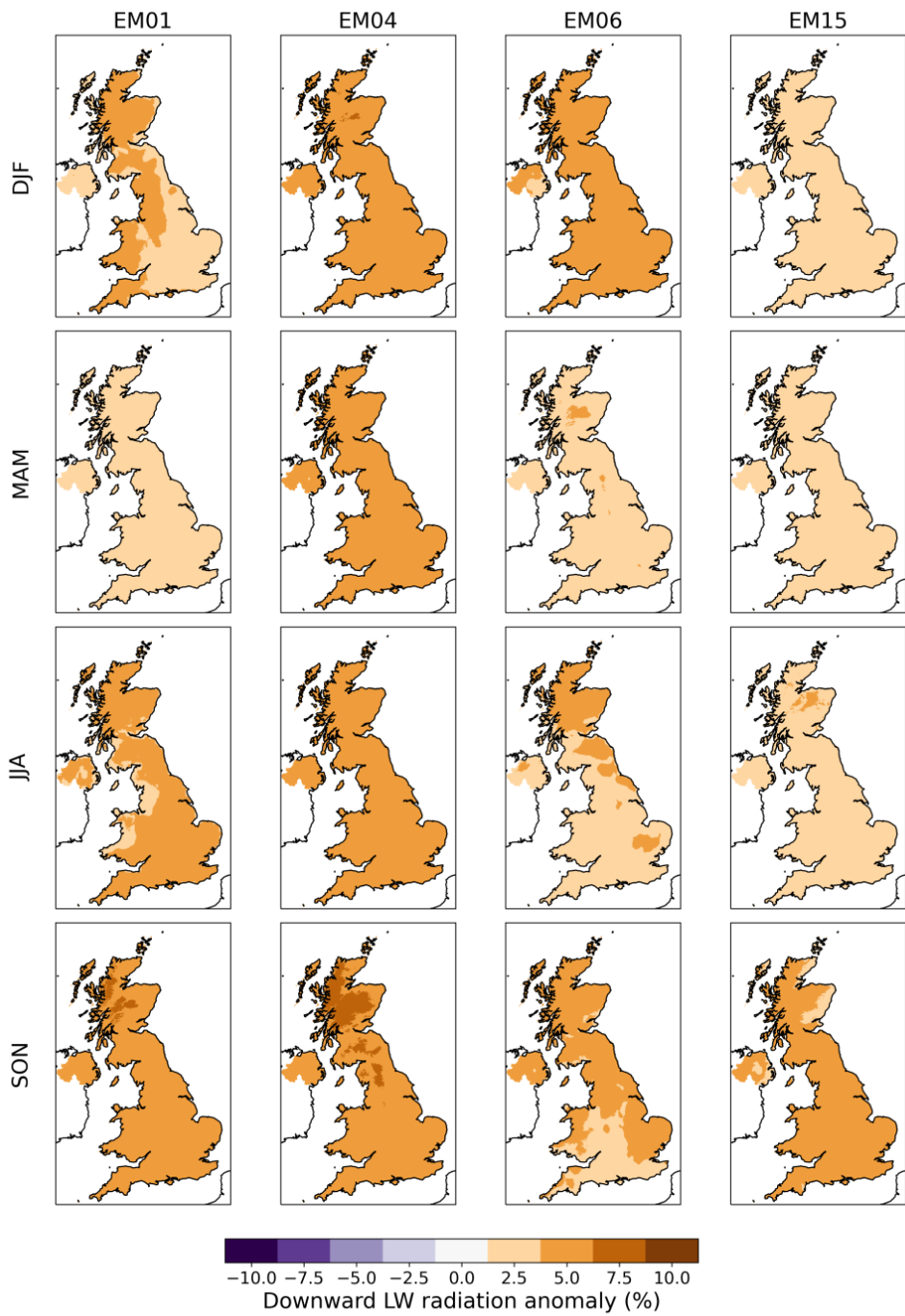
Figure S58: Seasonal downwelling longwave radiation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP8.5.
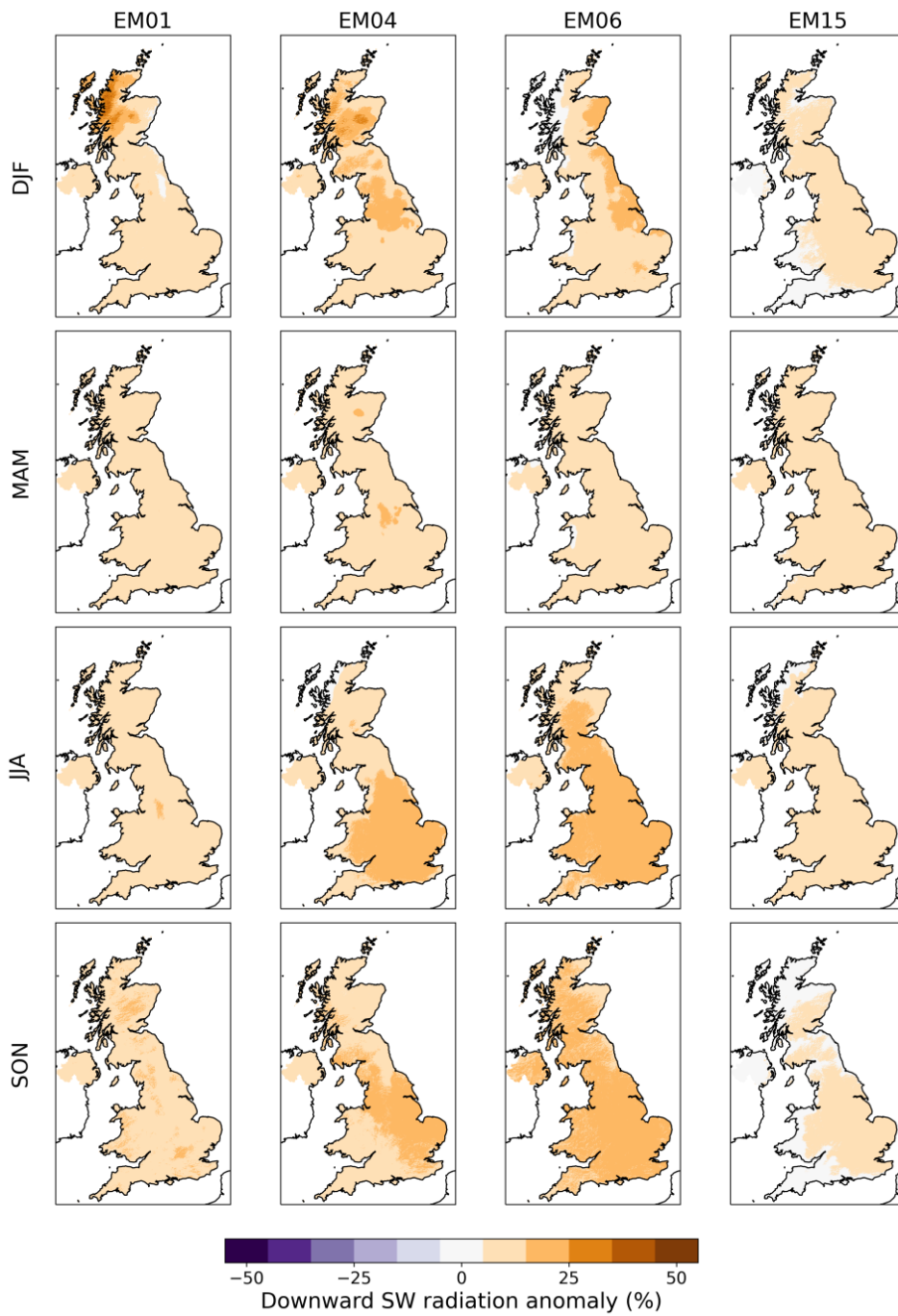
Figure S59: Seasonal downwelling shortwave radiation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
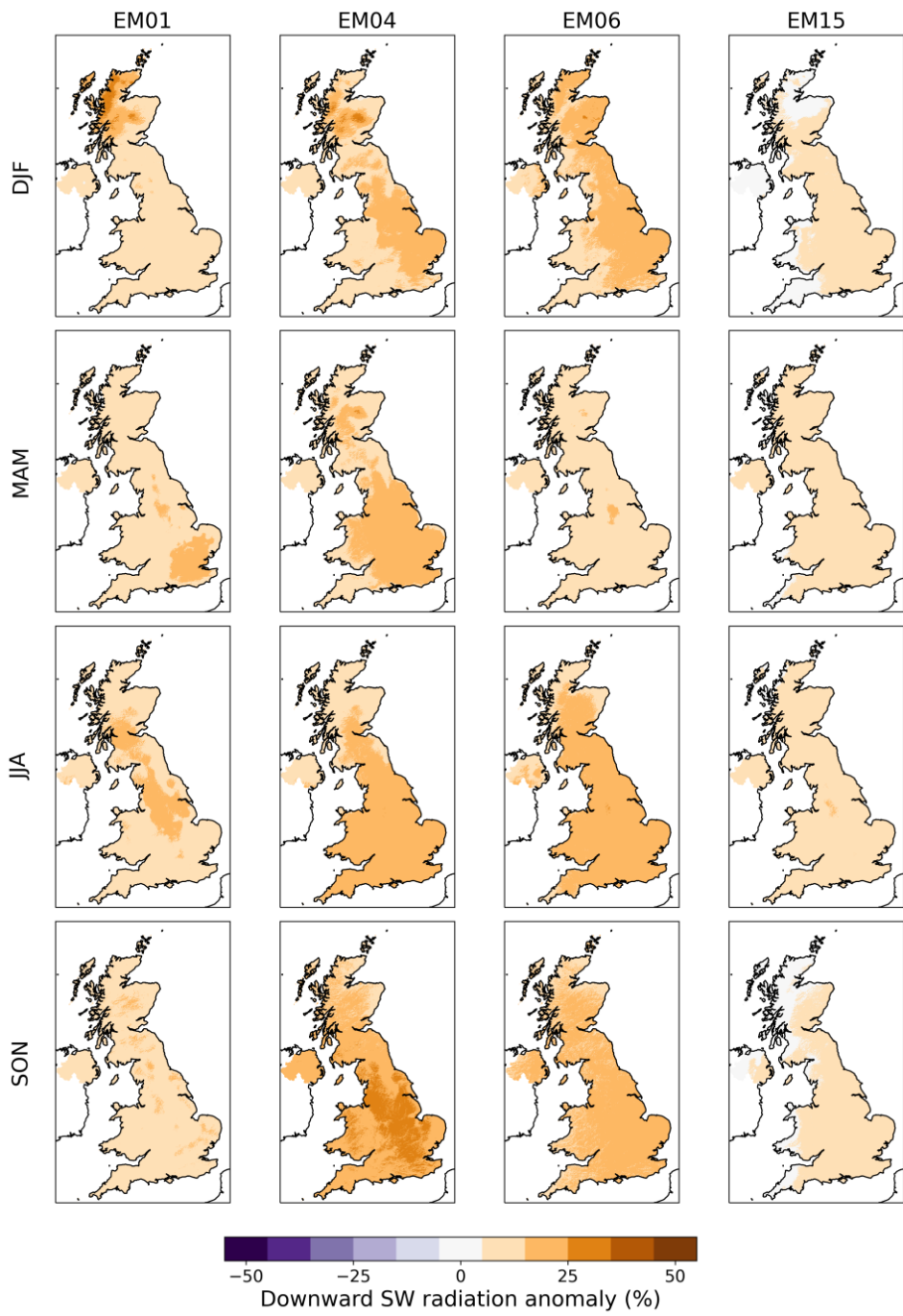
Figure S60: Seasonal downwelling shortwave radiation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
