Supplement of Earth Syst. Sci. Data, 9, 905–925, 2017
https://doi.org/10.5194/essd-9-905-2017-supplement

Open Access Earth System Science Data

Supplement of

CHASE-PL Climate Projection dataset over Poland – bias adjustment of EURO-CORDEX simulations

Abdelkader Mezghani et al.

Correspondence to: Abdelkader Mezghani (abdelkaderm@met.no)

1 Introduction

The regional climate model simulations, referred hereafter to as 'simulations', consist of nine historical simulations spanning the time period from 1949 to 2005 and of 18 model simulations spanning the future time period from 2006 to 2100 provided within the EURO-CORDEX initiative (Table 1). From these simulations, we extracted daily minimum and maximum temperatures and precipitation on grid cells belonging to the same spatial domain as the observations i.e. the area of Poland and parts of the Vistula and Odra basins belonging to neighbouring countries. This domain corresponds to the area from 13.1 to 26.1 degrees East and 48.6 to 54.9 degrees North. The total number of the grid cells equals $N_g = 23016$ (168 × 137).

We also focused on three common time slices spanning the periods 1971-2000 referred further to as control period and two future horizons 2021–2050 and 2071–2100, respectively. As those simulations were made available on different spatial resolutions, an interpolation onto the same 5 × 5 km grid as for observations was performed before the bias correction method was applied. The quantile mapping method as described in Sect.3 of the main manuscript was additionally applied to correct for systematic biases in regional climate model simulations. Future changes in climate variables (in terms of absolute change for tempertaure related variables and relative change for precpitation) were computed with regards to the base period 1971–2000.

The atlas presented here consists of nine bias adjusted simulations (N_{SIM}), four essential climatic variables ($N_{ECV} = 4$) such as daily precipitation and daily minimum, maximum, and averaged temperature projected into two future time horizons ($N_{HORIZONS} = 2$), and two representative concentration pathways such as RCP4.5 and RCP8.5 ($N_{RCPs} = 2$). We assessed the changes on seasonal and annual aggregates ($N_{TAGG} = 5$) of the climate parameters which yielded to analyze $N_{SIM} \times N_{ECV} \times N_{TAGG} \times N_{HORIZONS} \times N_{RCPs} = 9 \times 4 \times 5 \times 2 \times 2 = 720$ maps of projections. For that reason, the Climate Impact Geoportal (ClimateImpact.sggw.pl) was developed within the CHASE-PL project and present an alternative for producing interactive maps of projections with a zoom on Poland. In this supporting material, we only present some of the full catalogue of maps.

The supporting material is organized as the following. Model biases in both raw and corrected simulation are mapped and listed in Sect. 2. Climate change sensitivity to the bias corrected method is provided in Sect. 3. Changes in multi-model ensemble mean of projected monthly sums of precipitation and mean temperature are presented in Sect. 4.1. Maps of changes in individual model simulations are listed in Sect. 4.2 for both minimum and maximum temperature and monthly sums of precipitation.

Table 1. GCM/RCM simulations.

N	Global Climate Model			Regional Climate Model	
	Institute	Model	Run	Institute	Model
1	CNRM-CERFACS	CNRM-CM5	r1i1p1	CLMcom	CCLM4-8-17
2	CNRM-CERFACS	CNRM-CM5	r1i1p1	SMHI	RCA4
3	ICHEC	EC-EARTH	r12i1p1	CLMcom	CCLM4-8-17
4	ICHEC	EC-EARTH	r12i1p1	SMHI	RCA4
5	ICHEC	EC-EARTH	r1i1p1	KNMI	RACMO22E
6	ICHEC	EC-EARTH	r3i1p1	DMI	HIRHAM5
7	IPSL	IPSL-CM5A-MR	r1i1p1	SMHI	RCA4
8	MPI-M	MPI-ESM-LR	r1i1p1	CLMcom	CCLM4-8-17
9	MPI-M	MPI-ESM-LR	r1i1p1	SMHI	RCA4

2 Biases in raw and corrected simulations

2.1 CNRM-CM5/CCLM4-8-17 simulation

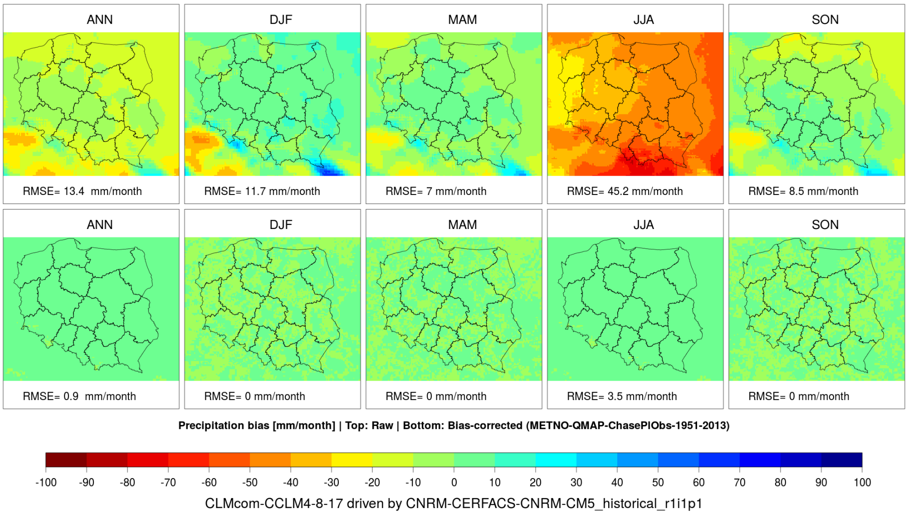

Fig. S1. Bias in modelled precipitation (mm/month) by simulation 1. The bias is computed as the difference between historical simulations and observations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSE indicates the root mean square values of the bias averaged over the whole spatial domain.

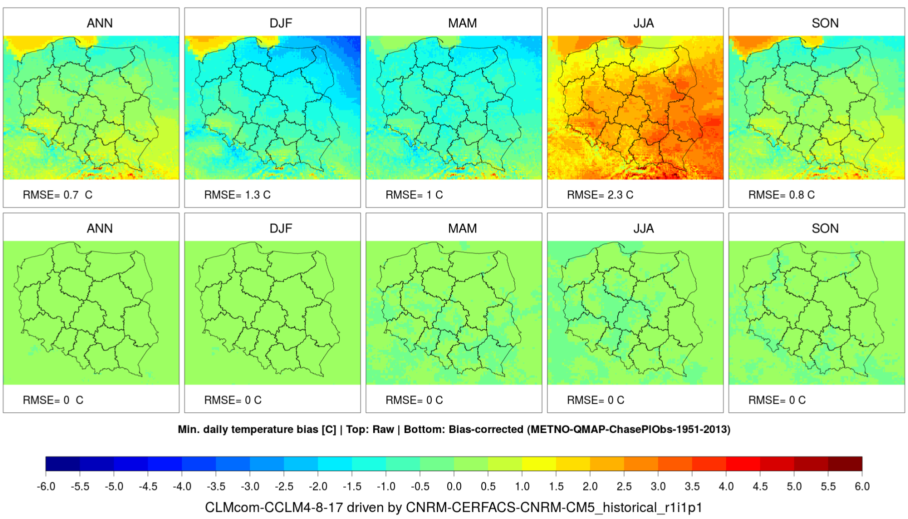

Fig. S2. Same caption as in Fig. S1 but for modelled minimum temperature (°C).

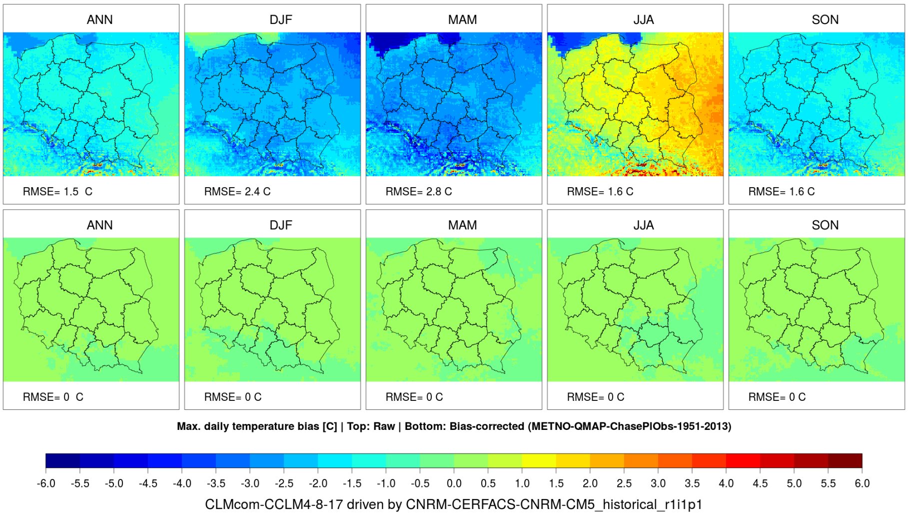

Fig. S3. Same caption as in Fig. S1 but for modelled maximum temperature (°C).

2.2 CNRM-CM5/RCA4 simulation

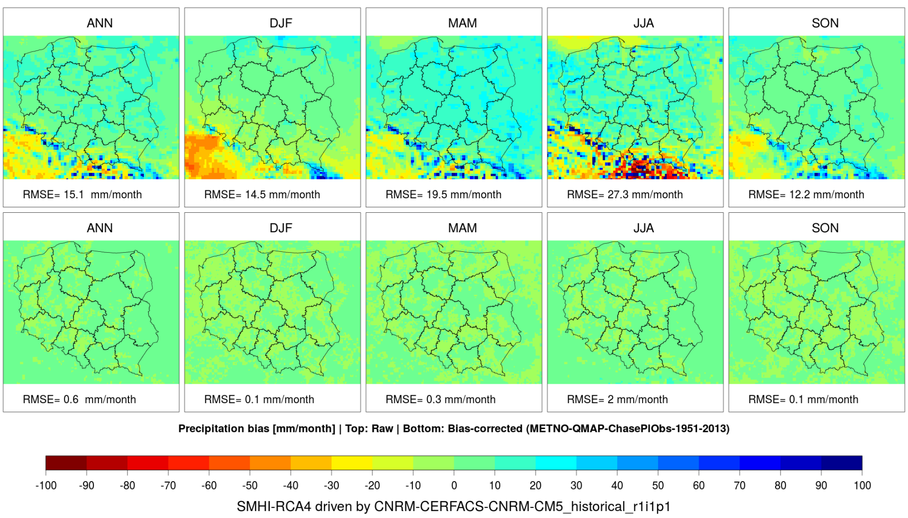

Fig. S4. Bias in modelled precipitation (mm/month) by simulation 2. The bias is computed as the difference between historical simulations and observations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSE indicates the root mean square values of the bias averaged over the whole spatial domain.

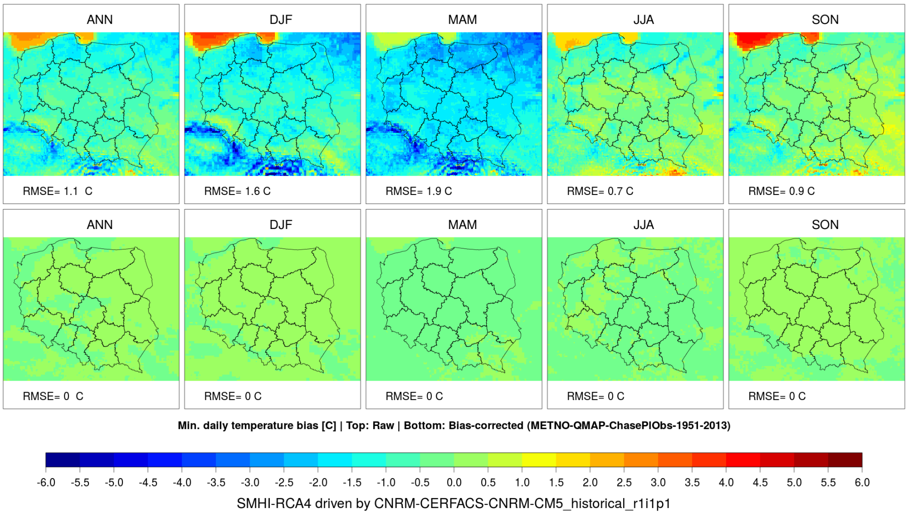

Fig. S5. Same caption as in Fig. S4 but for modelled minimum temperature (°C).

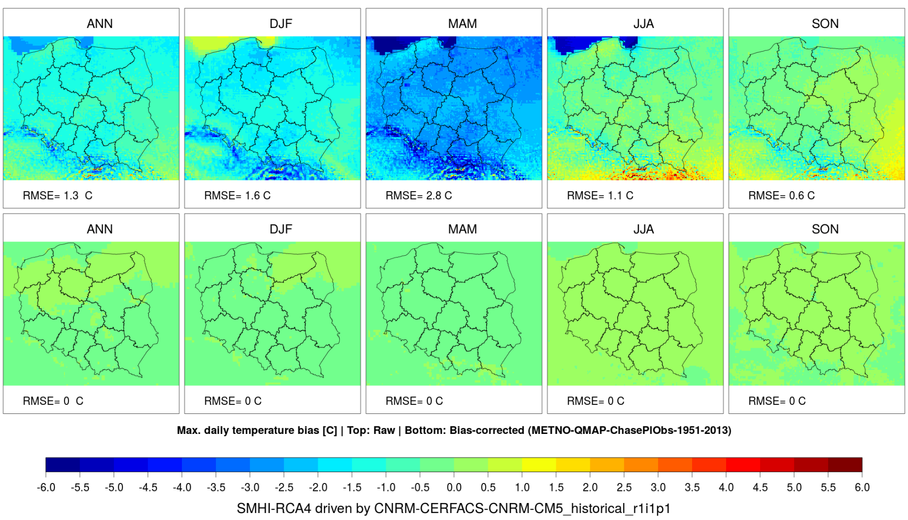

Fig. S6. Same caption as in Fig. S4 but for modelled maximum temperature (°C).

2.3 EC-EARTH/CCLM4-8-17 simulation

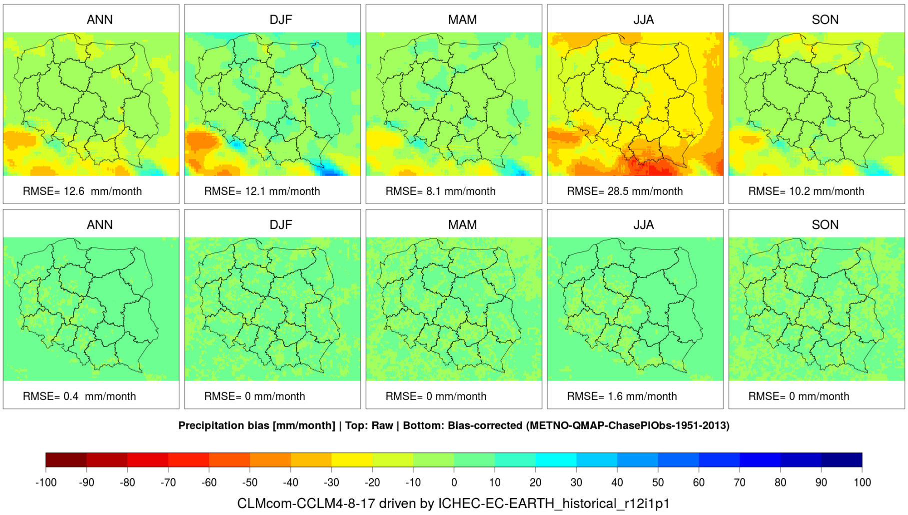

Fig. S7. Bias in modelled precipitation (mm/month) by simulation 3. The bias is computed as the difference between historical simulations and observations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSE indicates the root mean square values of the bias averaged over the whole spatial domain.

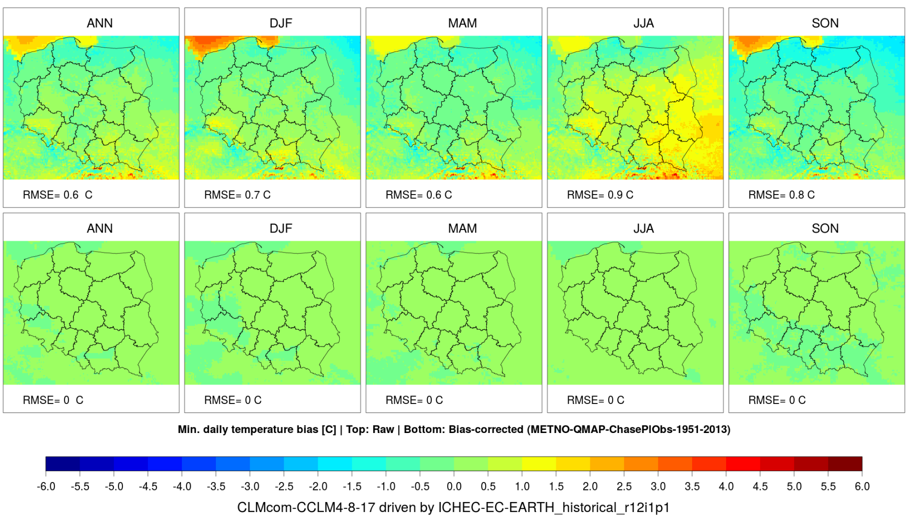

Fig. S8. Same caption as in Fig. S7 but for modelled minimum temperature (°C).