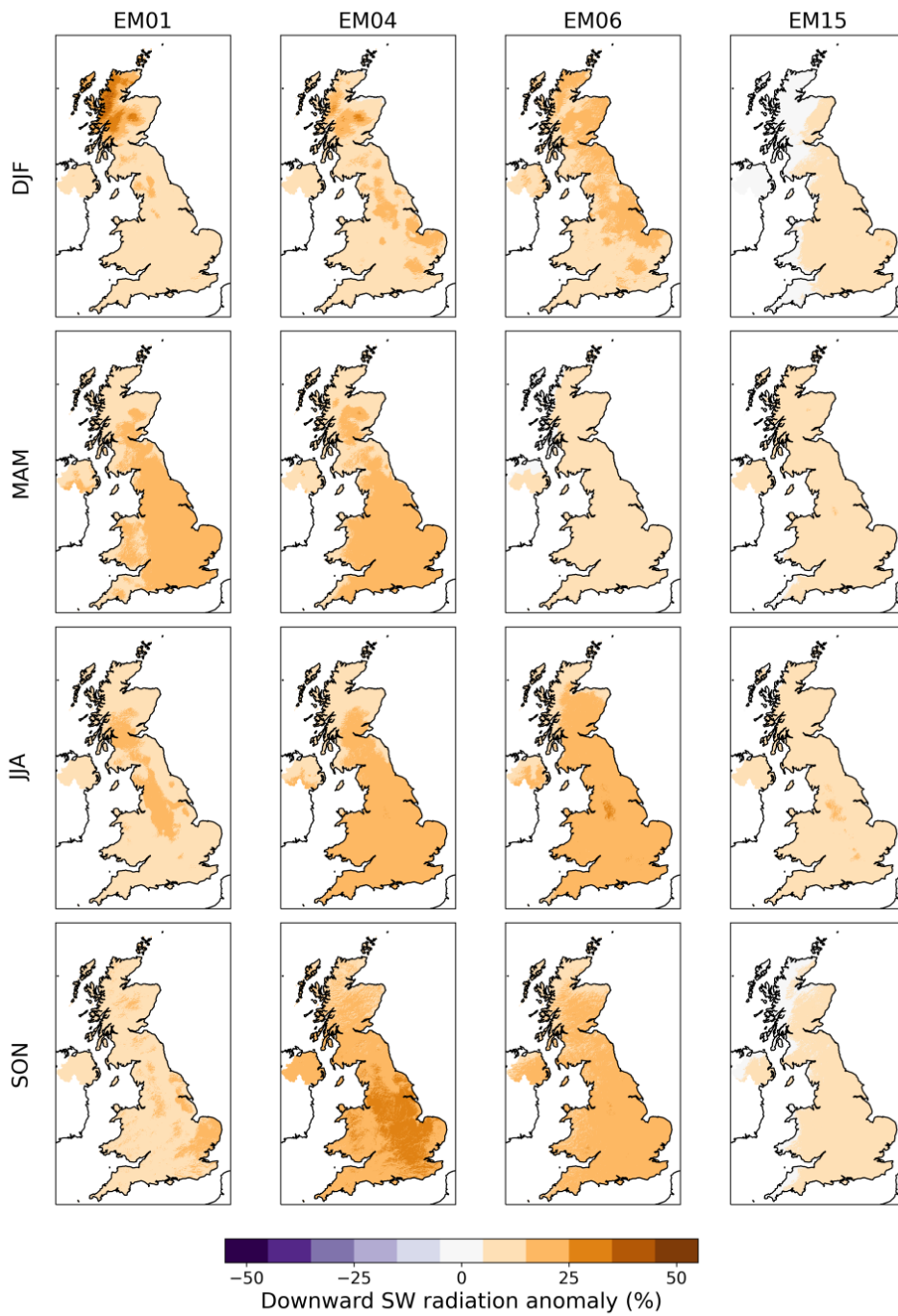
Figure S61: Seasonal downwelling shortwave radiation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
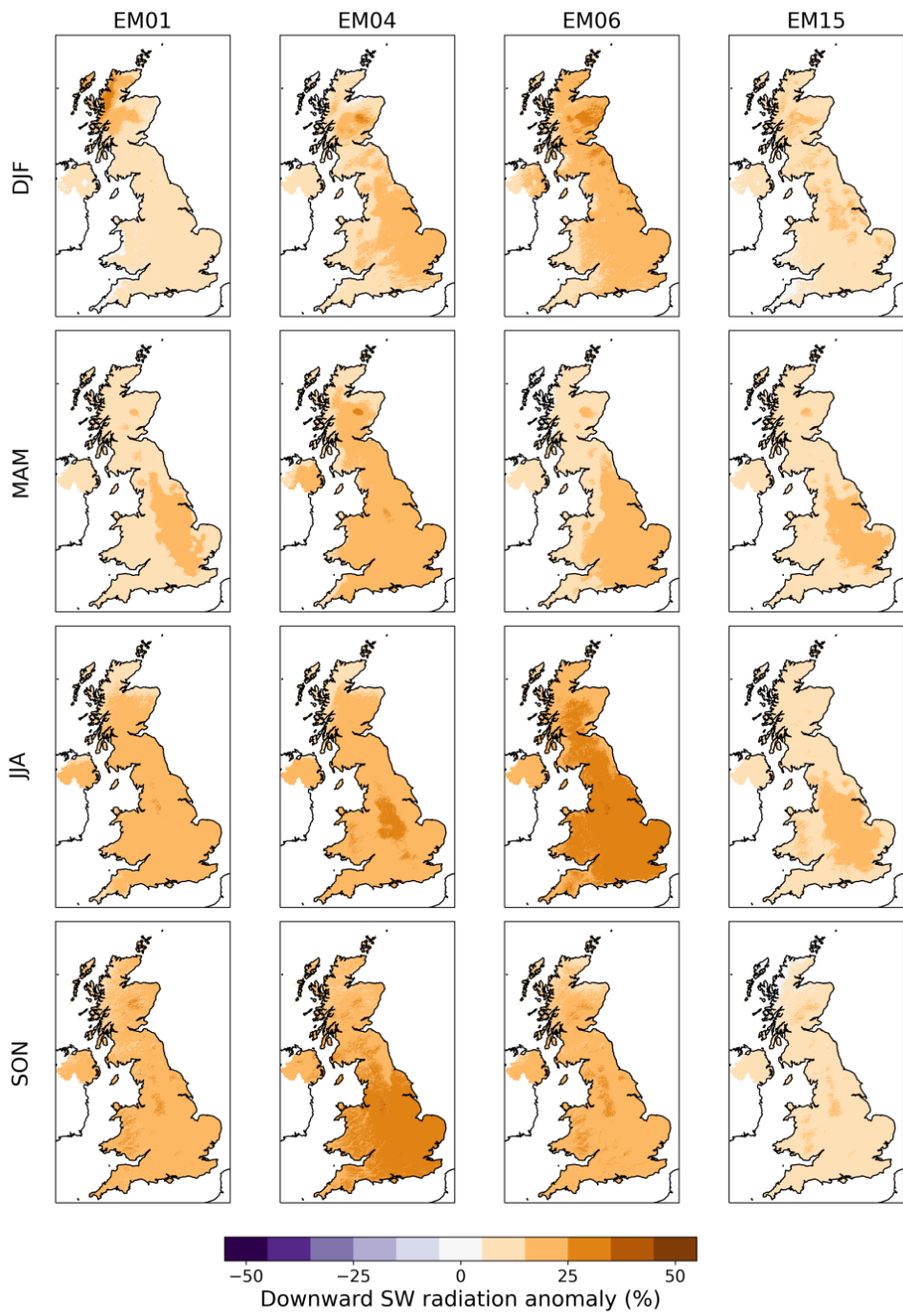
Figure S62: Seasonal downwelling shortwave radiation anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP8.5.
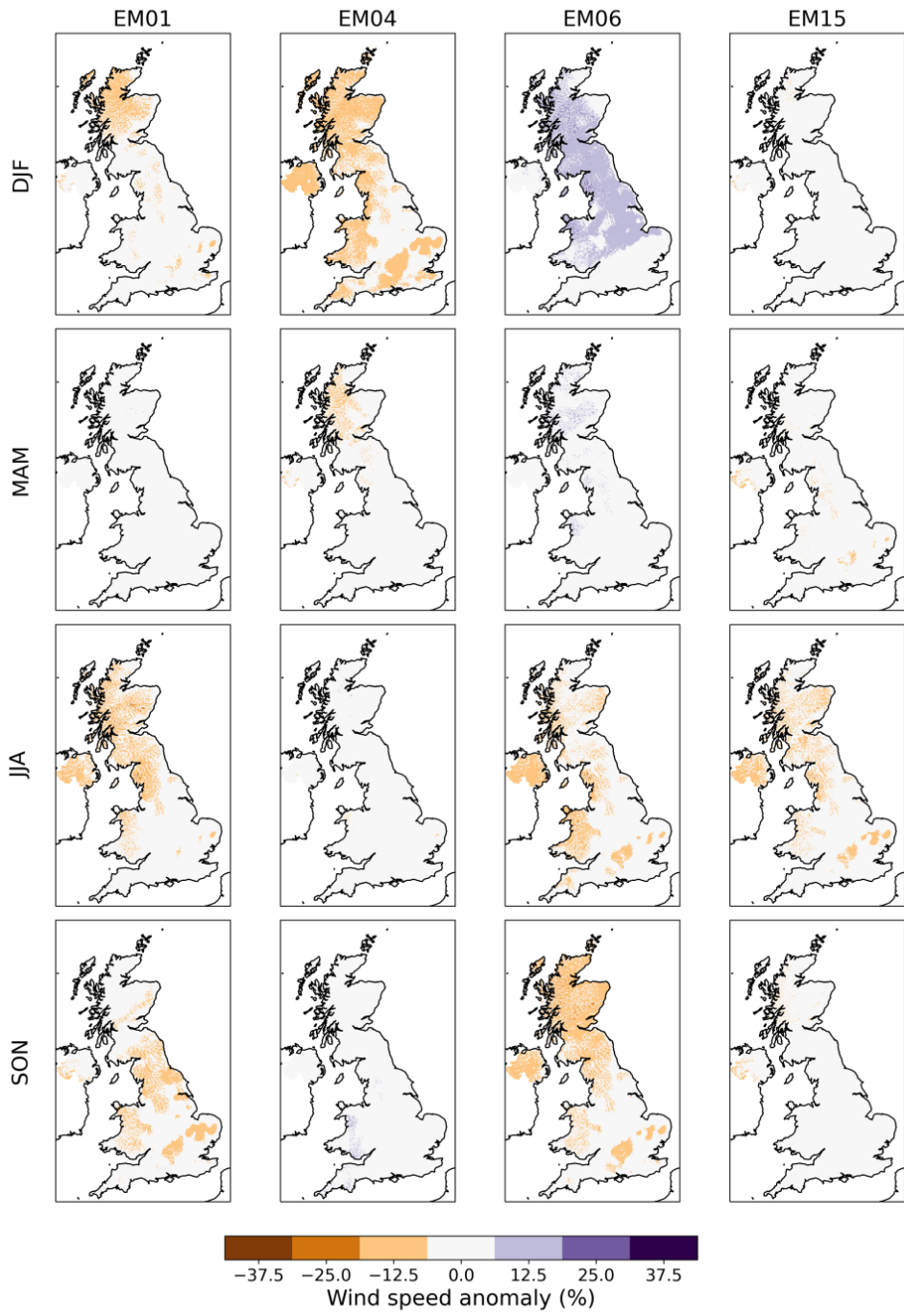
Figure S63: Seasonal wind speed anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
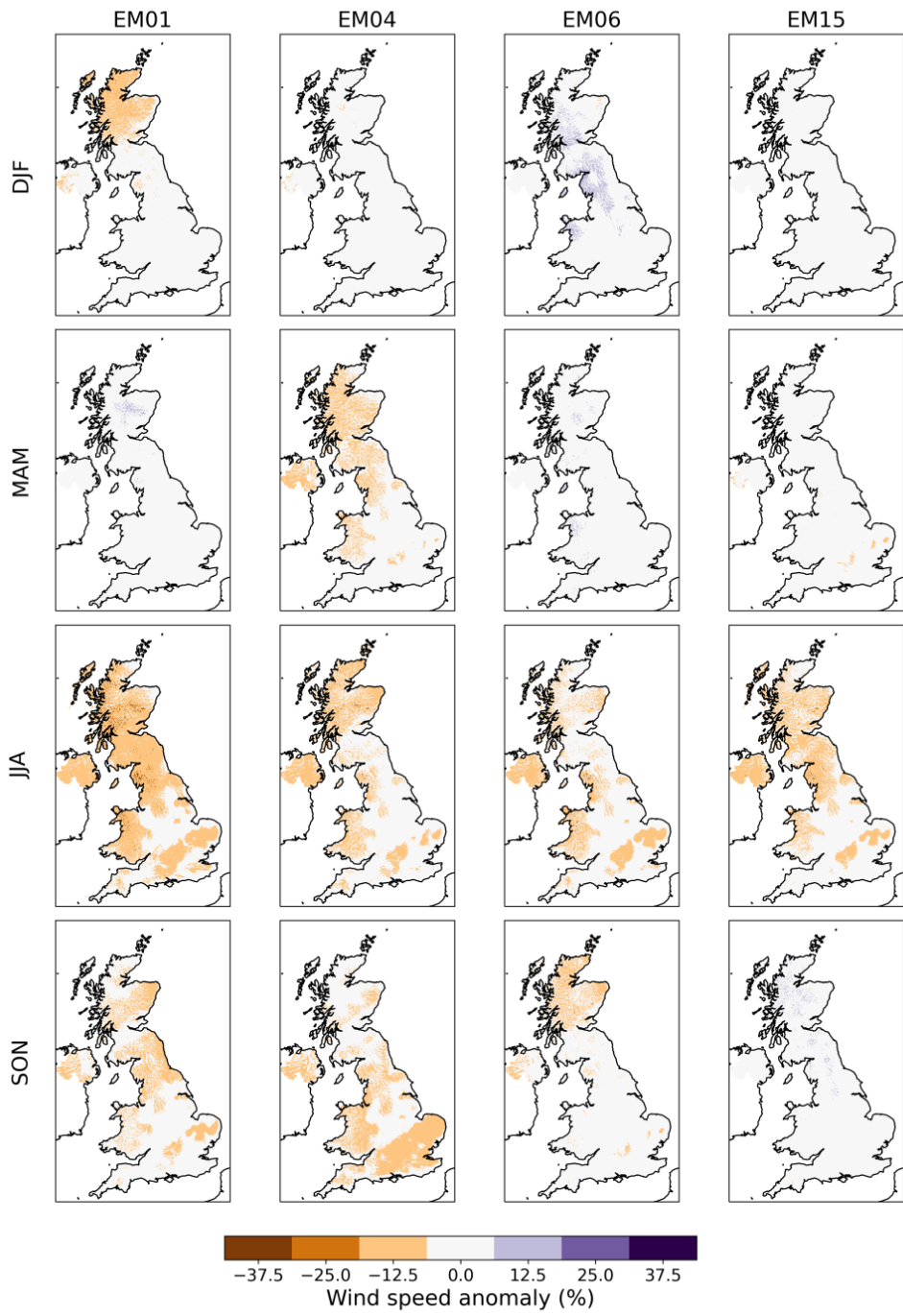
Figure S64: Seasonal wind speed anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
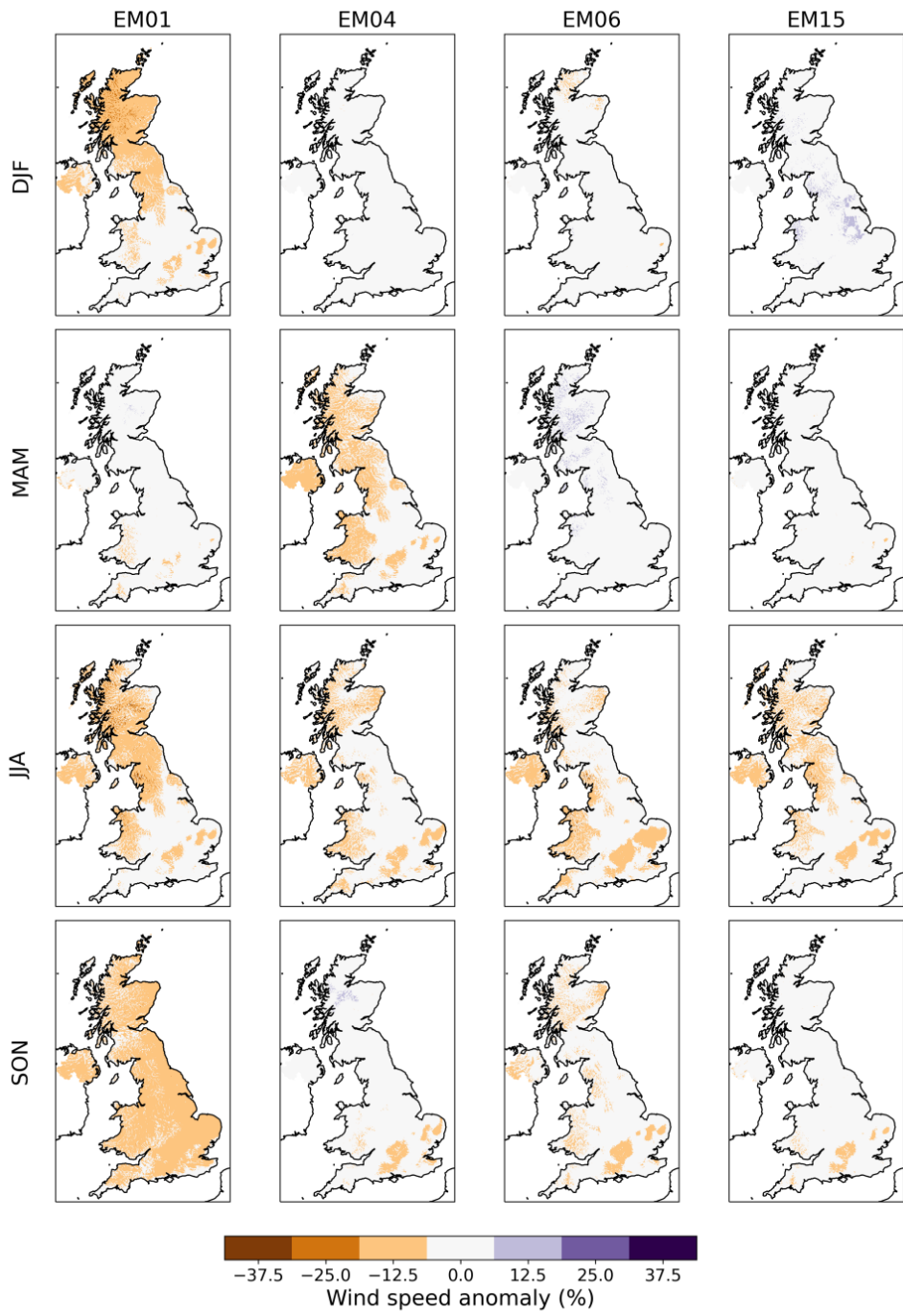
Figure S65: Seasonal wind speed anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
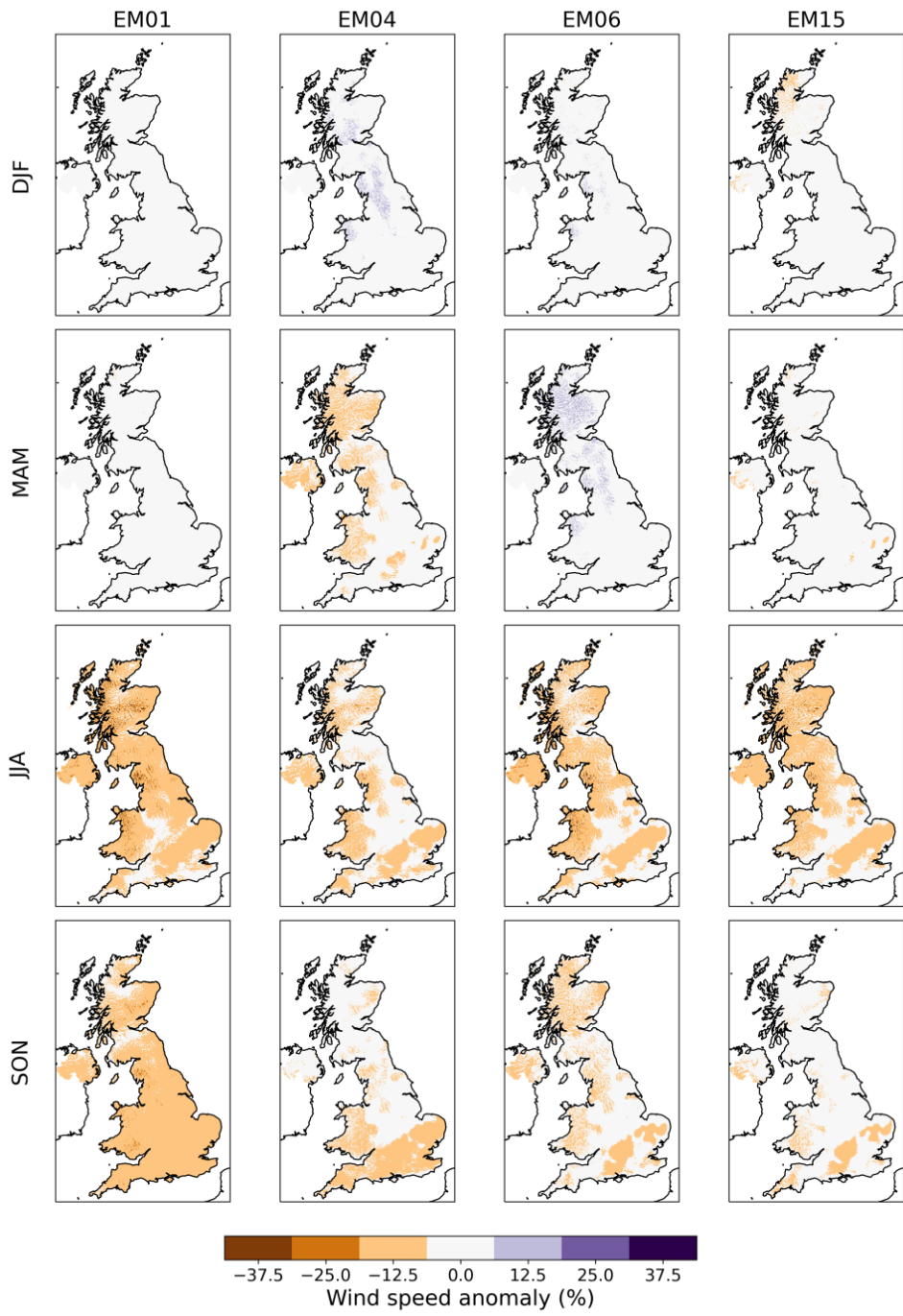
Figure S66: Seasonal wind speed anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP8.5.