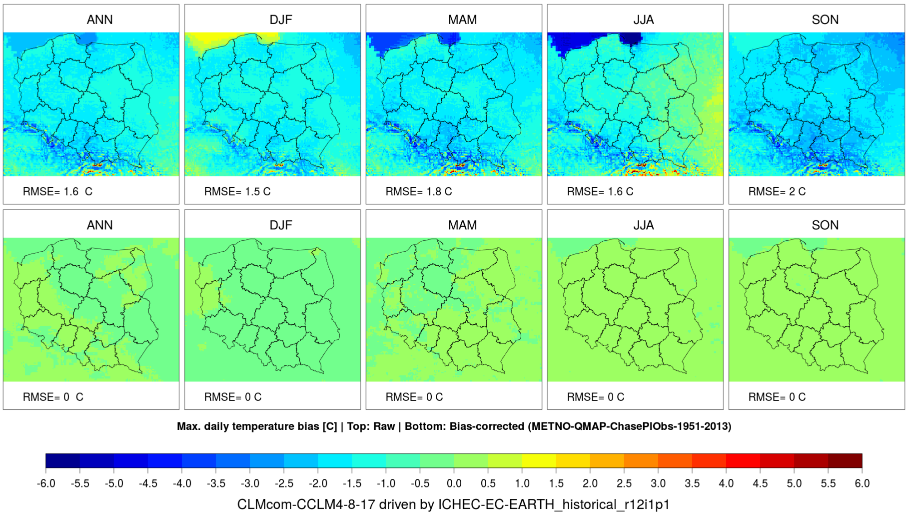

Fig. S9. Same caption as in Fig. S7 but for modelled maximum temperature (°C).

2.4 EC-EARTH/RCA4 simulation

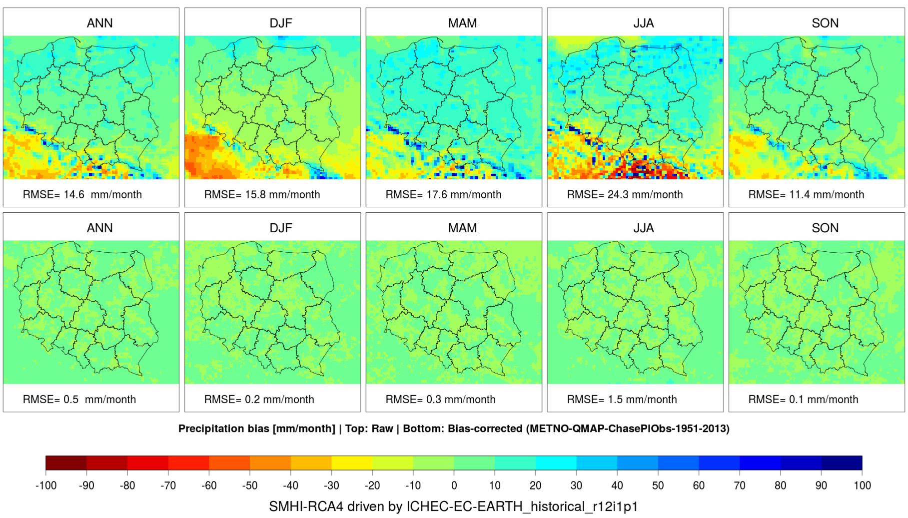

Fig. S10. Bias in modelled precipitation (mm/month) by simulation 4. The bias is computed as the difference between historical simulations and observations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSE indicates the root mean square values of the bias averaged over the whole spatial domain.

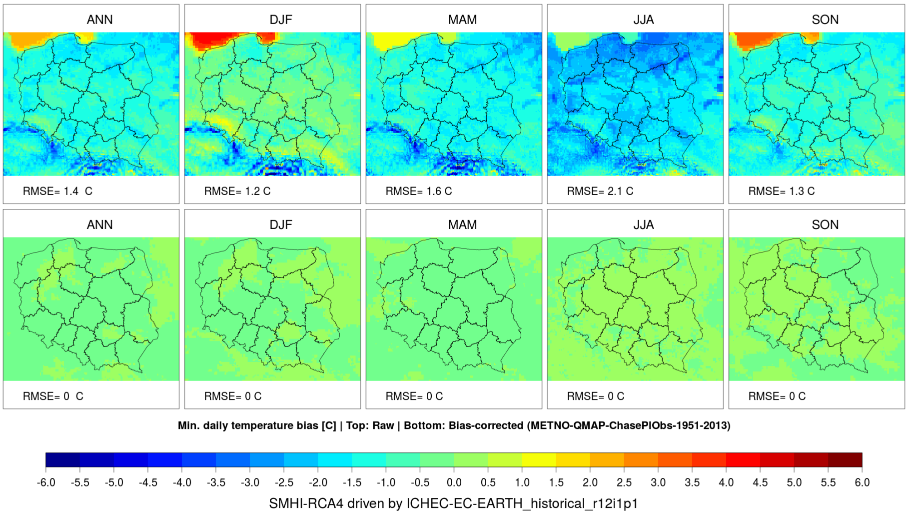

Fig. S11. Same caption as in Fig. S10 but for modelled minimum temperature (°C).

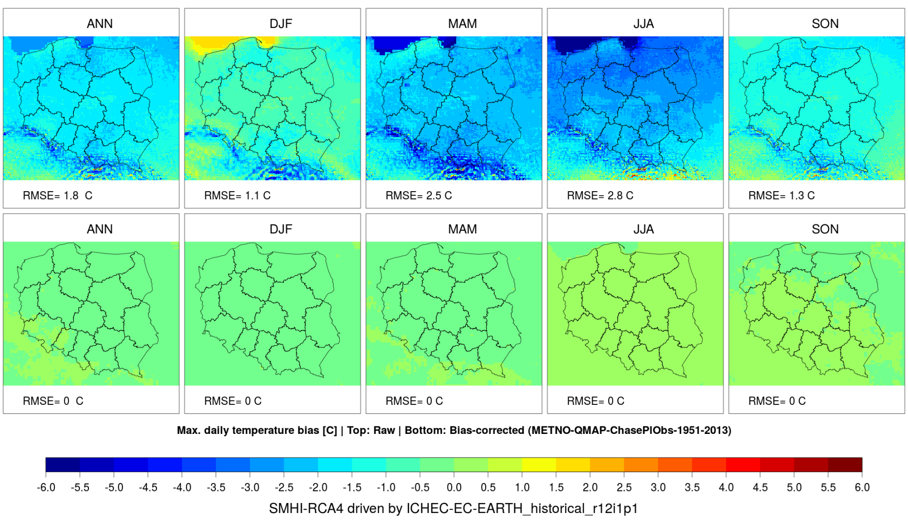

Fig. S 12. Same caption as in Fig. S10 but for modelled maximum temperature (°C).

2.5 EC-EARTH/RACMO22E simulation

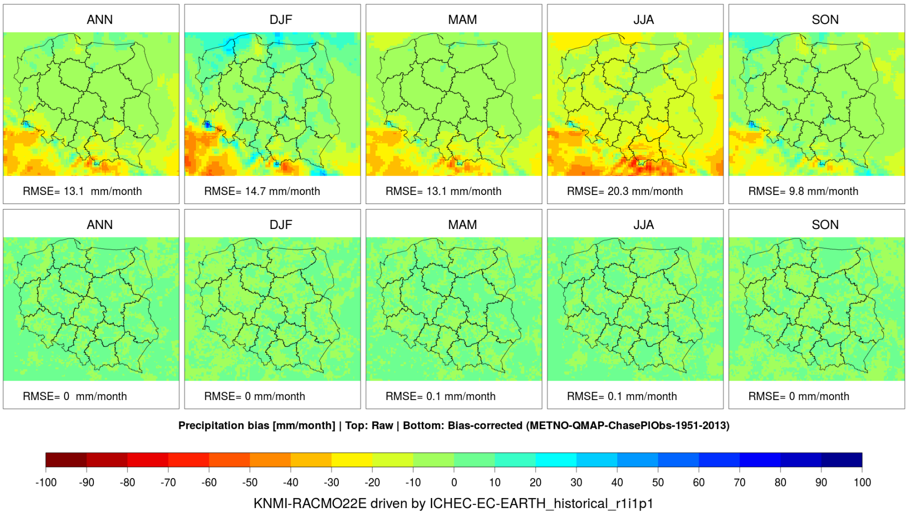

Fig. S13. Bias in modelled precipitation (mm/month) by simulation 5. The bias is computed as the difference between historical simulations and observations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSE indicates the root mean square values of the bias averaged over the whole spatial domain.

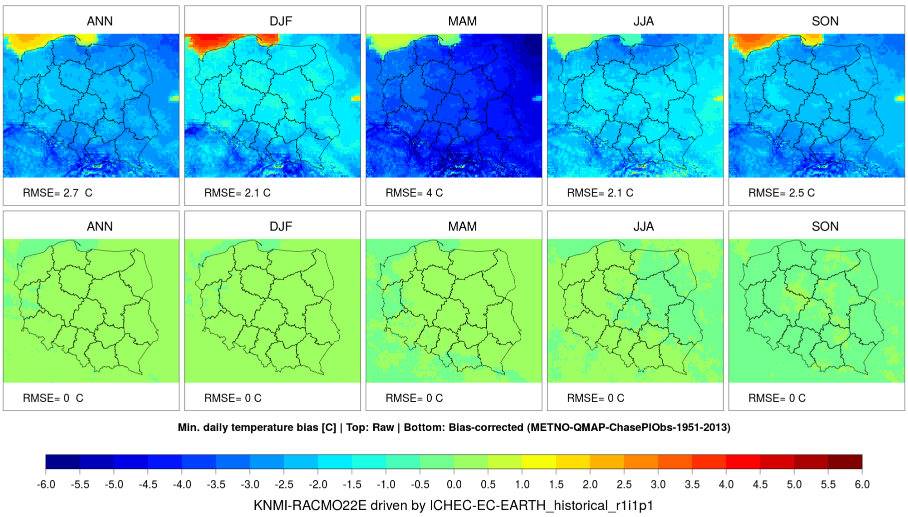

Fig. S14. Same caption as in Fig. S13 but for modelled minimum temperature (°C).

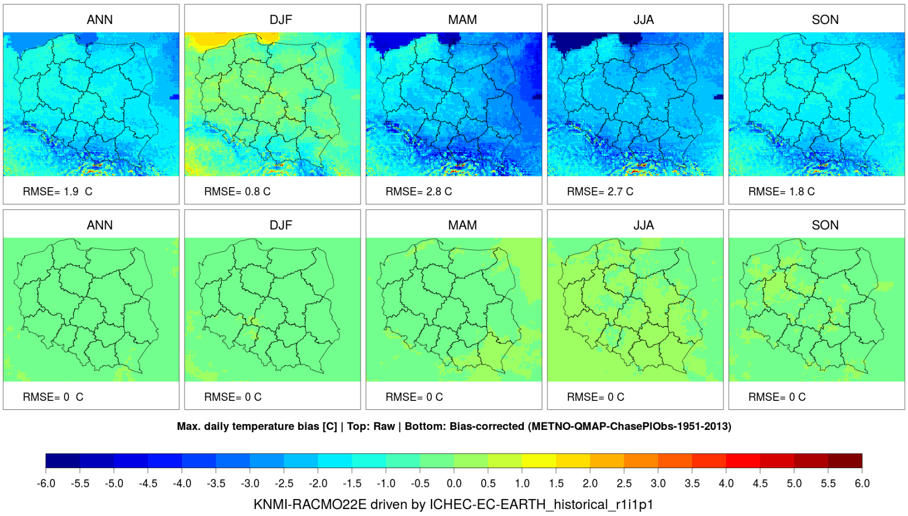

Fig. S15. Same caption as in Fig. S13 but for modelled maximum temperature (°C).

2.6 EC-EARTH/HIRHAM5 simulation

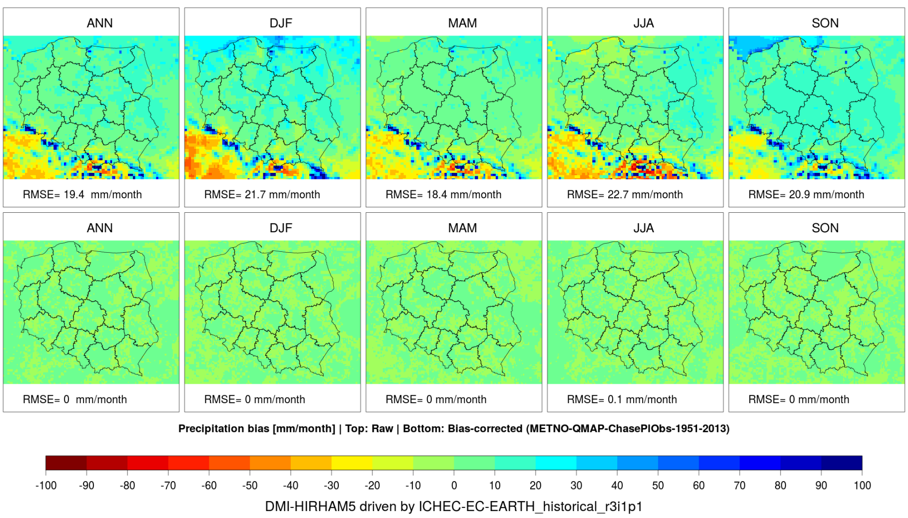

Fig. S16. Bias in modelled precipitation (mm/month) by simulation 6. The bias is computed as the difference between historical simulations and observations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSE indicates the root mean square values of the bias averaged over the whole spatial domain.

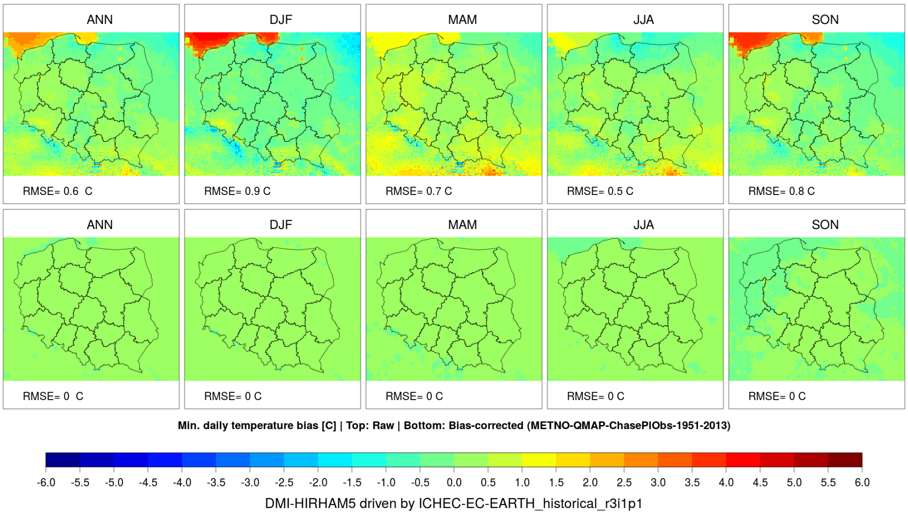

Fig. S17. Same caption as in Fig. S16 but for modelled minimum temperature (°C).

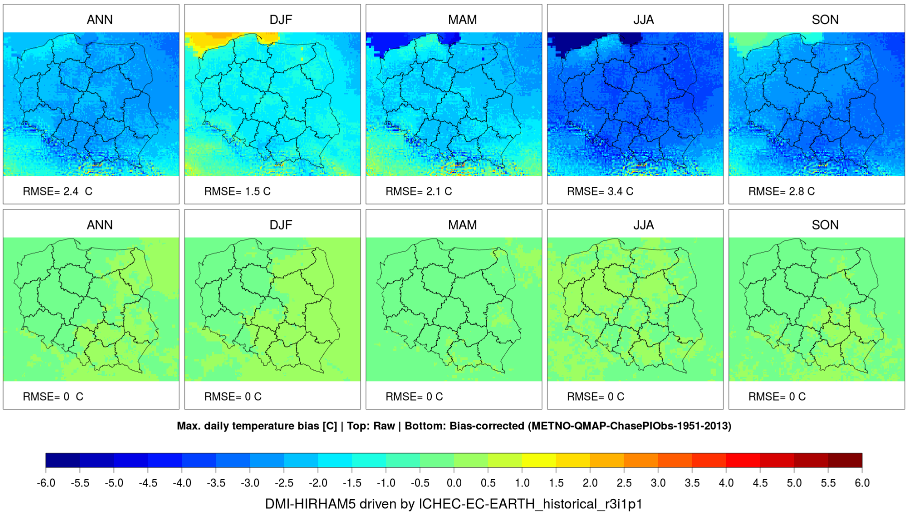

Fig. S18. Same caption as in Fig. S16 but for but for modelled maximum temperature (°C).