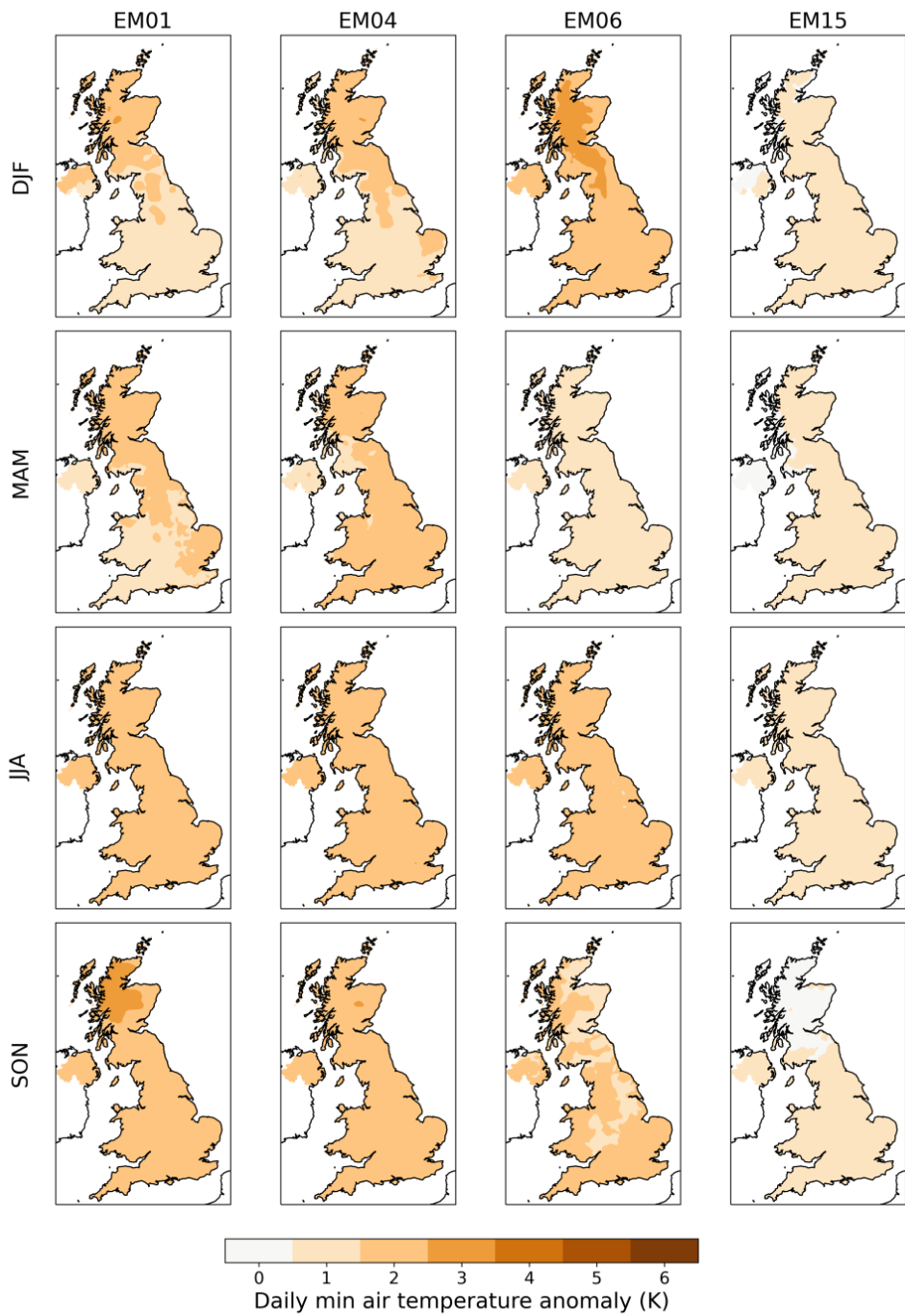
Figure S67: Seasonal daily minimum air temperature anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
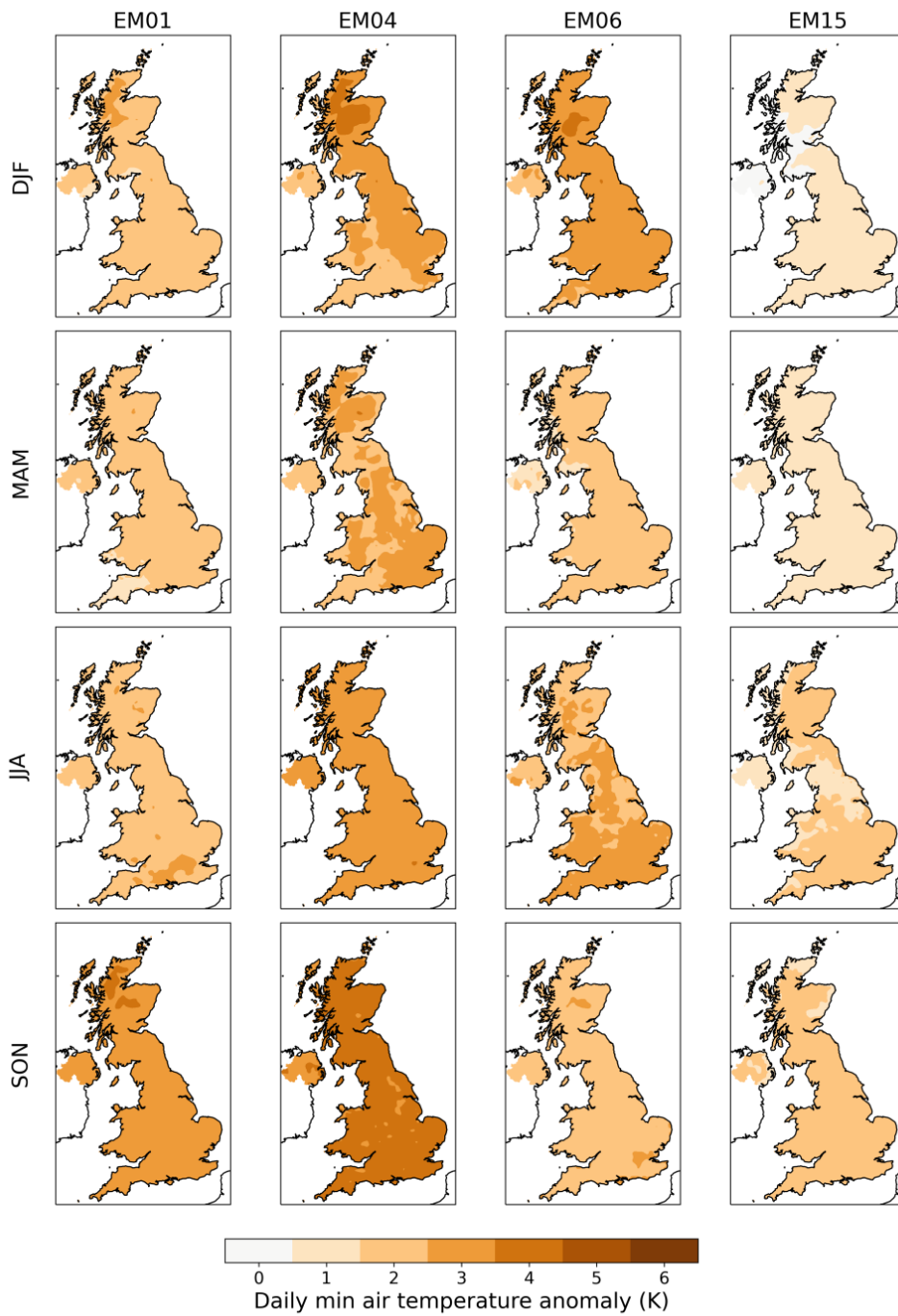
Figure S68: Seasonal daily minimum air temperature anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
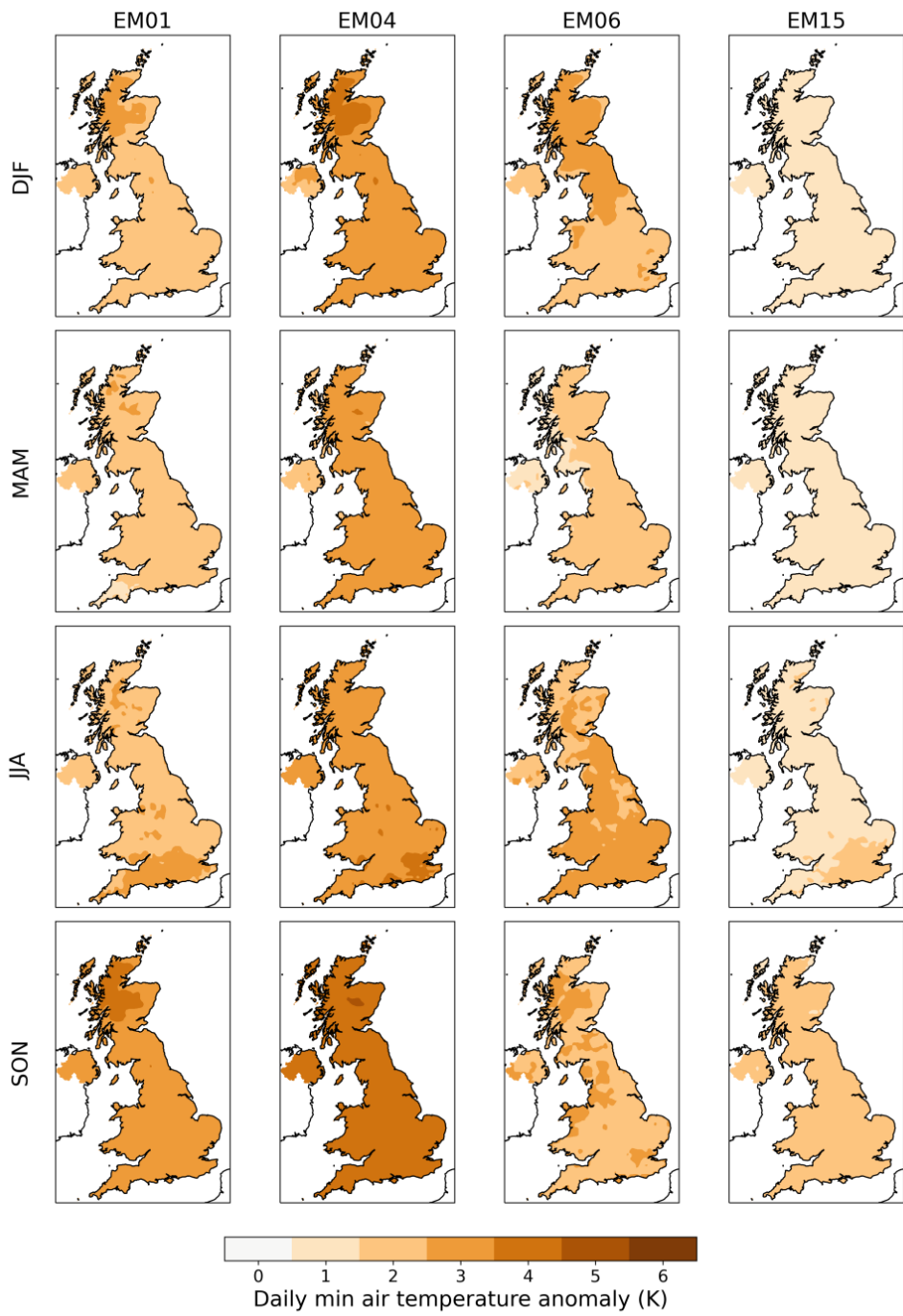
Figure S69: Seasonal daily minimum air temperature anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
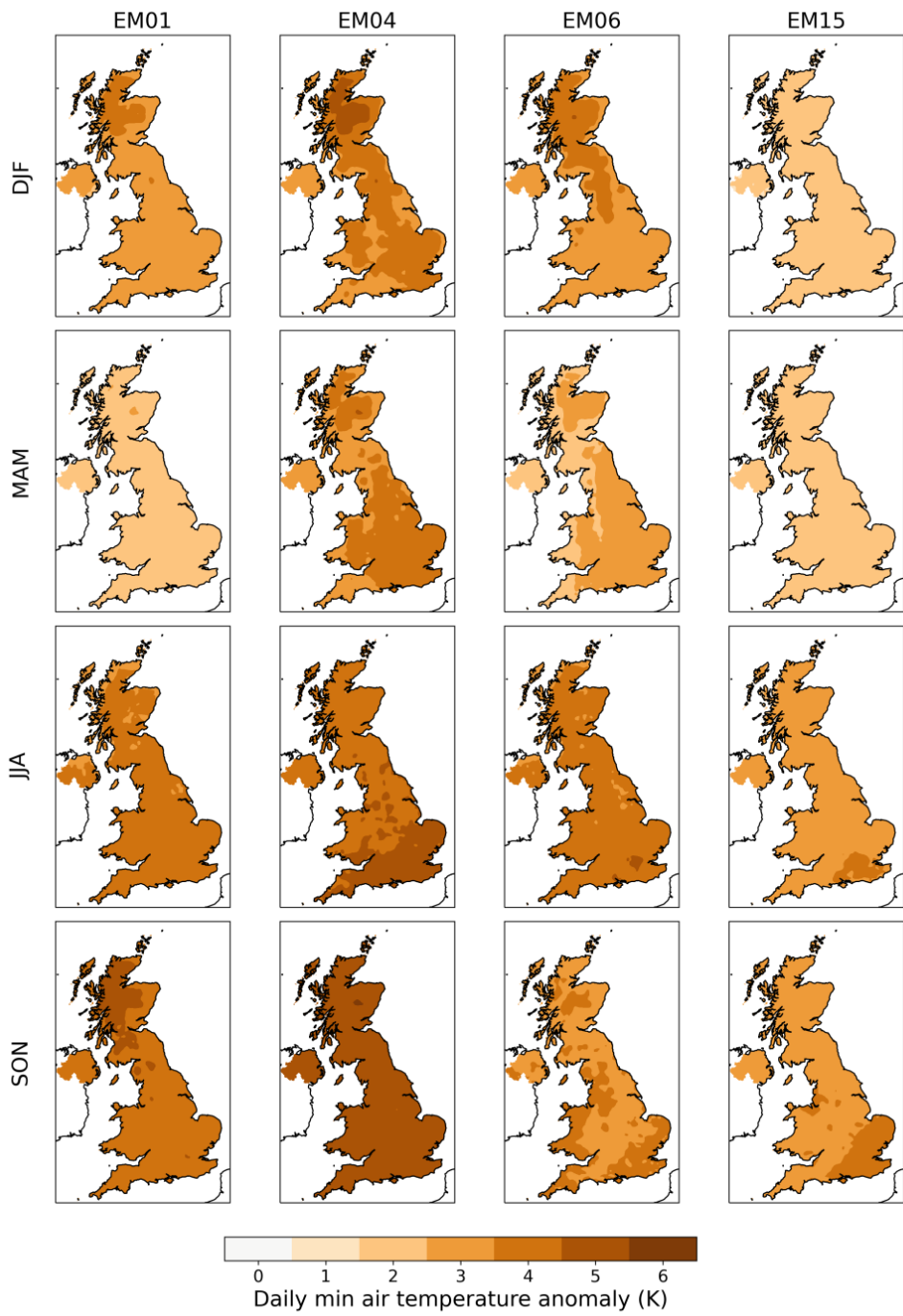
Figure S70: Seasonal daily minimum air temperature anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP8.5.
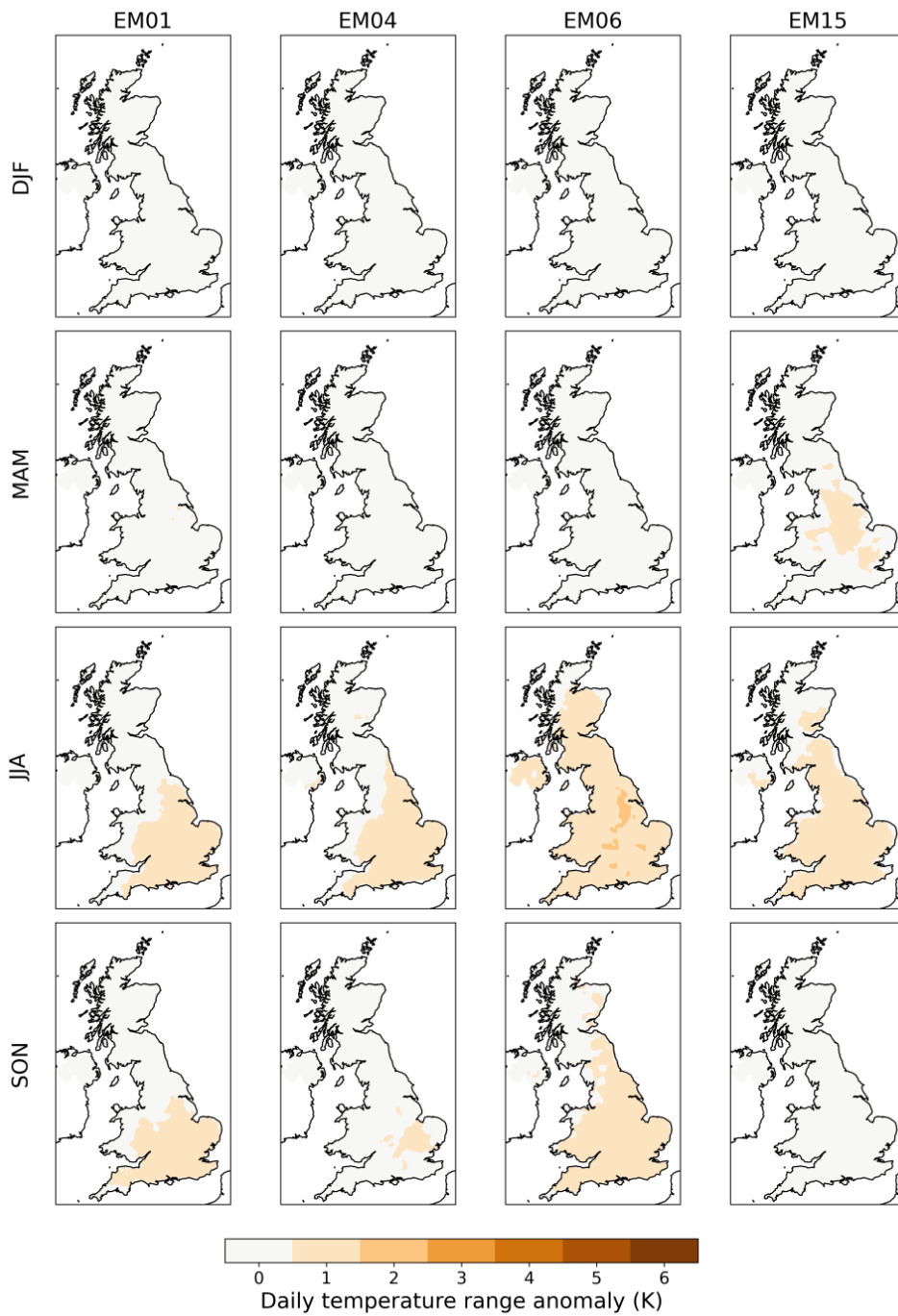
Figure S71: Seasonal daily air temperature range anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
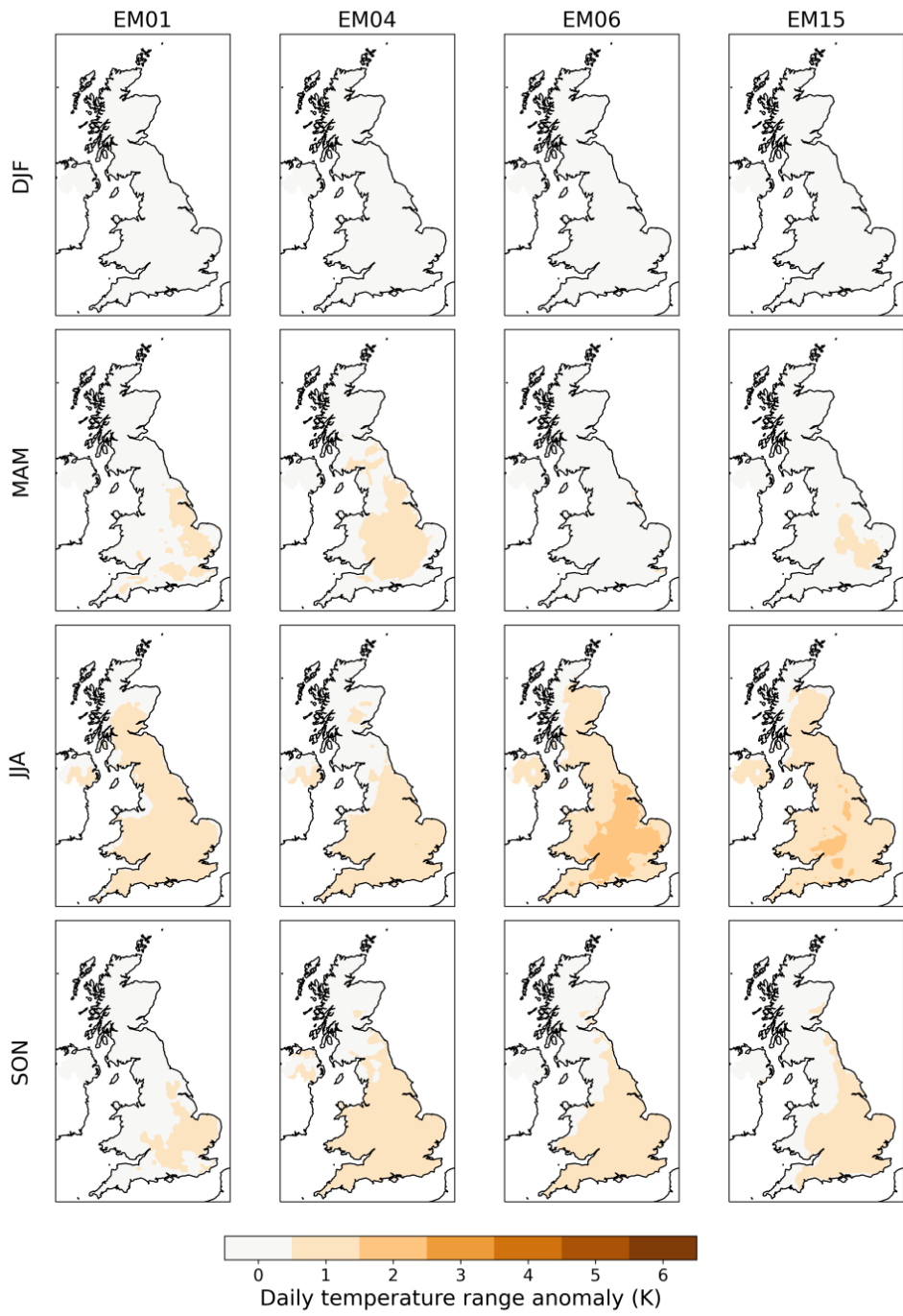
Figure S72: Seasonal daily air temperature range anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
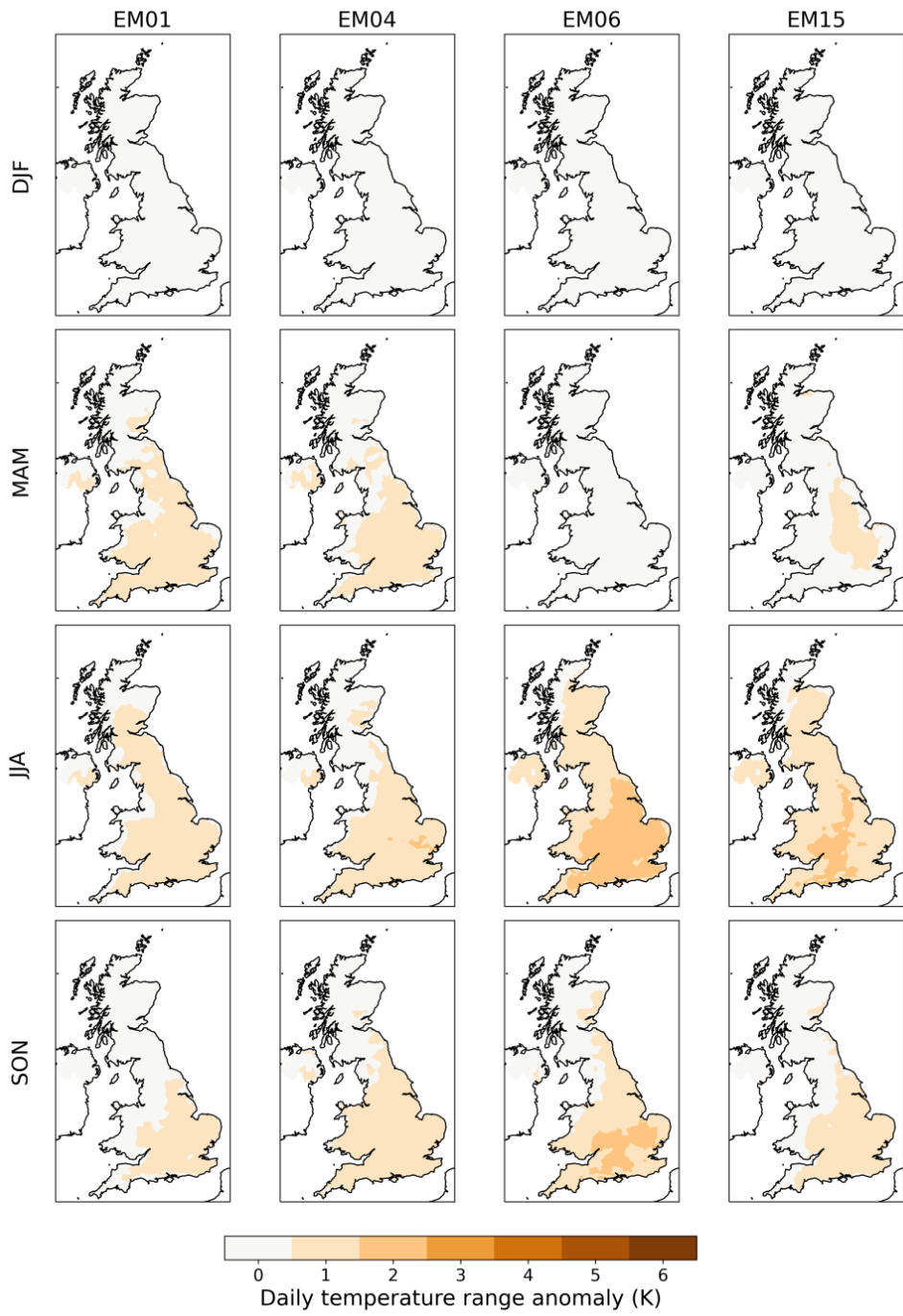
Figure S73: Seasonal daily air temperature range anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