2.7 IPSL-CM5A-MR/RCA4 simulation

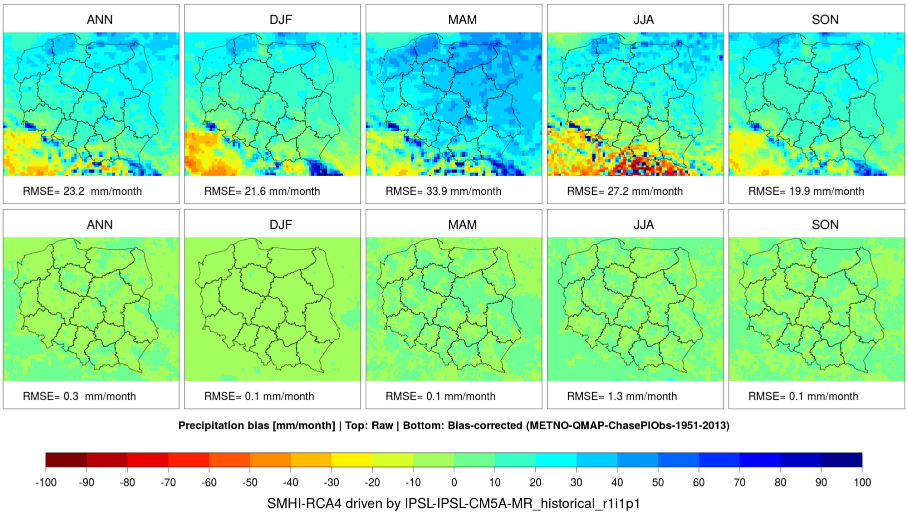

Fig. S19. Bias in modelled precipitation (mm/month) by simulation 7. The bias is computed as the difference between historical simulations and observations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSE indicates the root mean square values of the bias averaged over the whole spatial domain.

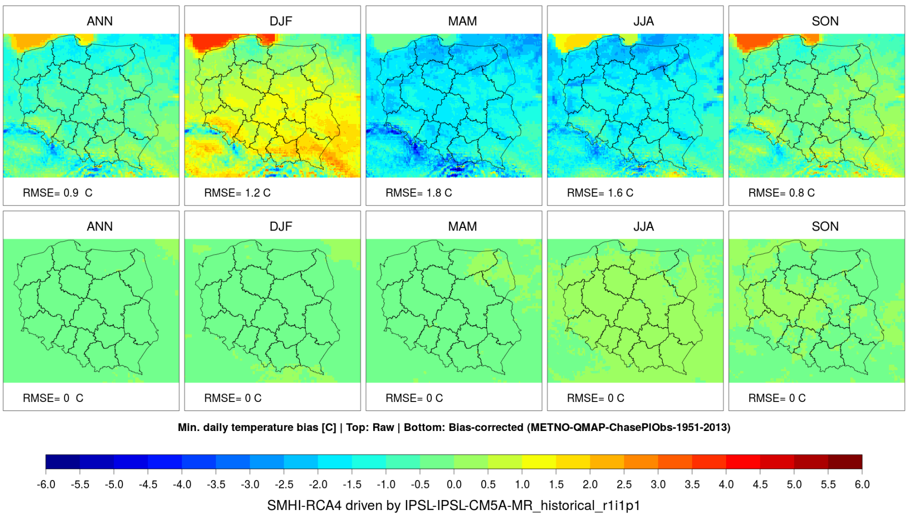

Fig. S20. Same caption as in Fig. S19 but for but for modelled minimum temperature (°C).

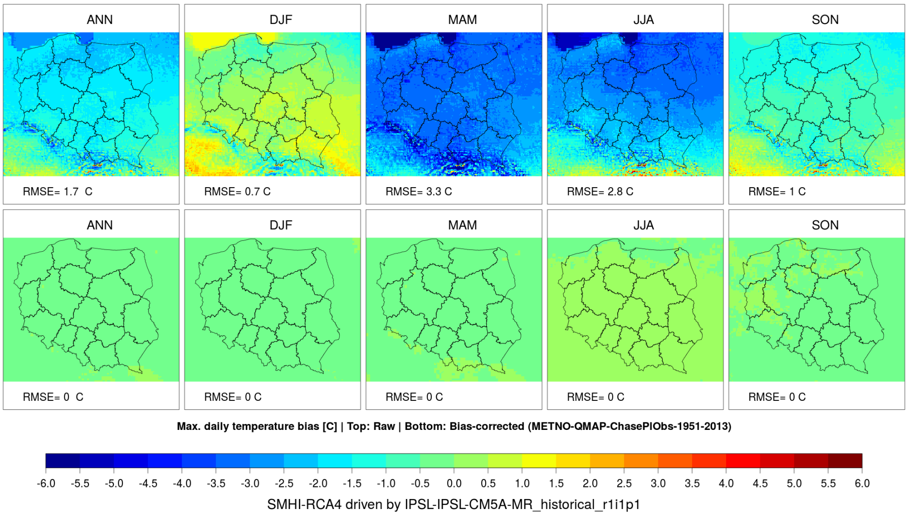

Fig. S21. Same caption as in Fig. S19 but for but for modelled maximum temperature (°C).

2.8 MPI-ESM-LR/CCLM4-8-17 simulation

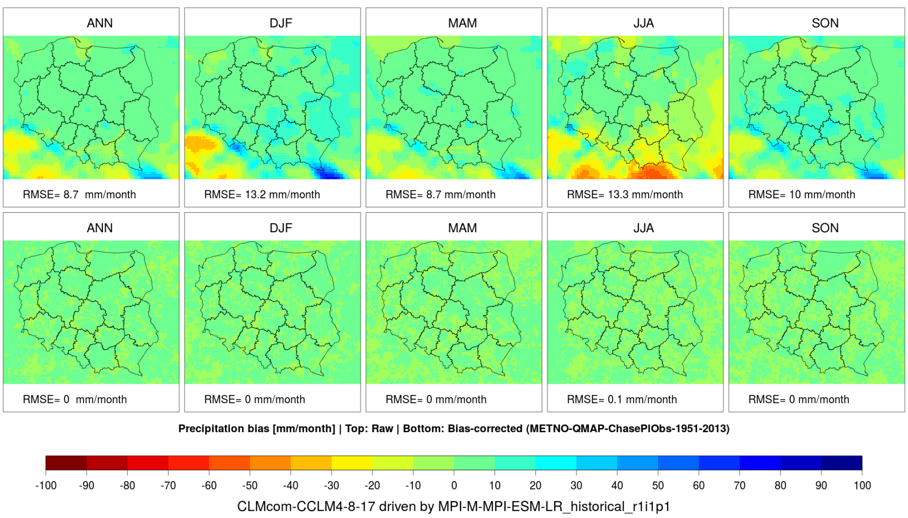

Fig. S22. Bias in modelled precipitation (mm/month) by simulation 8. The bias is computed as the difference between historical simulations and observations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSE indicates the root mean square values of the bias averaged over the whole spatial domain.

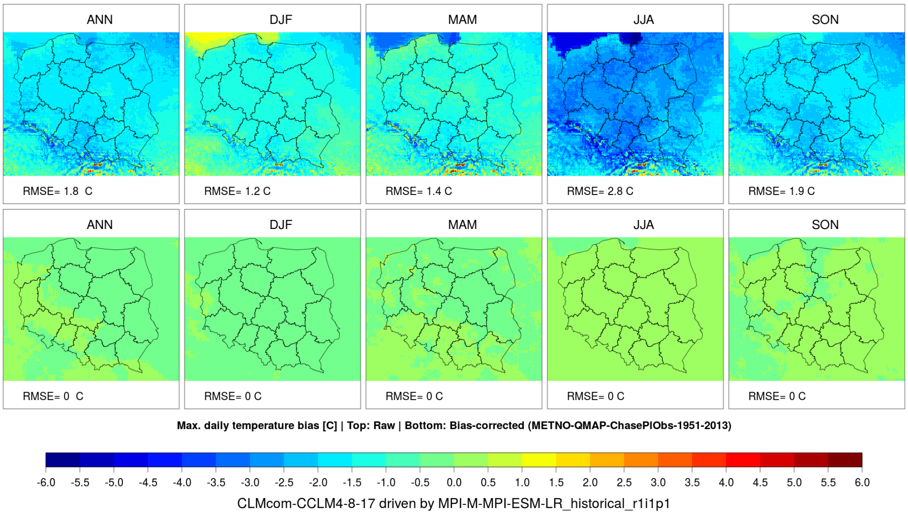

Fig. S23. Same caption as in Fig. S22 but for but for modelled minimum temperature (°C).

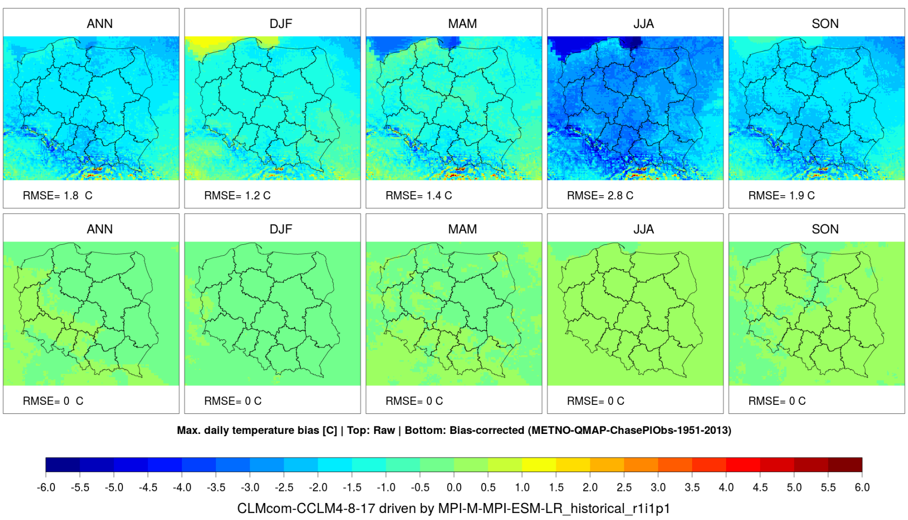

Fig. S24. Same caption as in Fig. S22 but for but for modelled maximum temperature (°C).

2.9 MPI-ESM-LR/RCA4 simulation

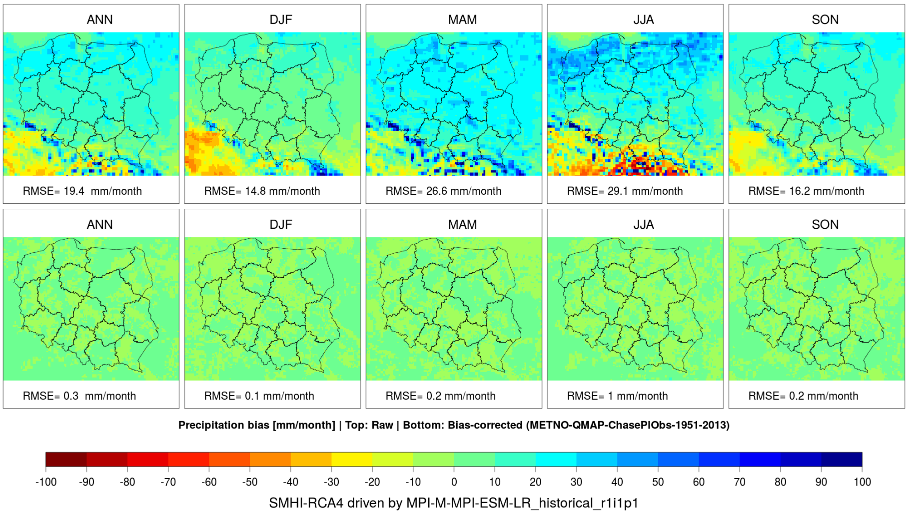

Fig. S25. Bias in modelled precipitation (mm/month) by simulation 9. The bias is computed as the difference between historical simulations and observations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSE indicates the root mean square values of the bias averaged over the whole spatial domain.

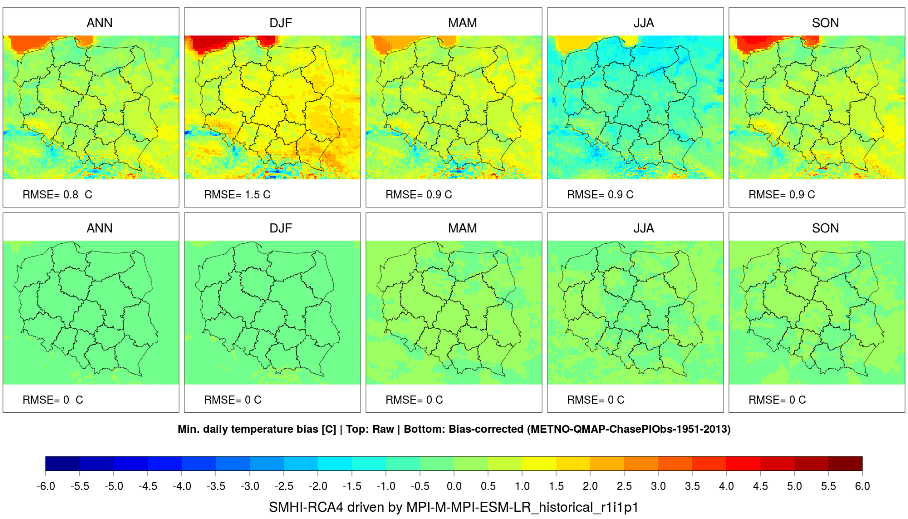

Fig. S26. Same caption as in Fig. S25 but for modelled minimum temperature (°C).

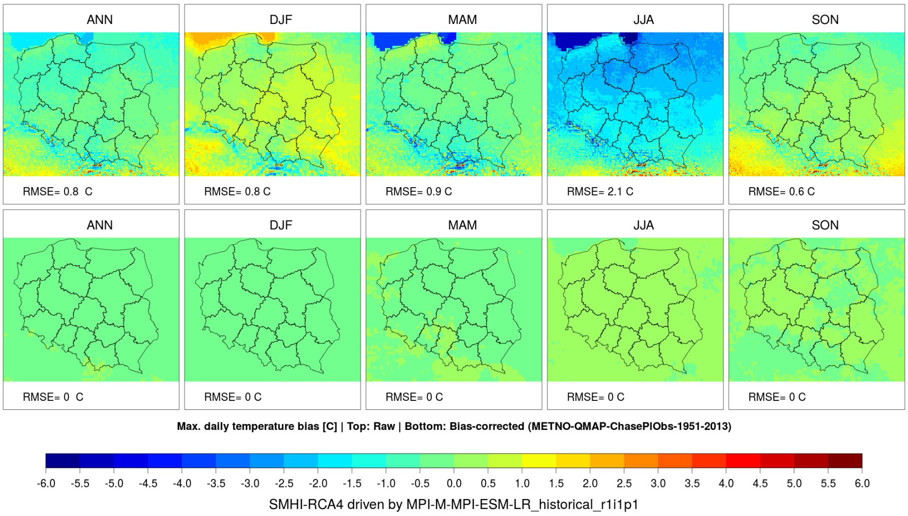

Fig. S27. Same caption as in Fig. S25 but for modelled maximum temperature (°C).

3 Sensitivity to the climate change signal

3.1 CNRM-CM5/CCLM4-8-17 simulation

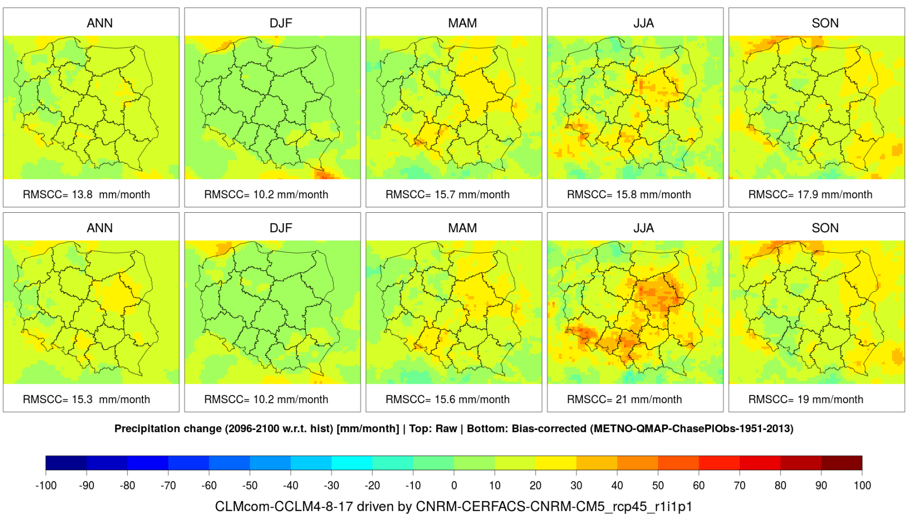

Fig. S28. Precipitation change signal (mm/month) for simulation 1. Absolute changes in future (2096–2100) with regards to historical simulations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSCC indicates the root mean square values of the climate change estimated over the whole spatial domain.

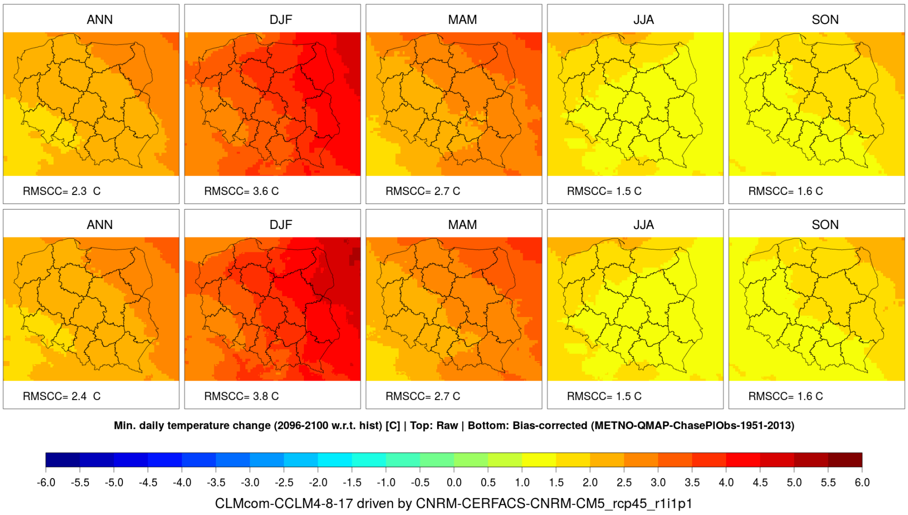

Fig. S29. Same caption as in Fig. S28 but for absolute changes in minimum temperature (°C).

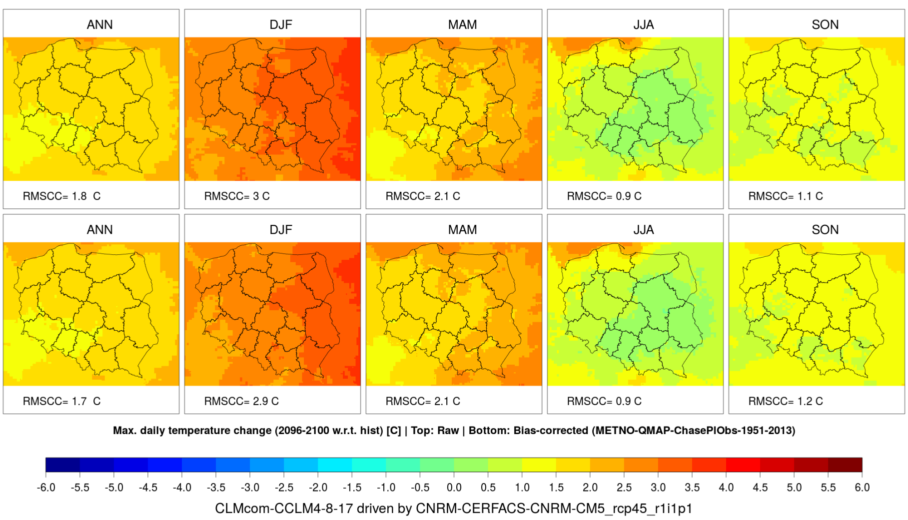

Fig. S30. Same caption as in Fig. S28 but for absolute changes in maximum temperature (°C).

3.2 CNRM-CM5/RCA4 simulation

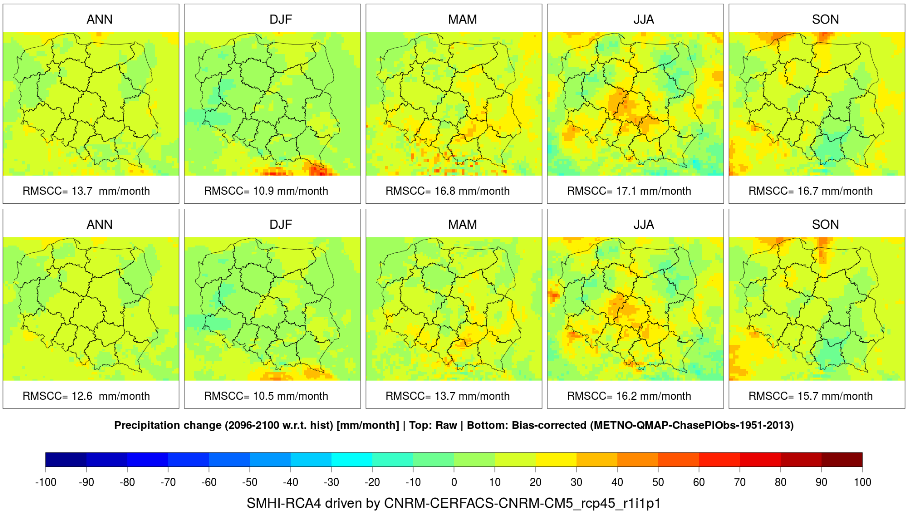

Fig. S31. Precipitation change signal (mm/month) for simulation 2. Absolute changes in future (2096–2100) with regards to historical simulations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSCC indicates the root mean square values of the climate change estimated over the whole spatial domain.

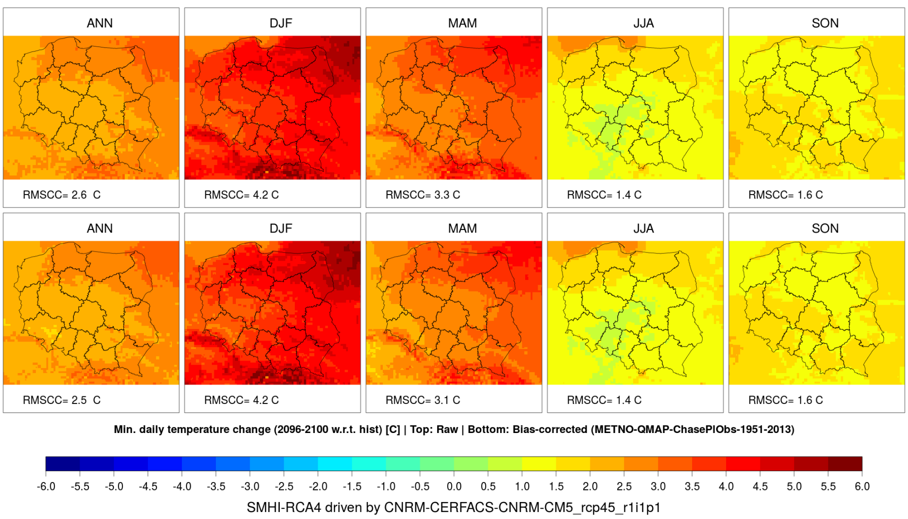

Fig. S32. Same caption as in Fig. S31 but for absolute changes in minimum temperature (°C).

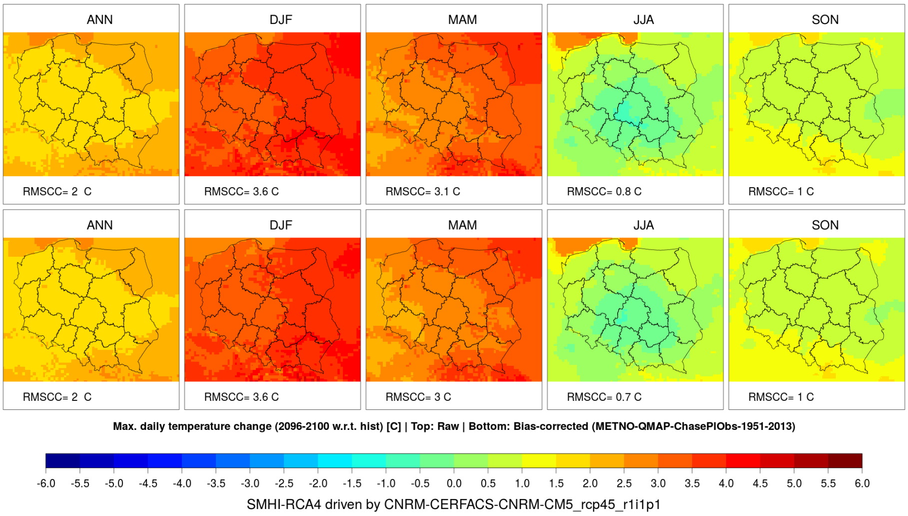

Fig. S33. Same caption as in Fig. S31 but for absolute changes in maximum temperature (°C).

3.3 EC-EARTH/CCLM4-8-17 simulation

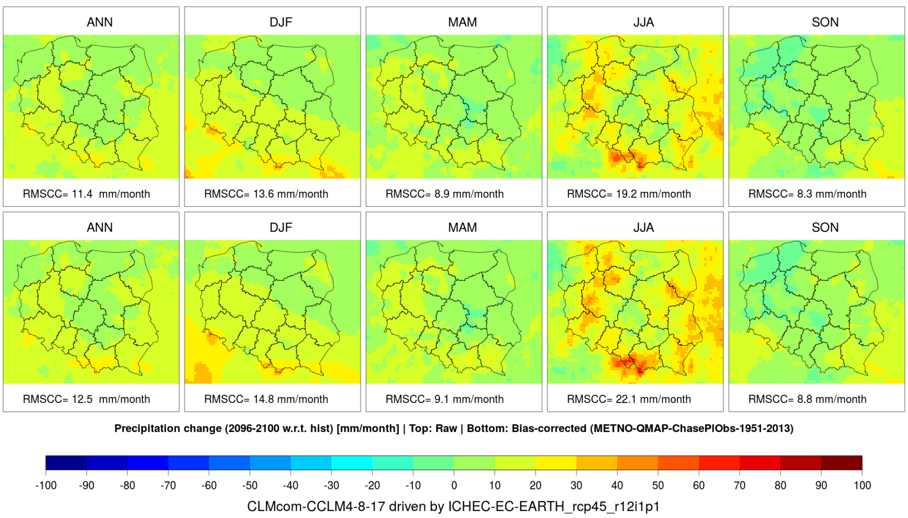

Fig. S34. Precipitation change signal (mm/month) for simulation 3. Absolute changes in future (2096–2100) with regards to historical simulations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSCC indicates the root mean square values of the climate change estimated over the whole spatial domain.

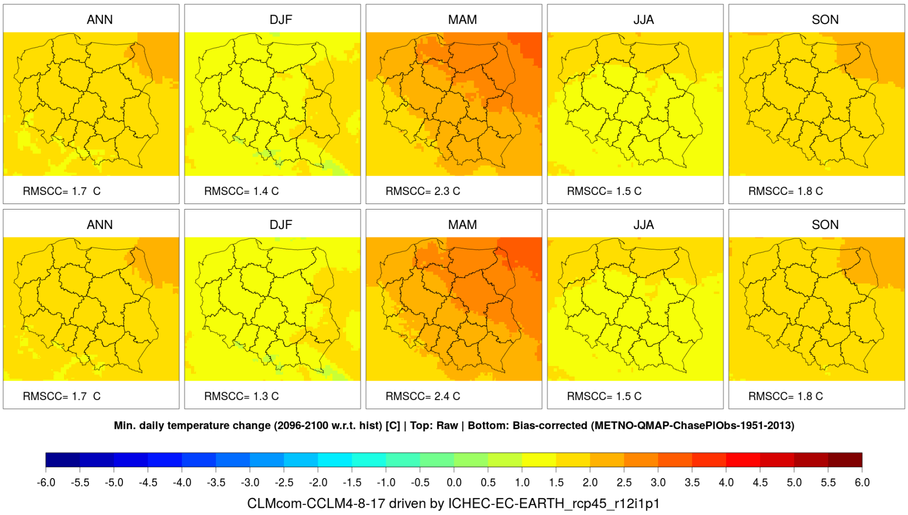

Fig. S35. Same caption as in Fig. S34 but for absolute changes in minimum temperature (°C).

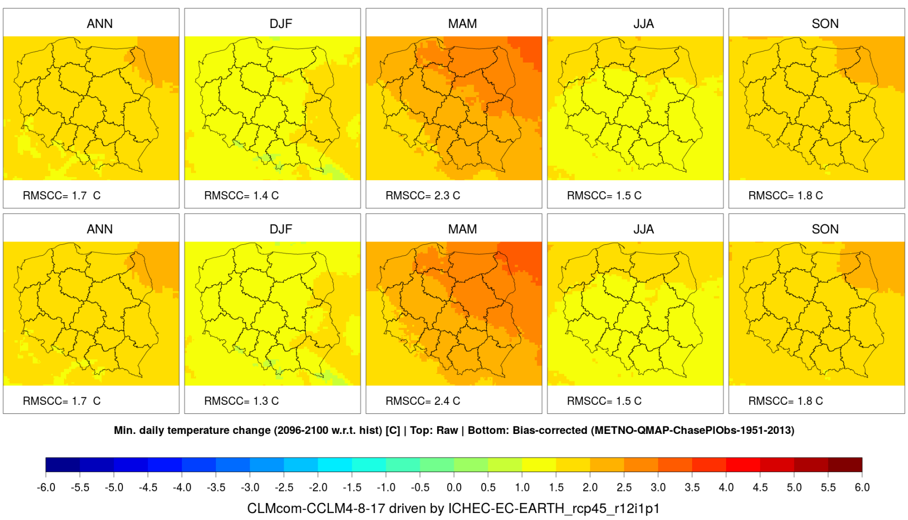

Fig. S36. Same caption as in Fig. S34 but for absolute changes in maximum temperature (°C).

3.4 EC-EARTH/RCA4 simulation

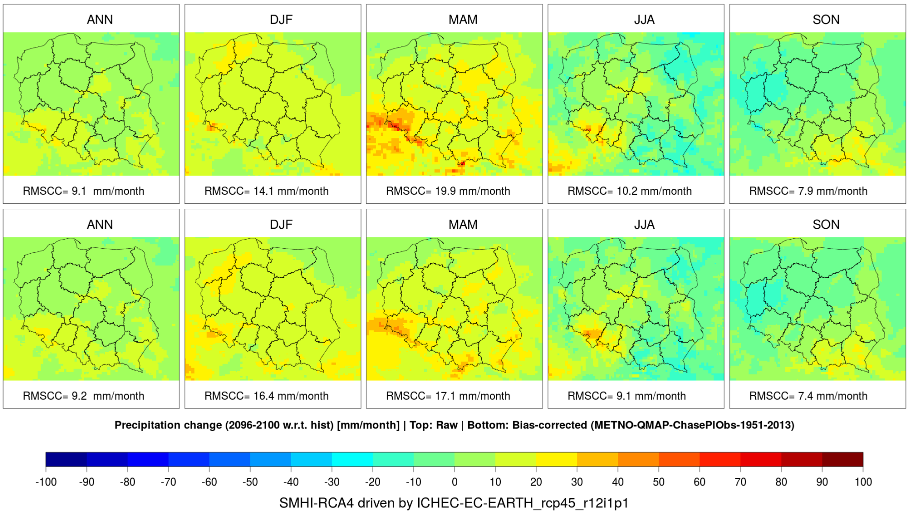

Fig. S37. Precipitation change signal (mm/month) for simulation 4. Absolute changes in future (2096–2100) with regards to historical simulations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSCC indicates the root mean square values of the climate change estimated over the whole spatial domain.

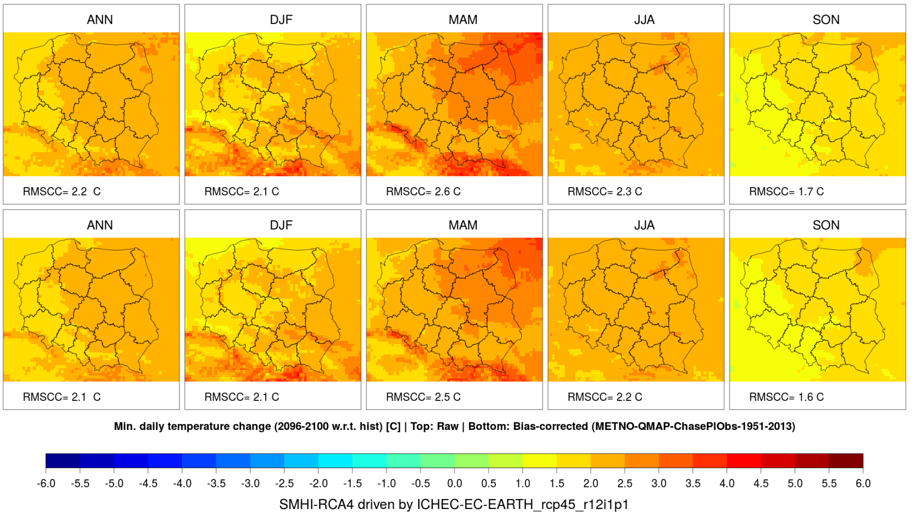

Fig. S38. Same caption as in Fig. S37 but for absolute changes in minimum temperature (°C).

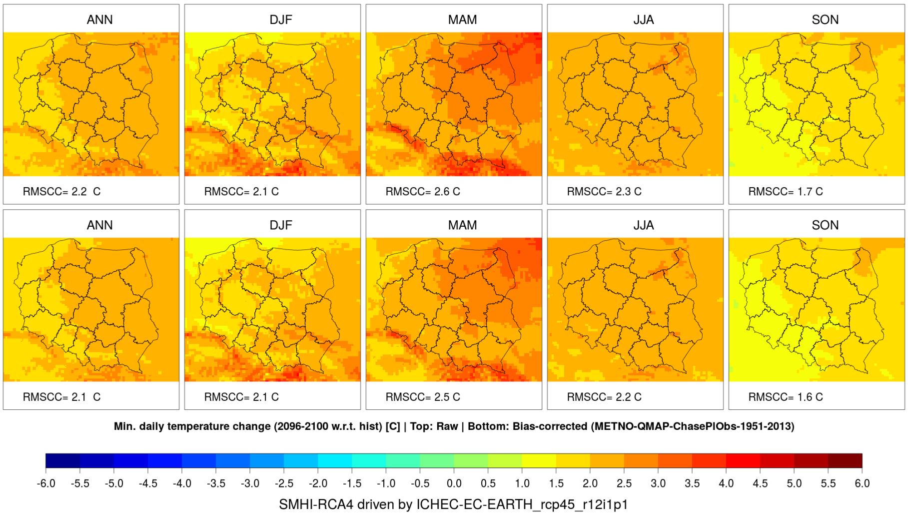

Fig. S39. Same caption as in Fig. S37 but for absolute changes in maximum temperature (°C).