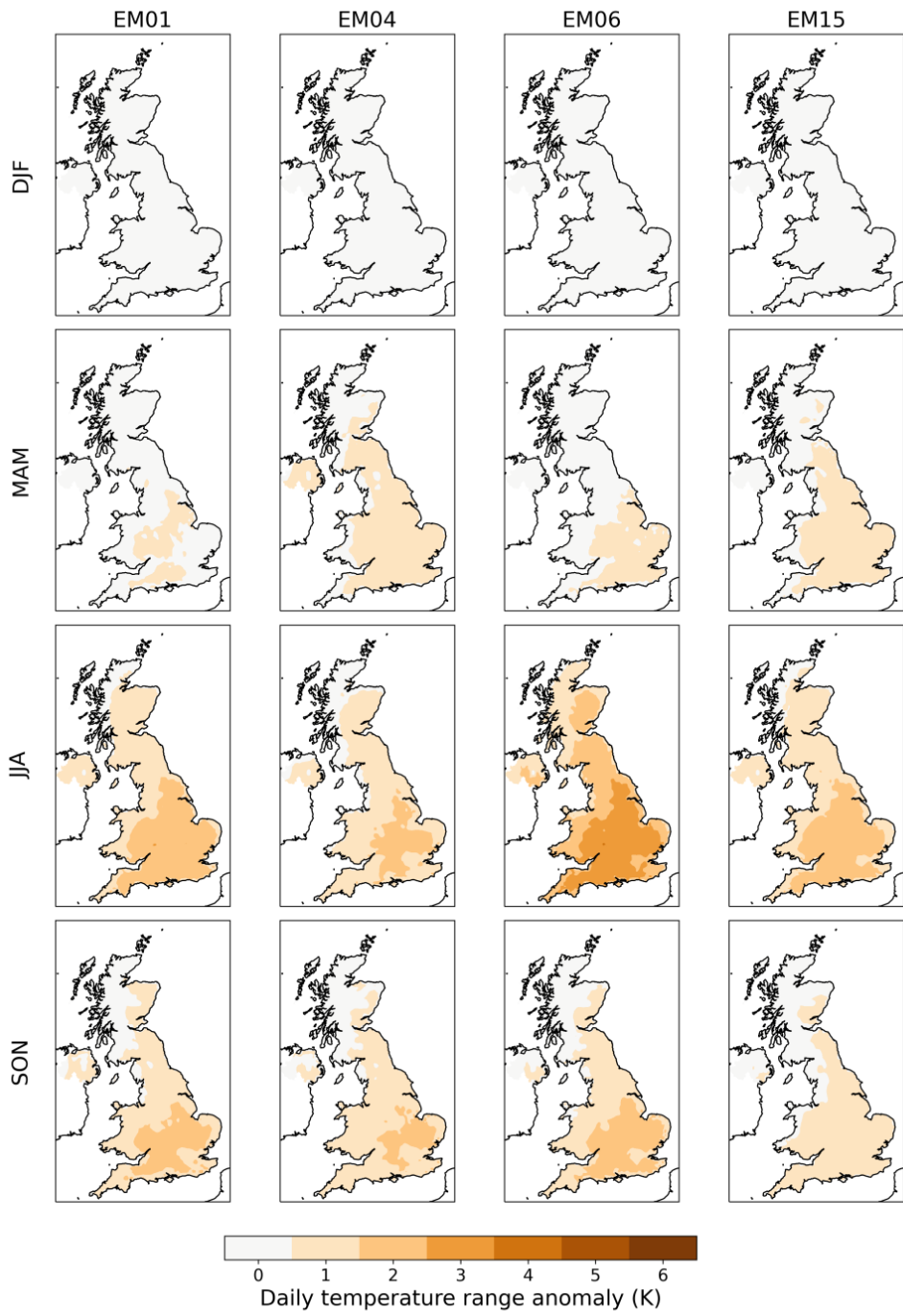
Figure S74: Seasonal daily air temperature range anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP8.5.
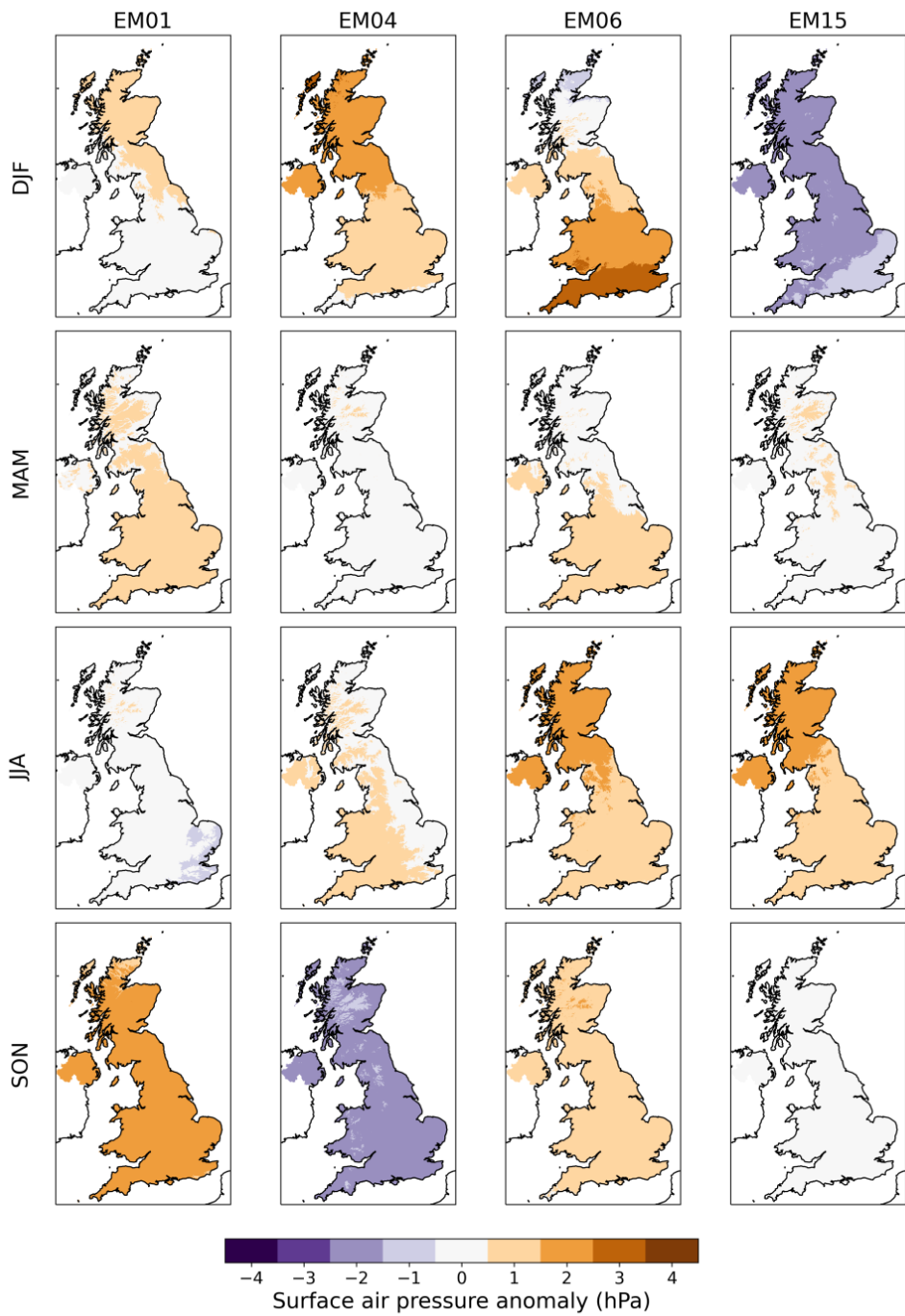
Figure S75: Seasonal surface air pressure anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP2.6.
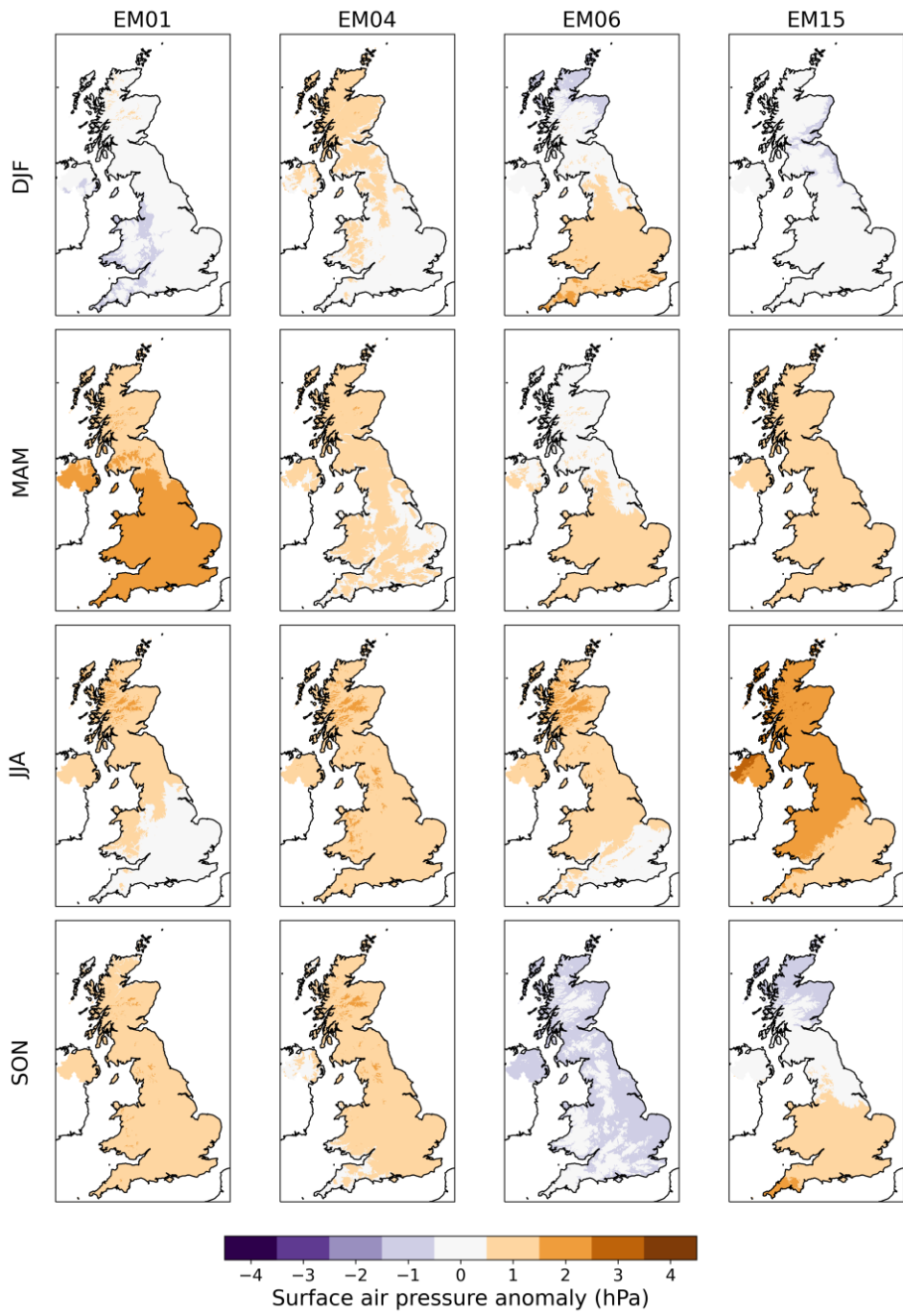
Figure S76: Seasonal surface air pressure anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP4.5.