3.5 EC-EARTH/RACMO22E simulation

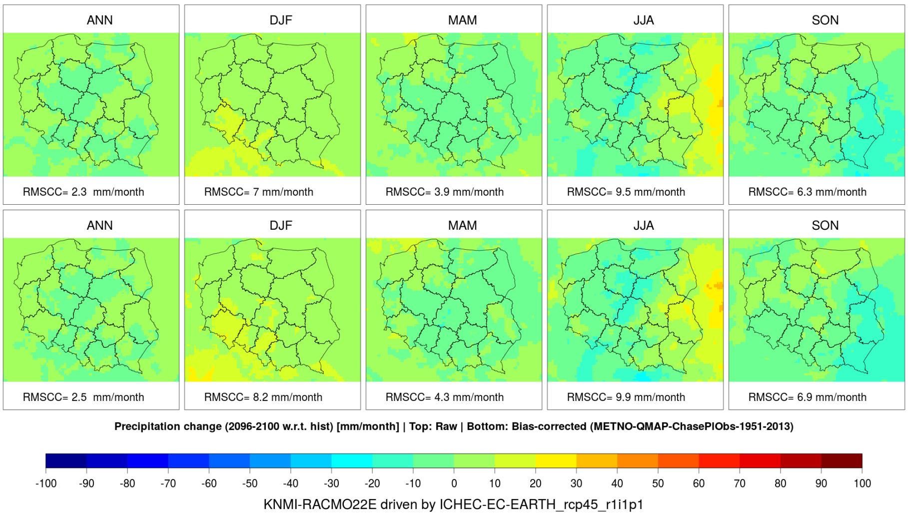

Fig. S40. Precipitation change signal (mm/month) for simulation 5. Absolute changes in future (2096–2100) with regards to historical simulations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSCC indicates the root mean square values of the climate change estimated over the whole spatial domain.

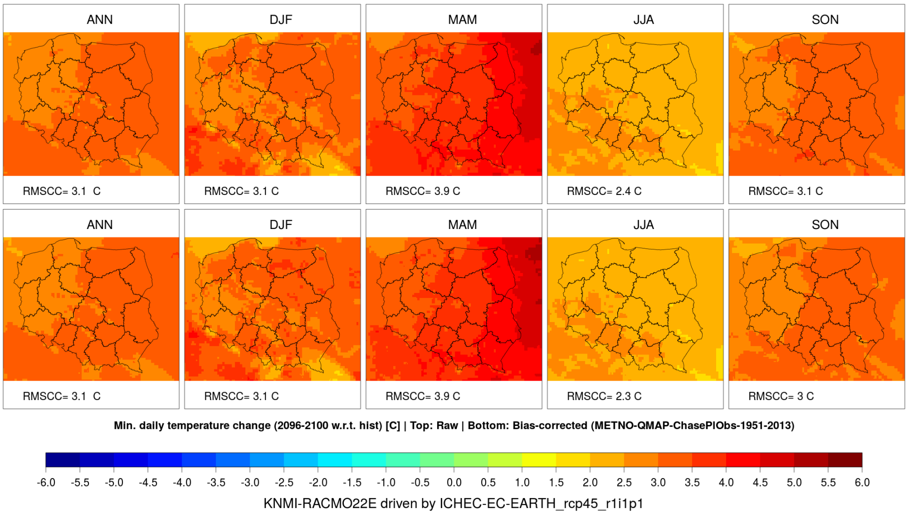

Fig. S41. Same caption as in Fig. S40 but for absolute changes in minimum temperature (°C).

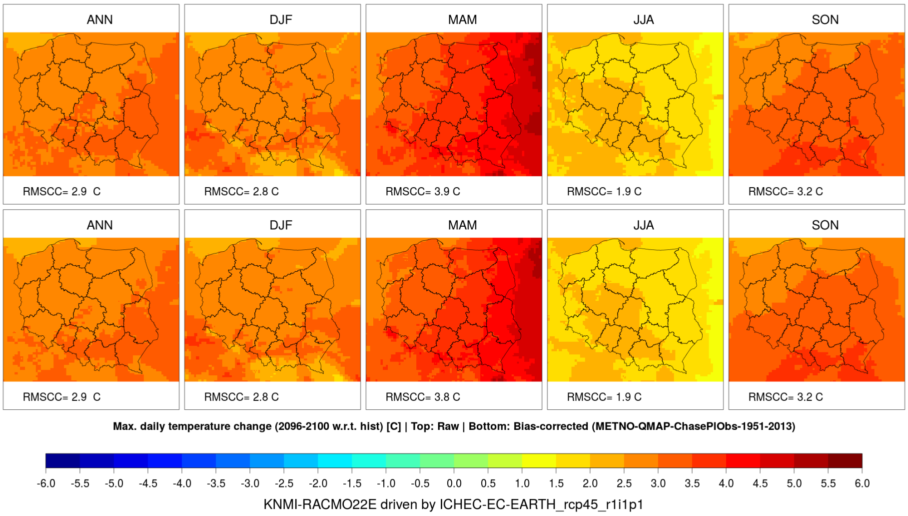

Fig. S42. Same caption as in Fig. S40 but for absolute changes in maximum temperature (°C).

3.6 EC-EARTH/HIRHAM5 simulation

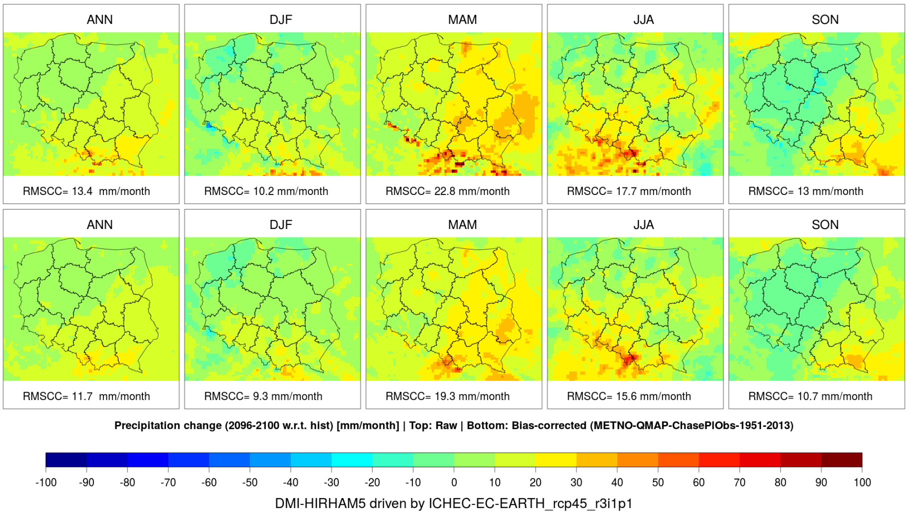

Fig. S43. Precipitation change signal (mm/month) for simulation 6. Absolute changes in future (2096–2100) with regards to historical simulations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSCC indicates the root mean square values of the climate change estimated over the whole spatial domain.

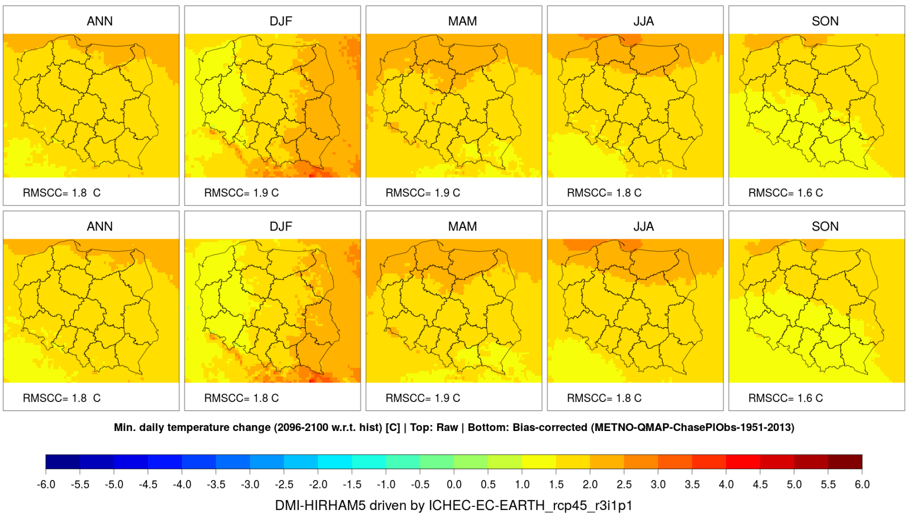

Fig. S44. Same caption as in Fig. S43 but for absolute changes in minimum temperature (°C).

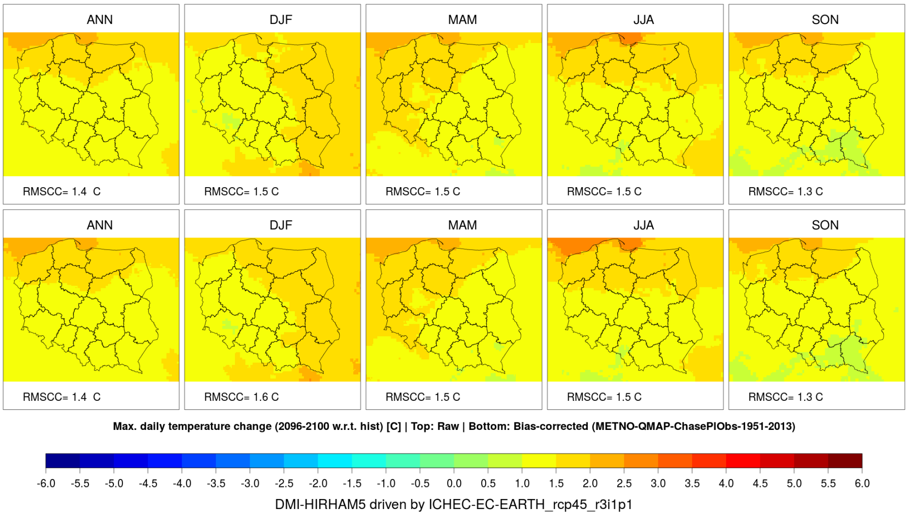

Fig. S45. Same caption as in Fig. S43 but for absolute changes in maximum temperature (°C).

3.7 IPSL-CM5A-MR/RCA4 simulation

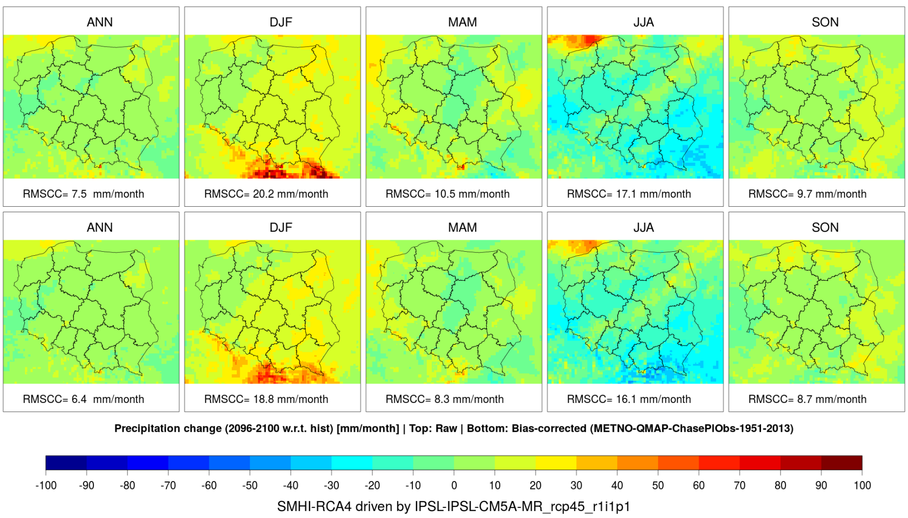

Fig. S46. Precipitation change signal (mm/month) for simulation 7. Absolute changes in future (2096–2100) with regards to historical simulations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSCC indicates the root mean square values of the climate change estimated over the whole spatial domain.

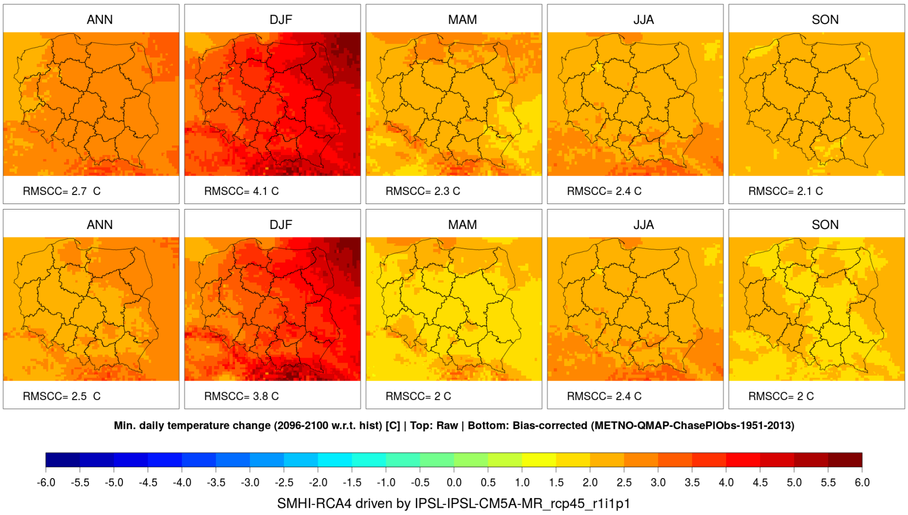

Fig. S47. Same caption as in Fig. S46 but for absolute changes in minimum temperature (°C).

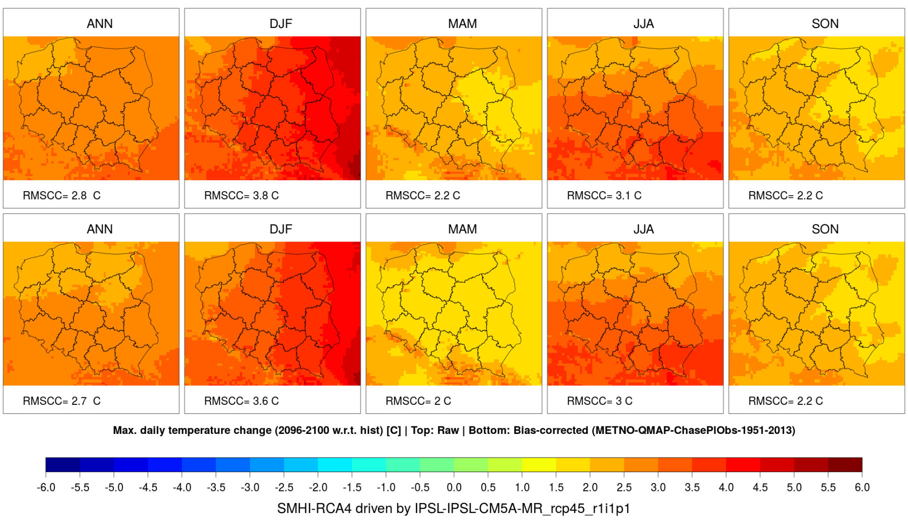

Fig. S48. Same caption as in Fig. S46 but for absolute changes in maximum temperature (°C).

3.8 MPI-ESM-LR/CCLM4-8-17 simulation

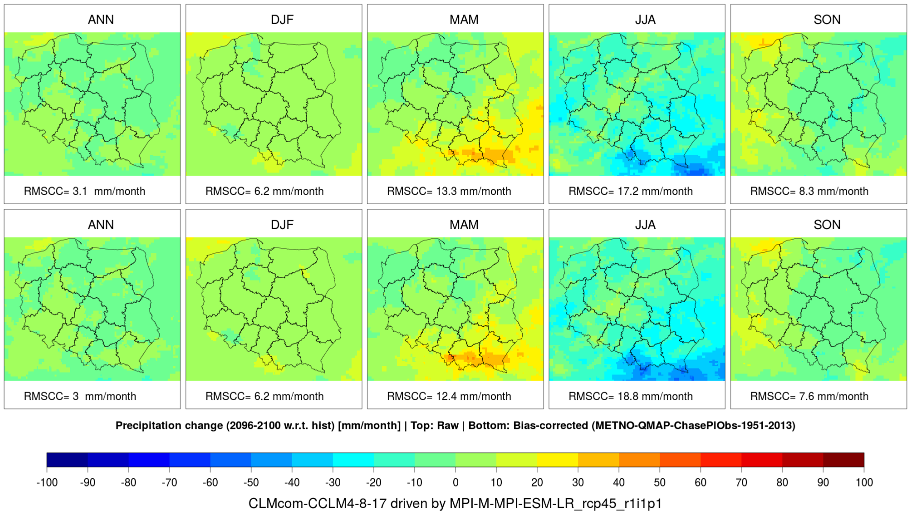

Fig. S49. Precipitation change signal (mm/month) for simulation 8. Absolute changes in future (2096–2100) with regards to historical simulations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSCC indicates the root mean square values of the climate change estimated over the whole spatial domain.

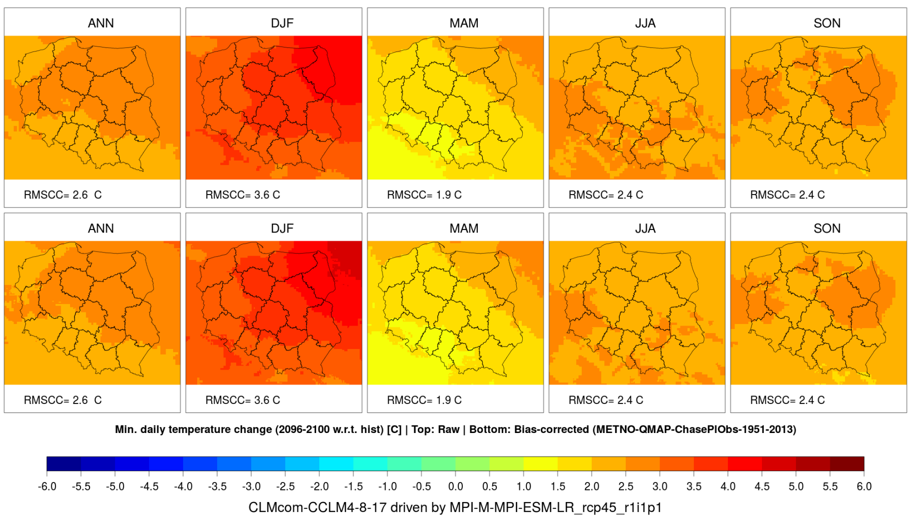

Fig. S50. Same caption as in Fig. S49 but for absolute changes in minimum temperature (°C).

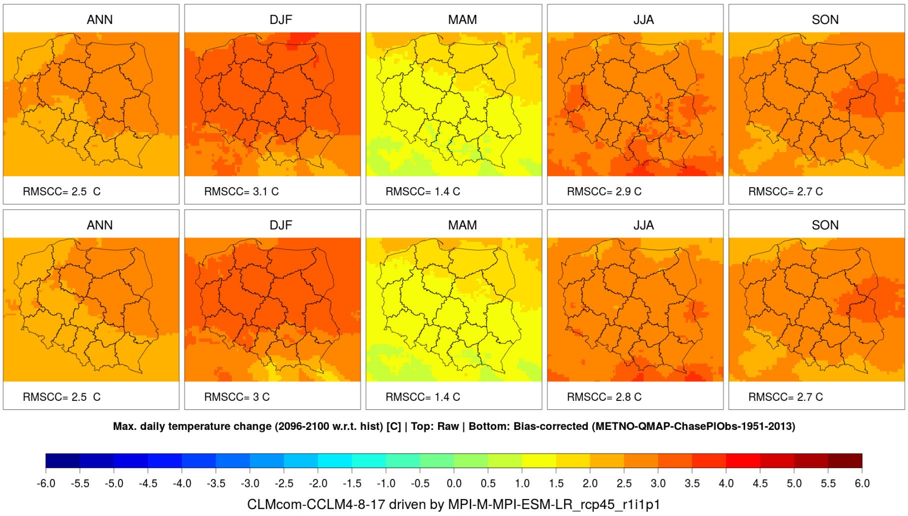

Fig. S51. Same caption as in Fig. S49 but for absolute changes in maximum temperature (°C).

3.9 MPI-ESM-LR/RCA4 simulation

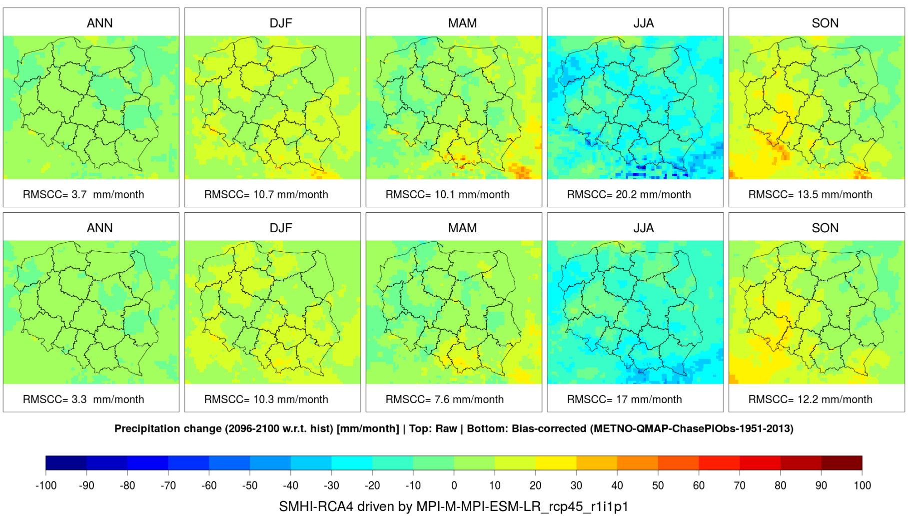

Fig. S52. Precipitation change signal (mm/month) for simulation 9. Absolute changes in future (2096–2100) with regards to historical simulations for both raw (top) and bias adjusted (bottom) data, respectively. The RMSCC indicates the root mean square values of the climate change estimated over the whole spatial domain.

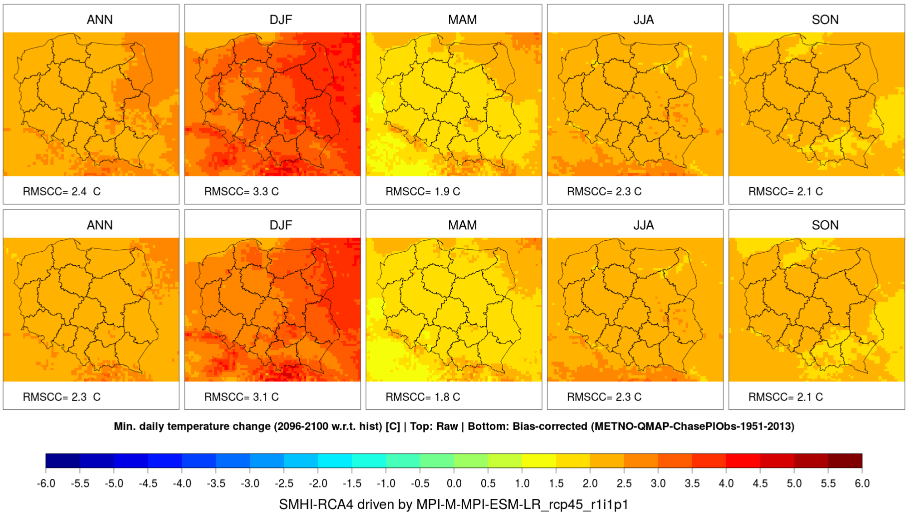

Fig. S53. Same caption as in Fig. S52 but for absolute changes in minimum temperature (°C).

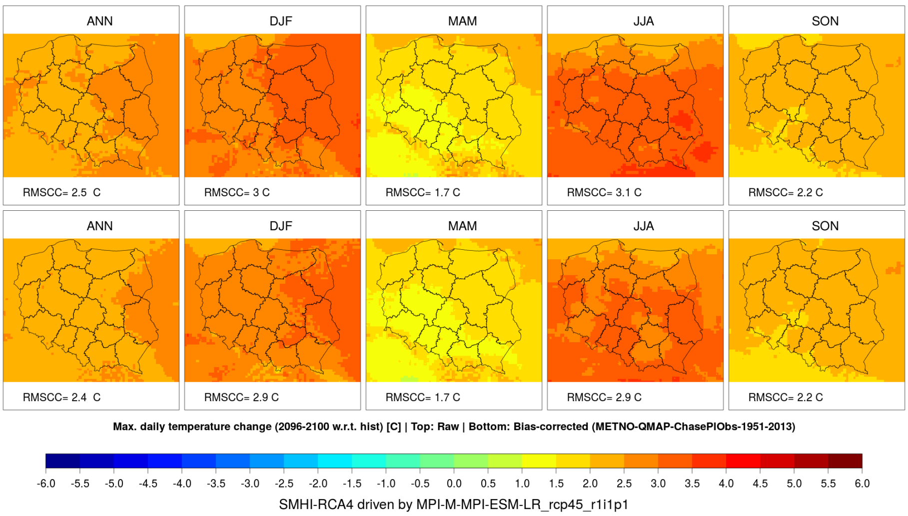

Fig. S54. Same caption as in Fig. S52 but for absolute changes in maximum temperature (°C).

4 Projected future climate changes in Poland

4.1 Changes in the multi-model ensemble mean

4.1.1 Projected precipitation changes

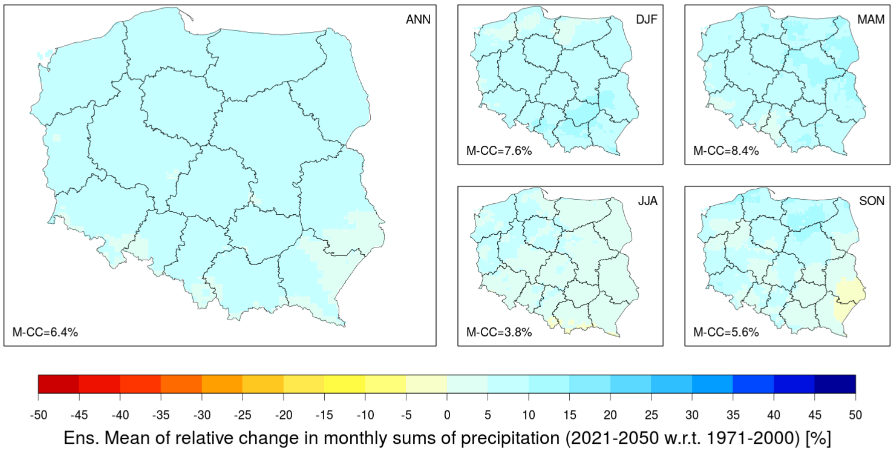

Fig. S55. Projected changes in monthly sums of precipitation (%) for the period (2021–2050) assuming the RCP4.5 scenario. Maps show annual (left large panel) and seasonal (right small panels) changes in the multi-model ensemble mean of absolute temperature with regards to the control period (1971-2000). The legend 'M-CC' means the areal mean change estimated from the gridded data.

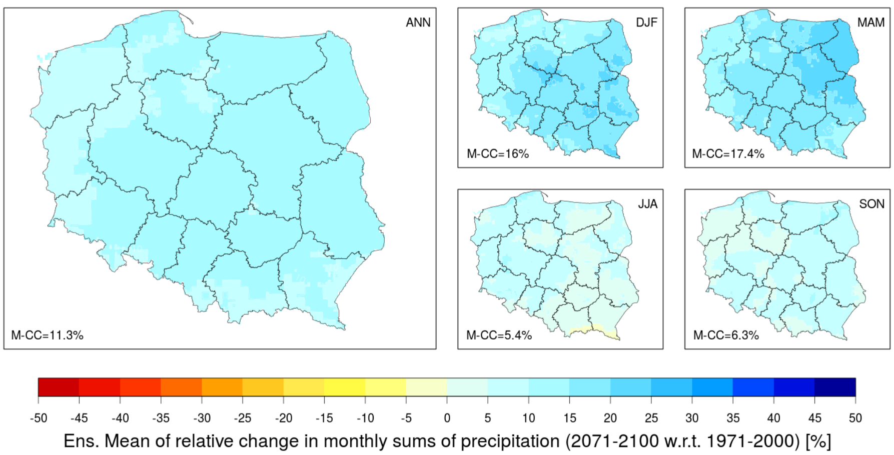

Fig. S56. Same as figure 55 but for projected precipitation changes (%) by 2071–2100 assuming the RCP4.5 scenario.

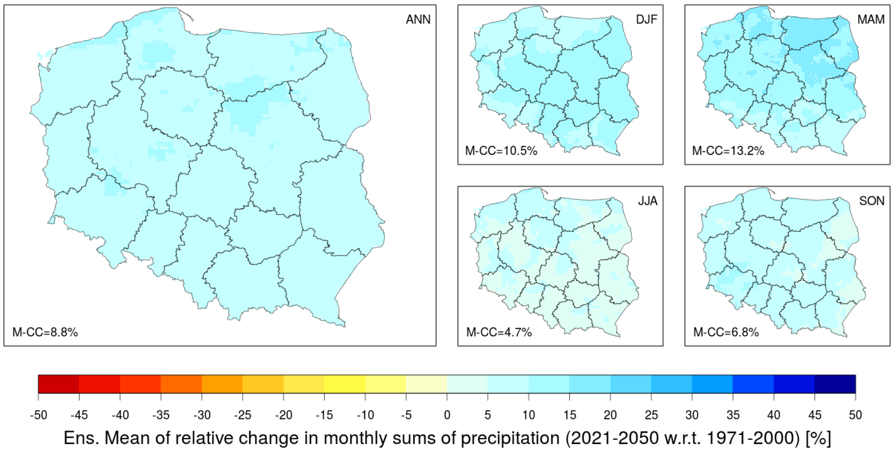

Fig. S57. Same as figure 55 but for projected precipitation changes (%) by 2021–2050 assuming the RCP8.5 scenario.

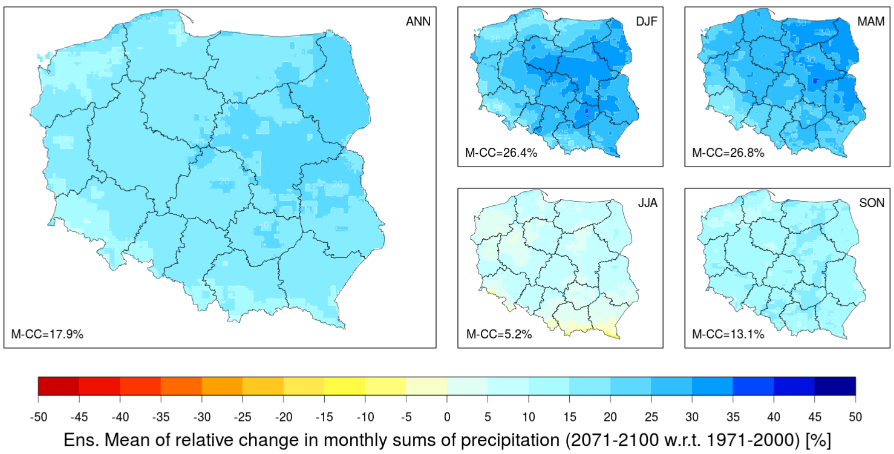

Fig. S58. Same as figure 55 but for projected precipitation changes (%) by 2071–2100 assuming the RCP8.5 scenario.

4.1.2 Projected temperature

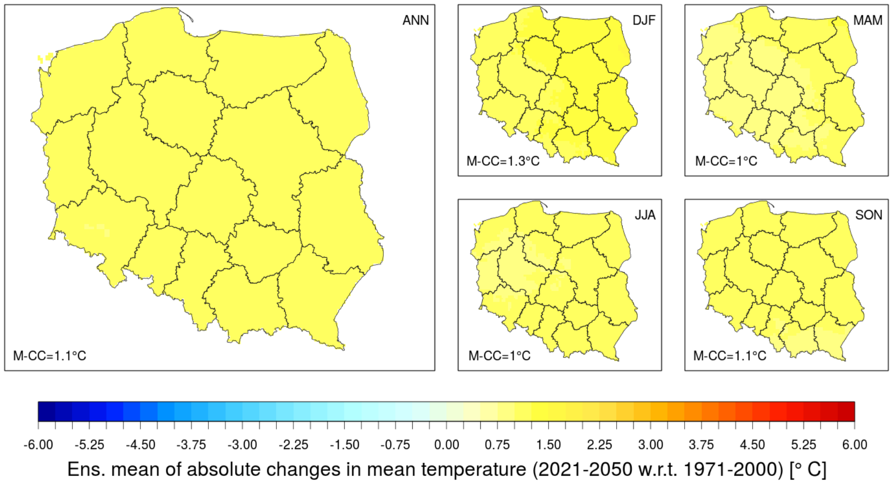

Fig. S59. Projected temperature changes (°C) for the near future (2021 - 2050) assuming the RCP4.5 scenario. Individual maps show the multi-model ensemble mean of absolute temperature deviations from the historical means (average over the period 1971-2000) based on annual (left large panel) and seasonal (right panels) mean projected temperature values. The legend 'M-CC' means the areal mean change estimated from the gridded data.