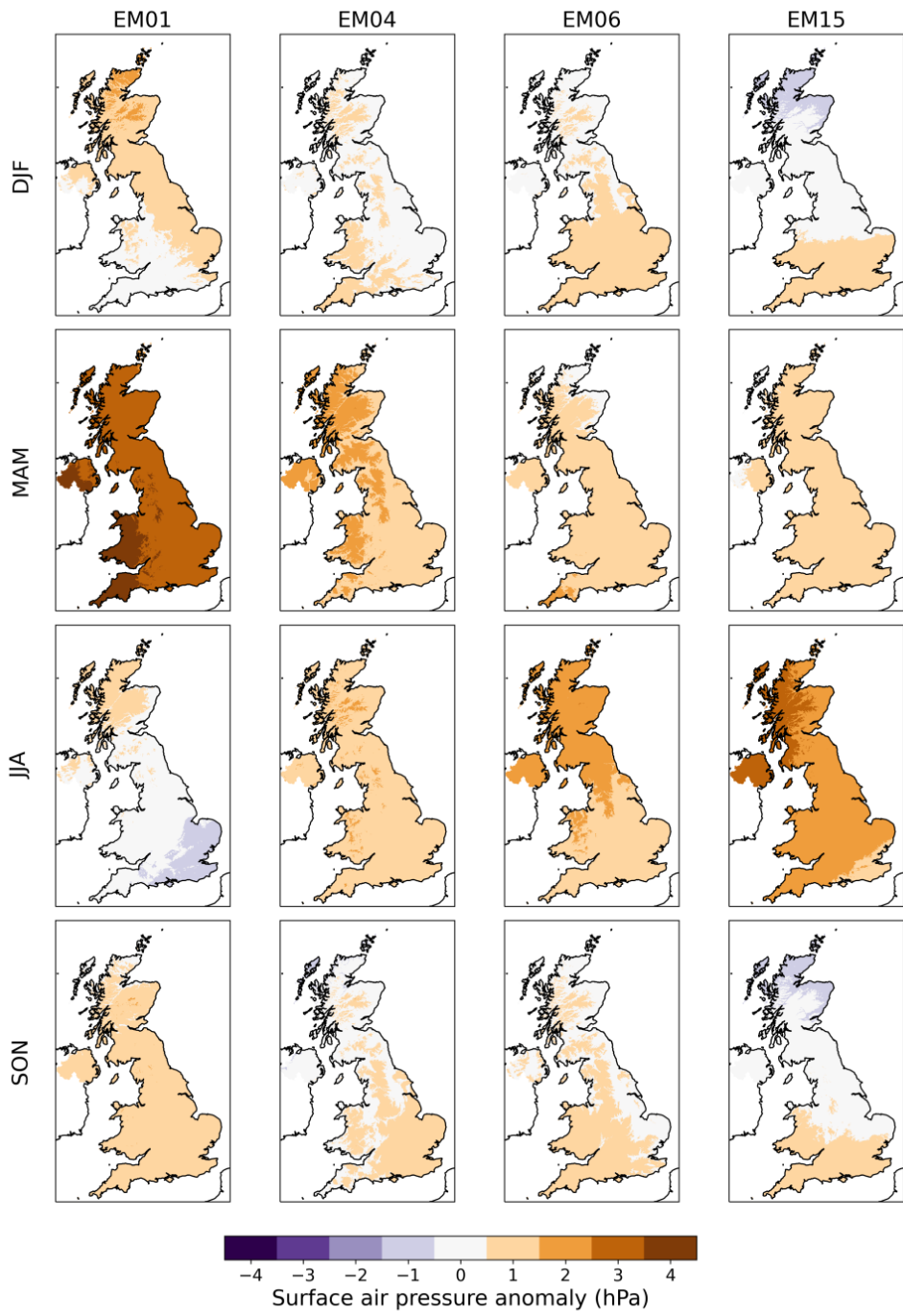
Figure S77: Seasonal surface air pressure anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP6.0.
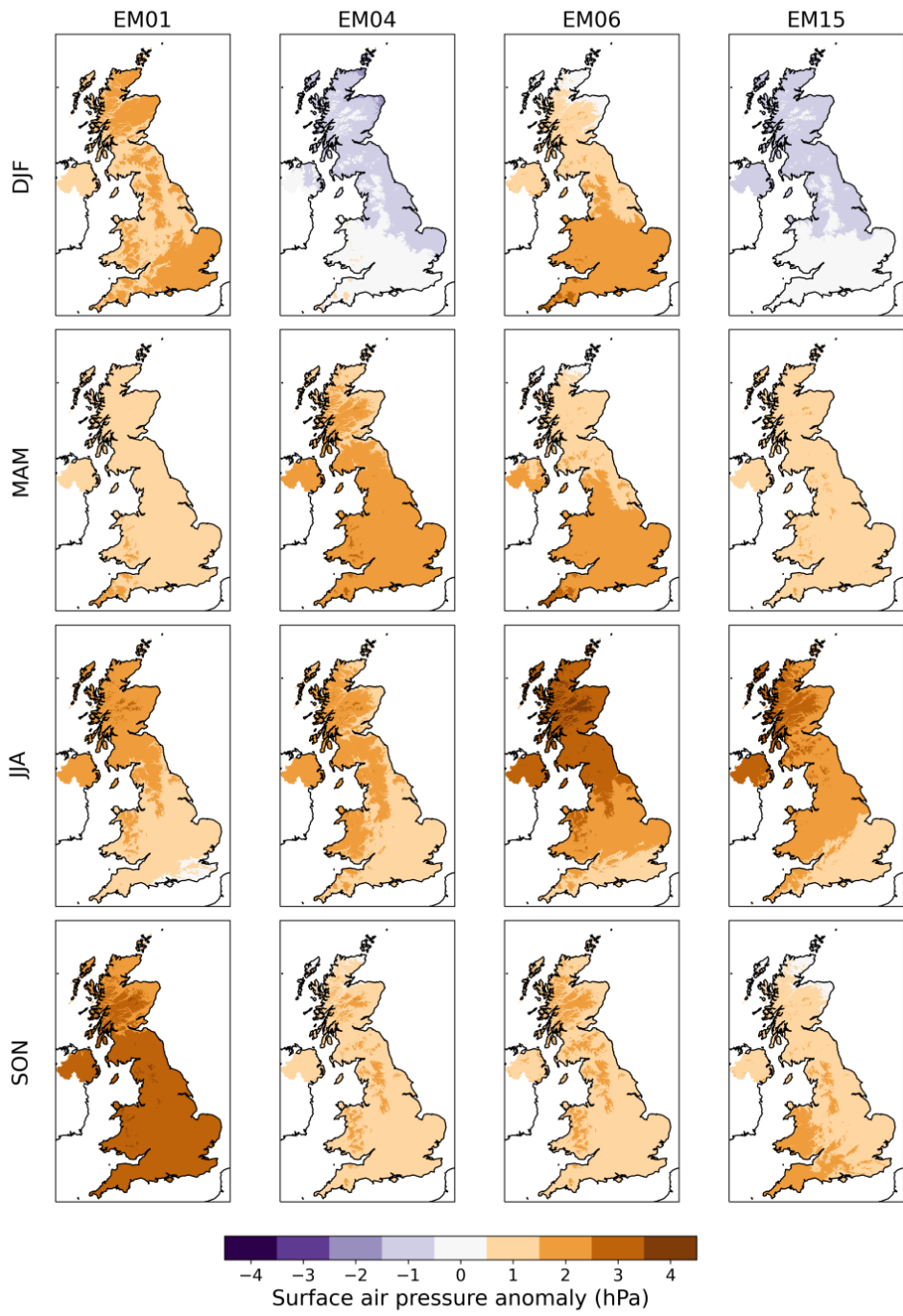
Figure S78: Seasonal surface air pressure anomalies 2060–2080 with respect to the baseline period 1980–2000 for RCP8.5.

5 Comparison with other strands of UKCP18

Time series of air temperature and precipitation, plotted along with UKCP18 CPM timeslices [1] and UKCP18 probabilistic projections [2] can be seen in Figs. 13 and 14 of the manuscript. Here we present the other variables that can be compared with either of these other strands in Figs. S79 to S85. Note that not all variables were available in all strands of UKCP18.
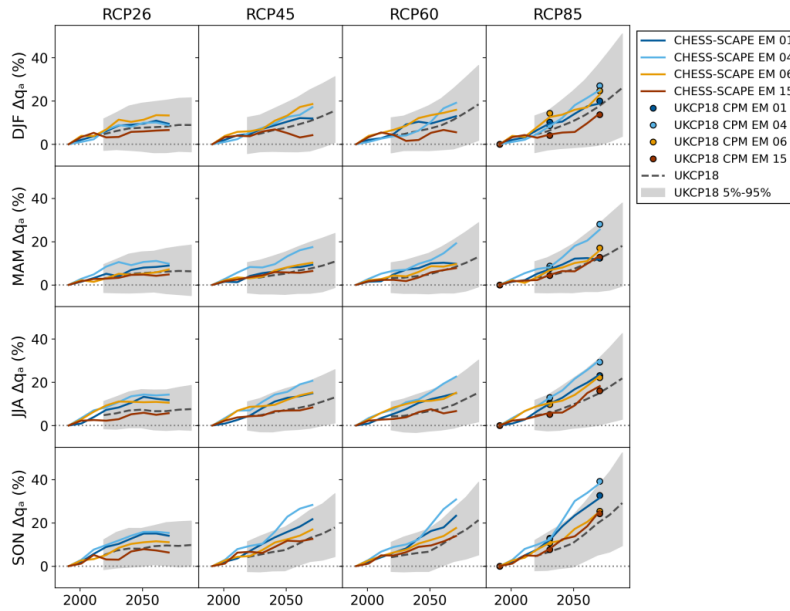
Figure S79: Twenty-year seasonal mean specific humidity anomalies for each ensemble member and RCP. The coloured lines show CHESS-SCAPE bias-corrected variables RCP2.6 (dark blue), RCP4.5 (light blue), RCP6.0 (yellow), RCP8.5 (brown). The grey dashed lines show the median of the UKCP18 probabilistic projections, while the light grey regions show the 5%-95% interval. The dots show the average of the UKCP18 CPM projections at 1980-2000, 2020-2040 and 2060-2080.