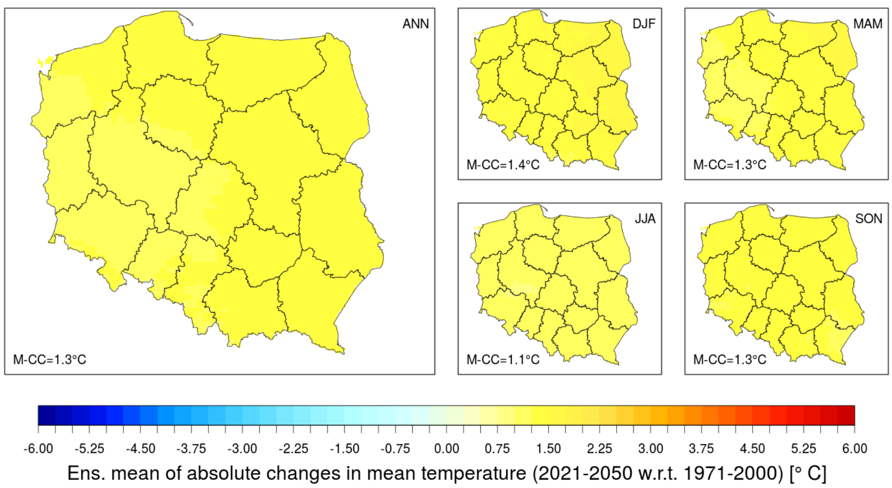

Fig. S60. Same as figure 62 but for projected temperature changes (%) by 2021–2050 assuming the RCP8.5 scenario.

4.2 Changes in individual model simulations

4.2.1 Projected precipitation

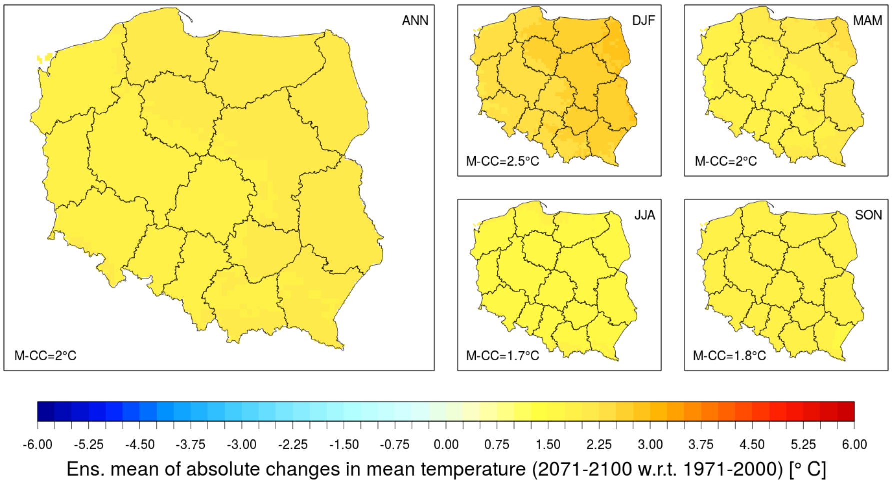

Fig. S61. Same as figure 62 but for projected temperature changes (%) by 2071–2100 assuming the RCP4.5 scenario.

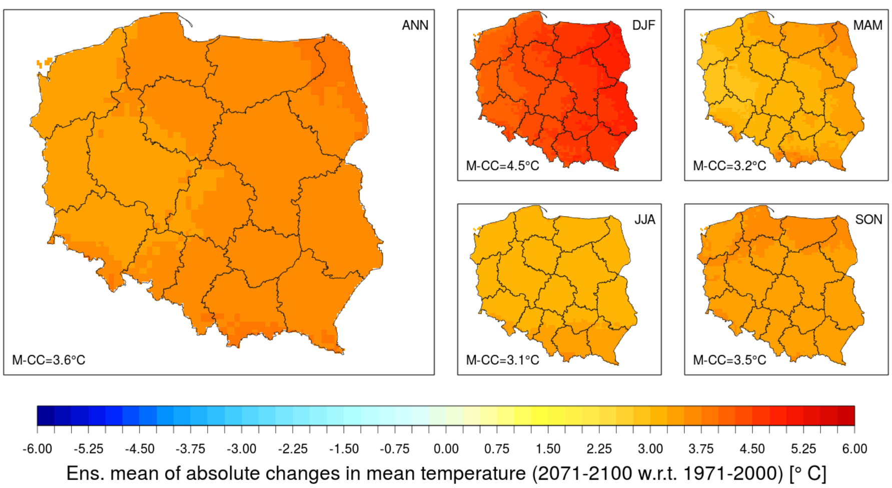

Fig. S62. Same as figure 62 but for projected temperature changes (%) by 2071–2100 assuming the RCP8.5 scenario.

Annual

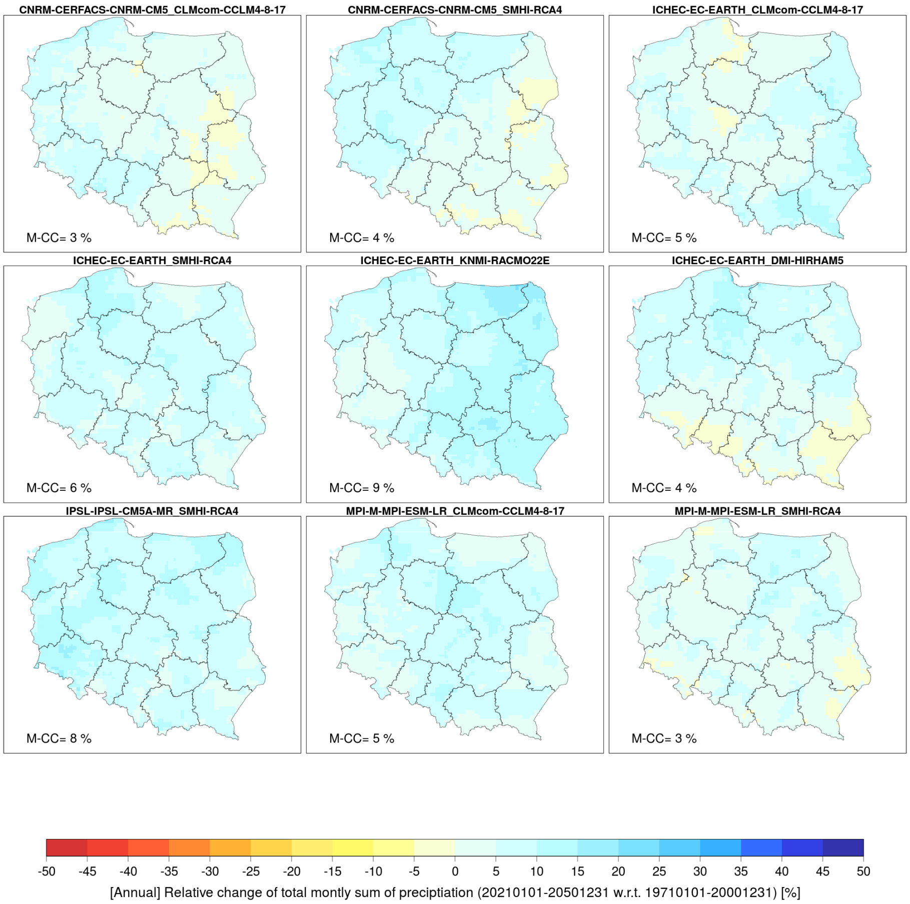

Fig. S63. Changes in projected annual means of monthly sums of precipitation by 2021–2050 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

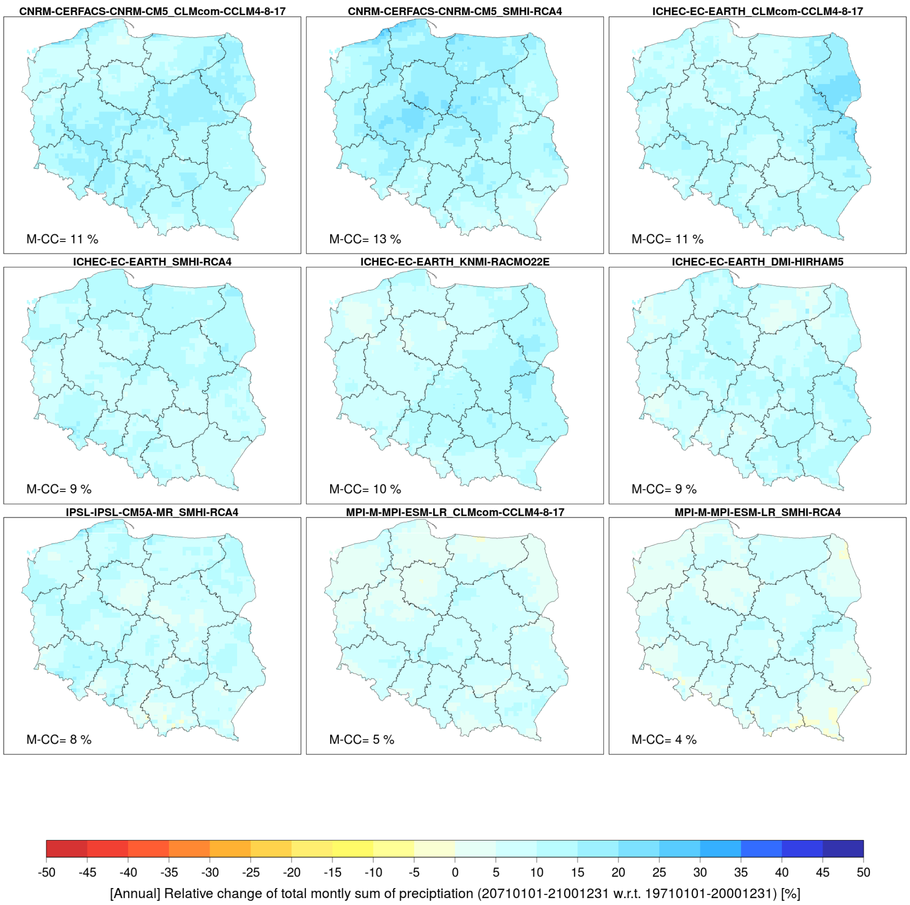

Fig. S64. Changes in projected annual means of monthly sums of precipitation by 2071–2100 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

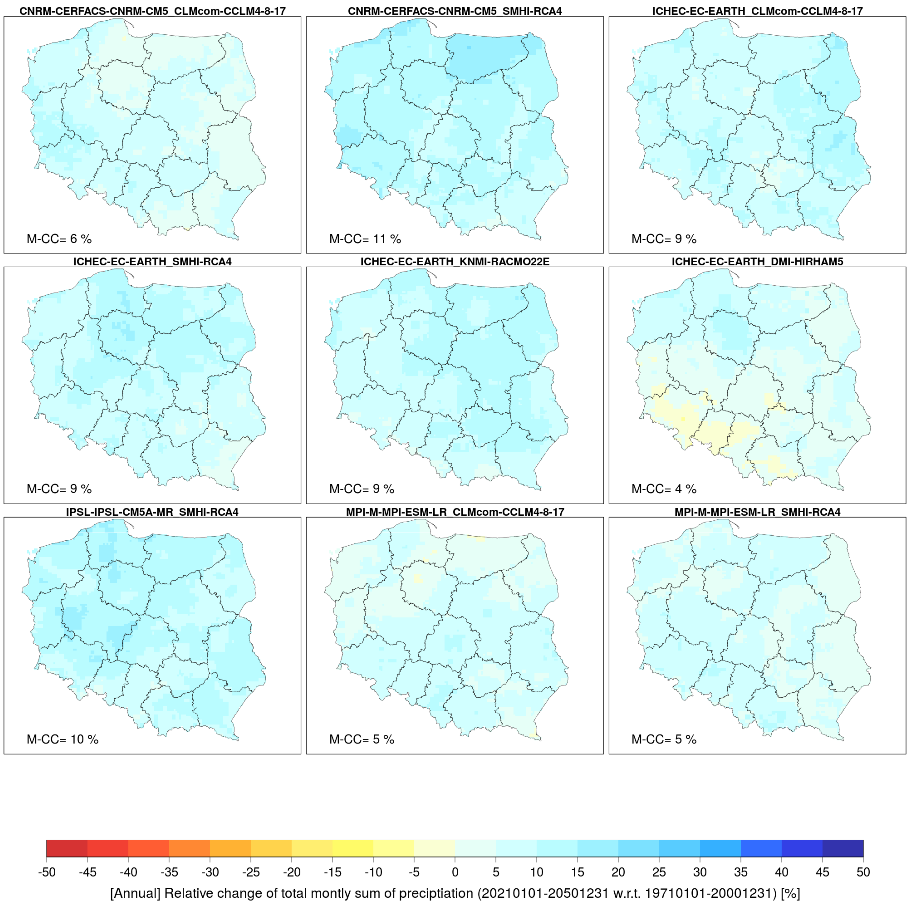

Fig. S65. Changes in projected annual means of monthly sums of precipitation by 2021–2050 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

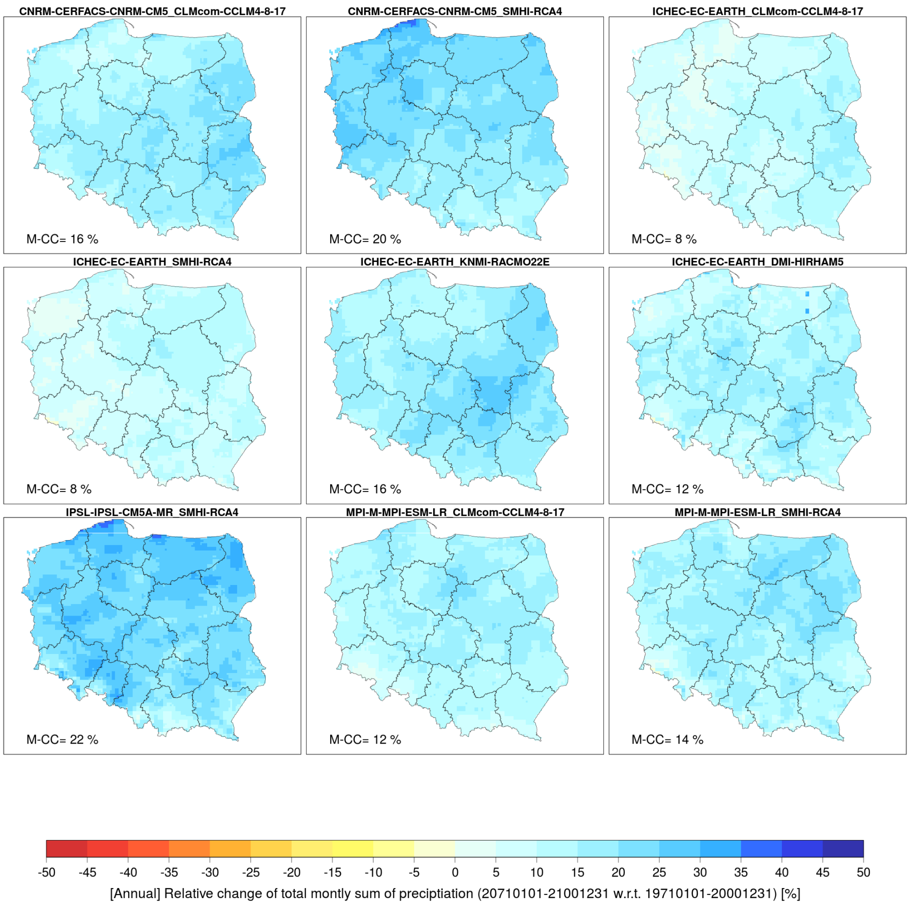

Fig. S66. Changes in projected annual means of monthly sums of precipitation by 2071–2100 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

60 **Winter - DJF**

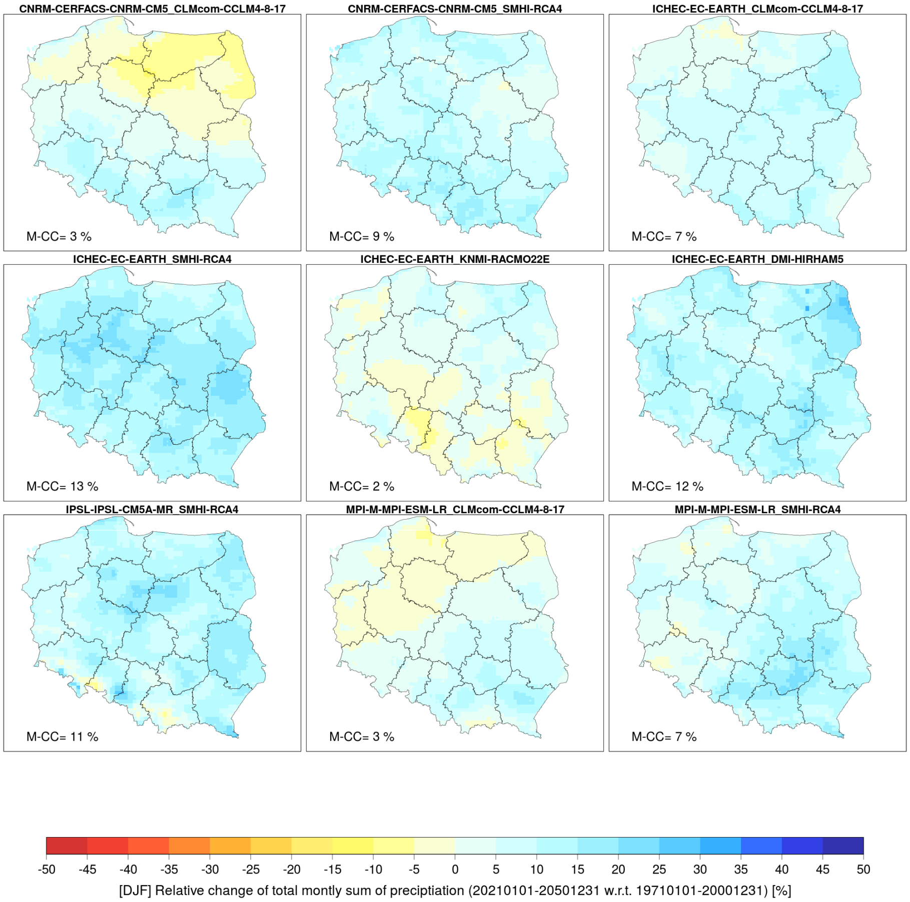

Fig. S67. Changes in projected winter means of monthly sums of precipitation by 2021–2050 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