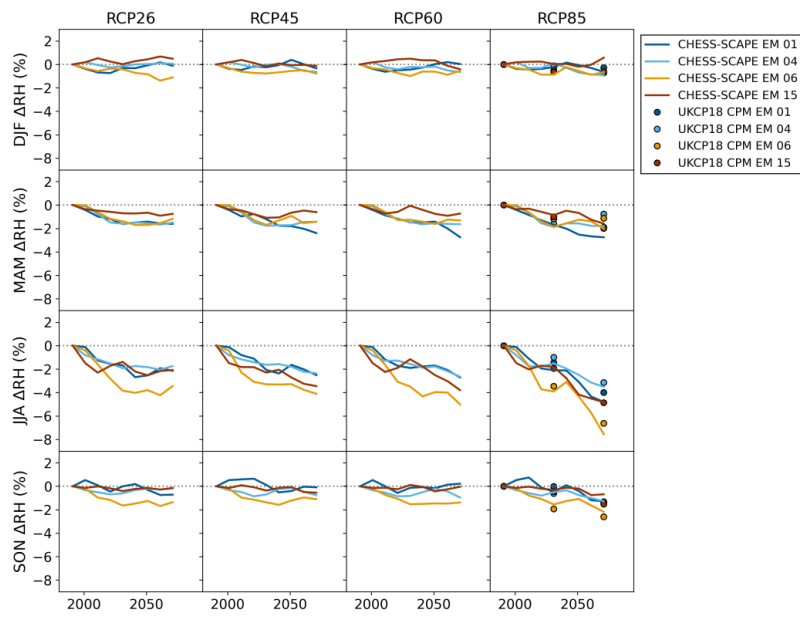
Figure S80: Twenty-year seasonal mean relative humidity anomalies for each ensemble member and RCP. The coloured lines show CHESS-SCAPE bias-corrected variables RCP2.6 (dark blue), RCP4.5 (light blue), RCP6.0 (yellow), RCP8.5 (brown). The dots show the average of the UKCP18 CPM projections at 1980-2000, 2020-2040 and 2060-2080.
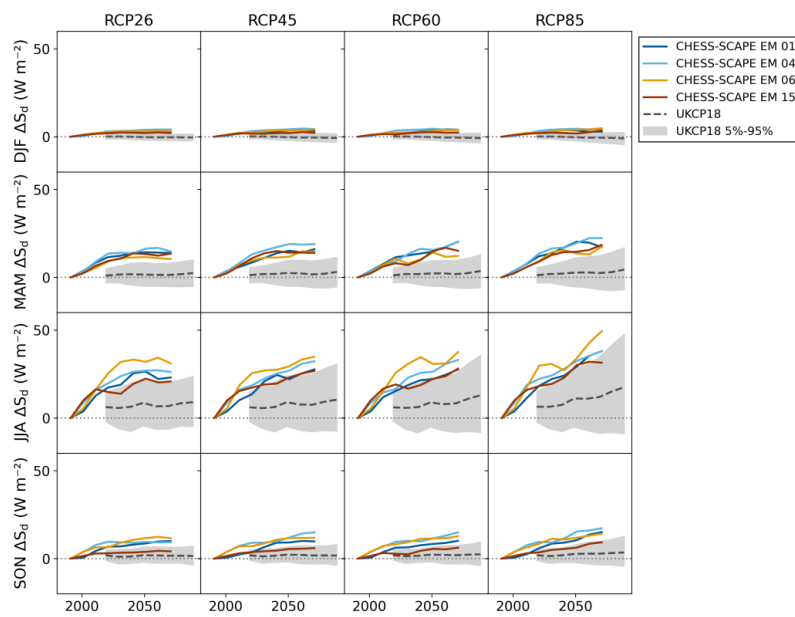
Figure S81: Twenty-year seasonal mean downwelling shortwave radiation anomalies for each ensemble member and RCP. Note that CHESS-SCAPE shows downwelling radiation while UKCP18 probabilistic and CPM are net shortwave radiation. The coloured lines show CHESS-SCAPE bias-corrected variables RCP2.6 (dark blue), RCP4.5 (light blue), RCP6.0 (yellow), RCP8.5 (brown). The grey dashed lines show the median of the UKCP18 probabilistic projections, while the light grey regions show the 5%-95% interval.
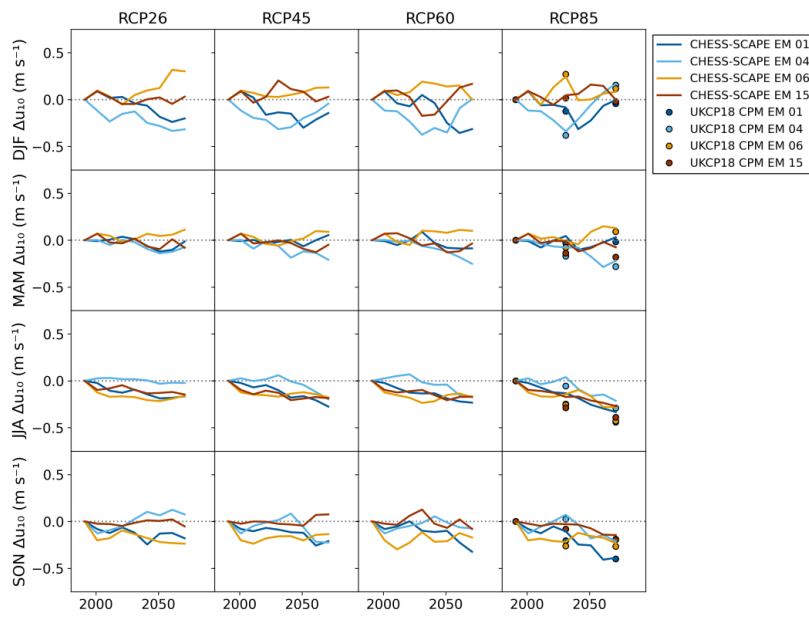
Figure S82: Twenty-year seasonal mean wind speed anomalies for each ensemble member and RCP. The coloured lines show CHESS-SCAPE bias-corrected variables RCP2.6 (dark blue), RCP4.5 (light blue), RCP6.0 (yellow), RCP8.5 (brown). The dots show the average of the UKCP18 CPM projections at 1980-2000, 2020-2040 and 2060-2080.
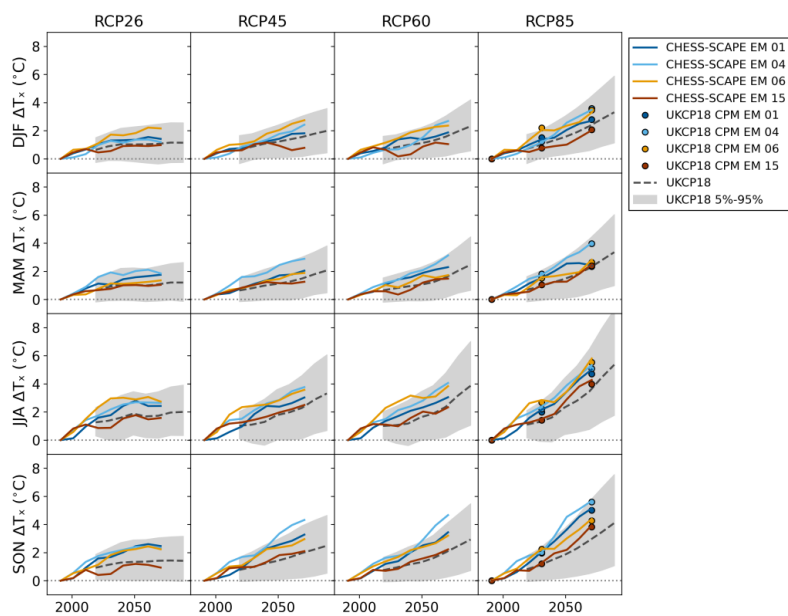
Figure S83: Twenty-year seasonal mean daily maximum air temperature anomalies for each ensemble member and RCP. The coloured lines show CHESS-SCAPE bias-corrected variables RCP2.6 (dark blue), RCP4.5 (light blue), RCP6.0 (yellow), RCP8.5 (brown). The grey dashed lines show the median of the UKCP18 probabilistic projections, while the light grey regions show the 5%-95% interval. The dots show the average of the UKCP18 CPM projections at 1980-2000, 2020-2040 and 2060-2080.
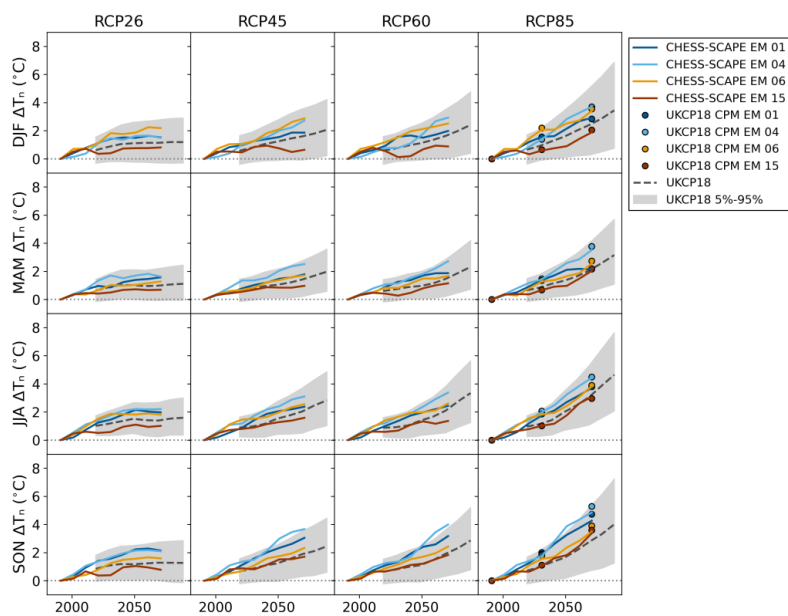
Figure S84: Twenty-year seasonal mean daily minimum air temperature anomalies for each ensemble member and RCP. The coloured lines show CHESS-SCAPE bias-corrected variables RCP2.6 (dark blue), RCP4.5 (light blue), RCP6.0 (yellow), RCP8.5 (brown). The grey dashed lines show the median of the UKCP18 probabilistic projections, while the light grey regions show the 5%-95% interval. The dots show the average of the UKCP18 CPM projections at 1980-2000, 2020-2040 and 2060-2080.
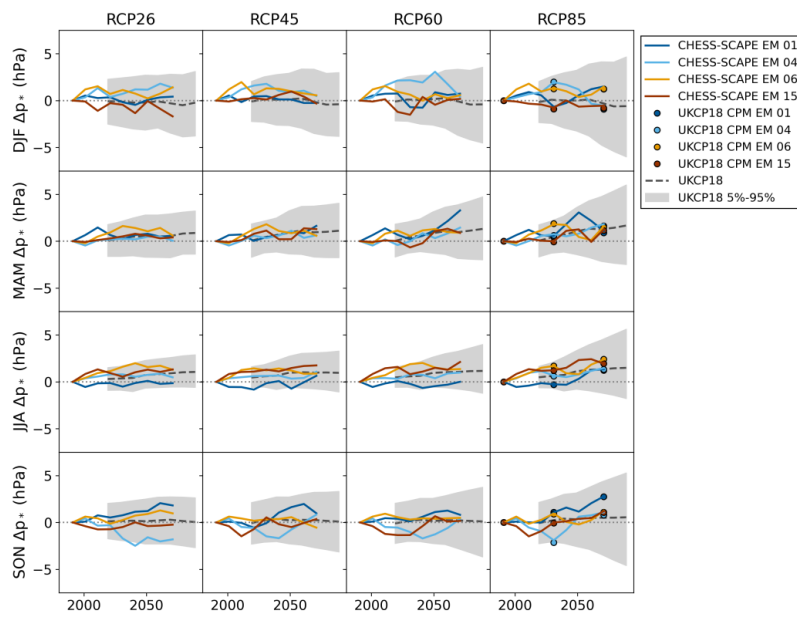
Figure S85: Twenty-year seasonal mean surface air pressure anomalies for each ensemble member and RCP. The coloured lines show CHESS-SCAPE bias-corrected variables RCP2.6 (dark blue), RCP4.5 (light blue), RCP6.0 (yellow), RCP8.5 (brown). The grey dashed lines show the median of the UKCP18 probabilistic projections, while the light grey regions show the 5%-95% interval. The dots show the average of the UKCP18 CPM projections at 1980-2000, 2020-2040 and 2060-2080.

References

[1] Met Office Hadley Centre. UKCP Local Projections by Administrative Regions over the UK for 1980-2080, 2018. URL `https://catalogue.ceda.ac.uk/uuid/e7b0165f3b57409998ca2632dad7a1a3`. Accessed 2020-06-03.

[2] Met Office Hadley Centre. UKCP18 Probabilistic Projections by Administrative Regions over the UK for 1961-2100, 2018. URL `https://catalogue.ceda.ac.uk/uuid/8eca5b80ee244d9486162e699c5197f5`. Accessed 2020-06-03.