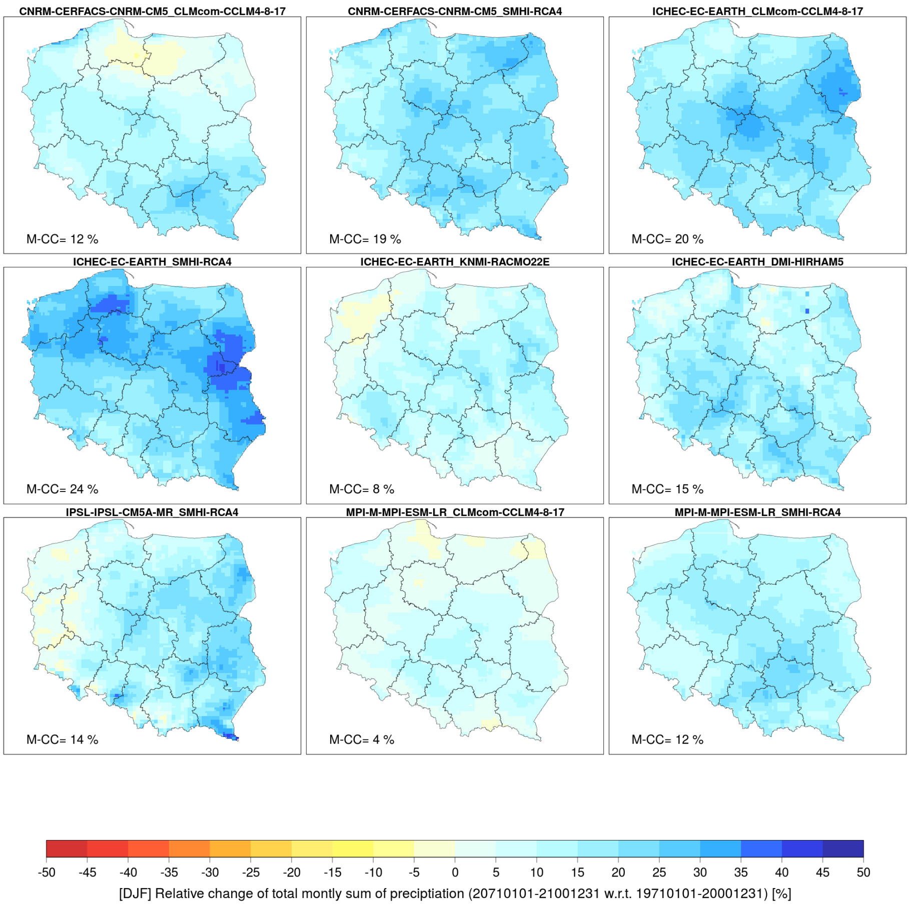

Fig. S68. Changes in projected winter means of monthly sums of precipitation by 2071–2100 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

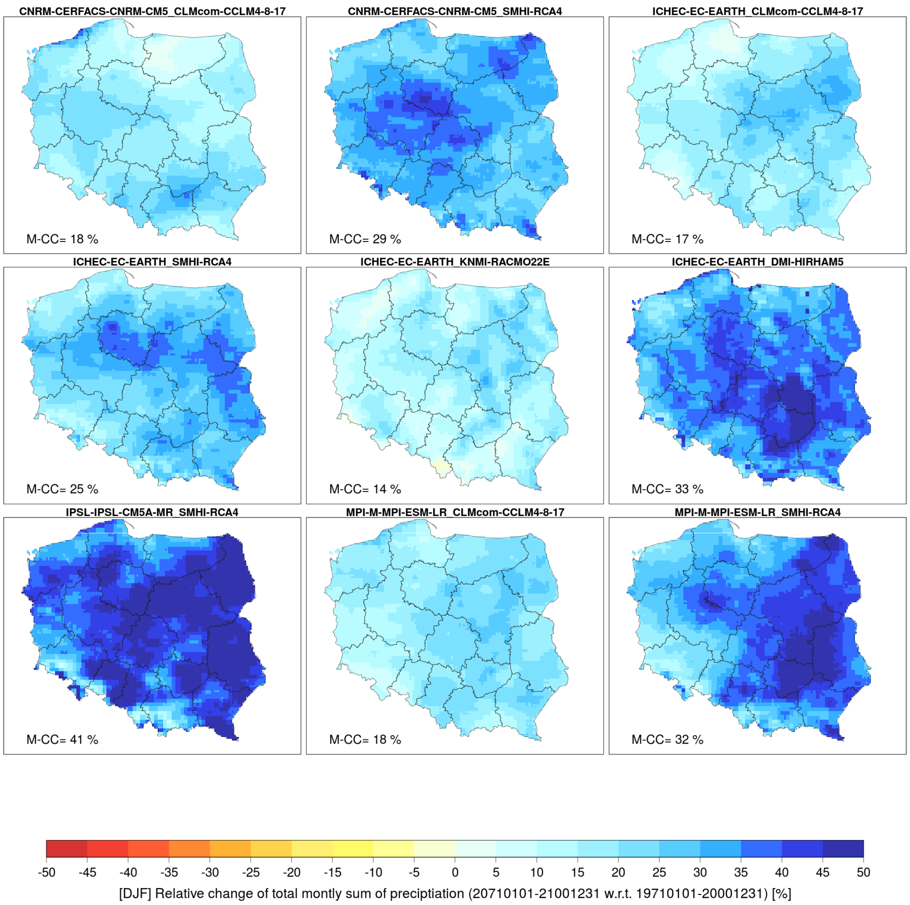

Fig. S69. Changes in projected winter means of monthly sums of precipitation by 2071–2100 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

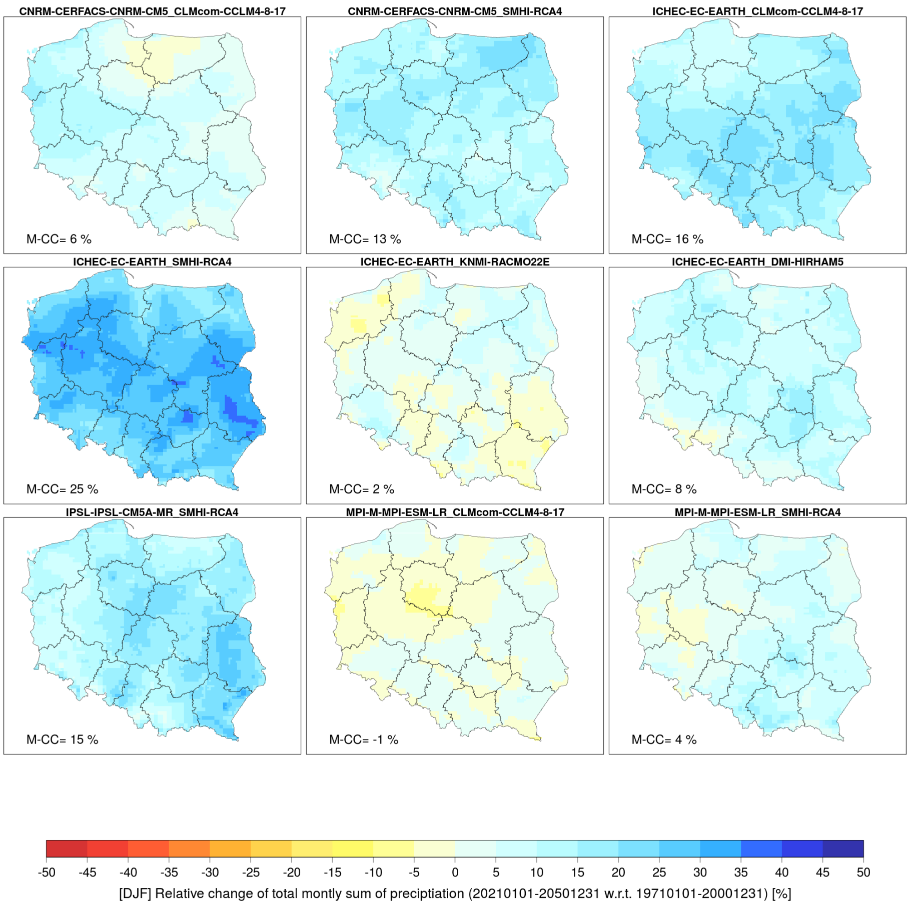

Fig. S70. Changes in projected winter means of monthly sums of precipitation by 2021–2050 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Spring - MAM

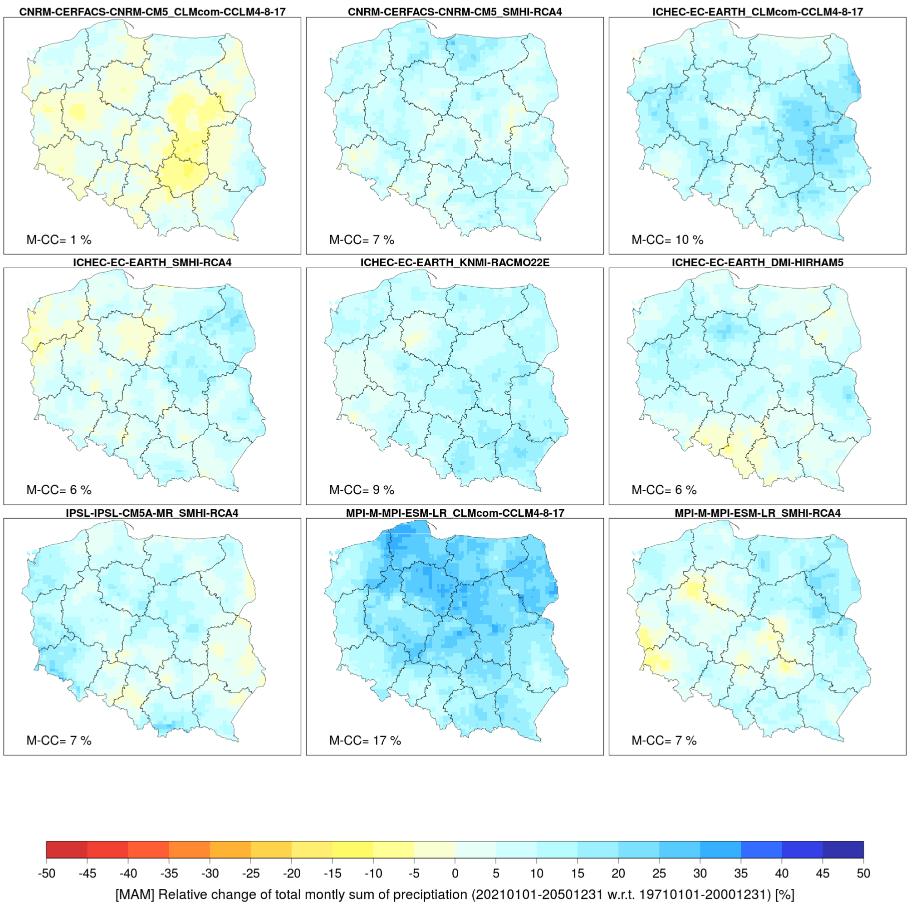

Fig. S71. Changes in projected spring means of monthly sums of precipitation by 2021–2050 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

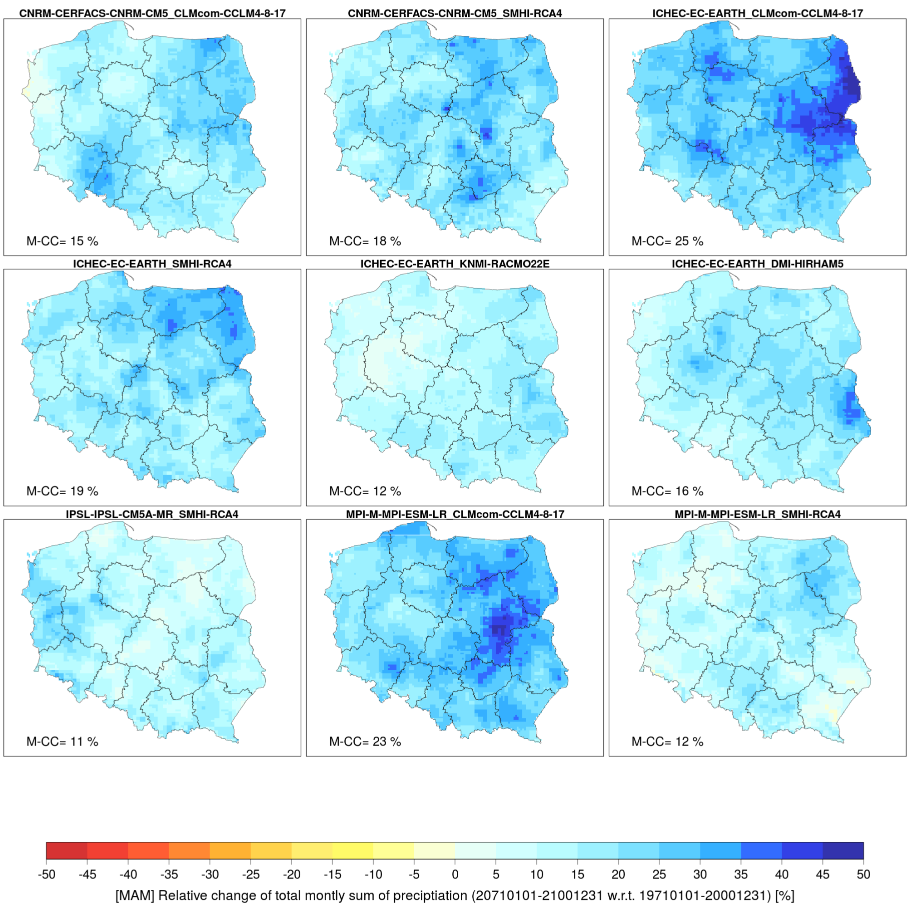

Fig. S72. Changes in projected spring means of monthly sums of precipitation by 2071–2100 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

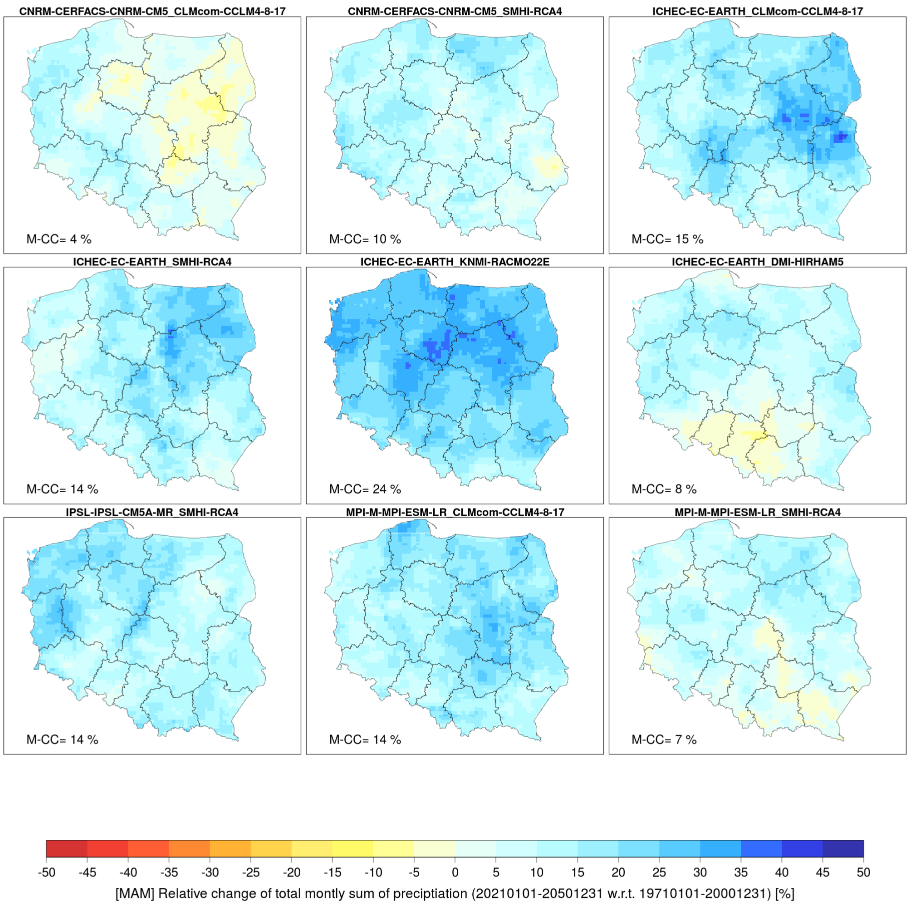

Fig. S73. Changes in projected spring means of monthly sums of precipitation by 2021–2050 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

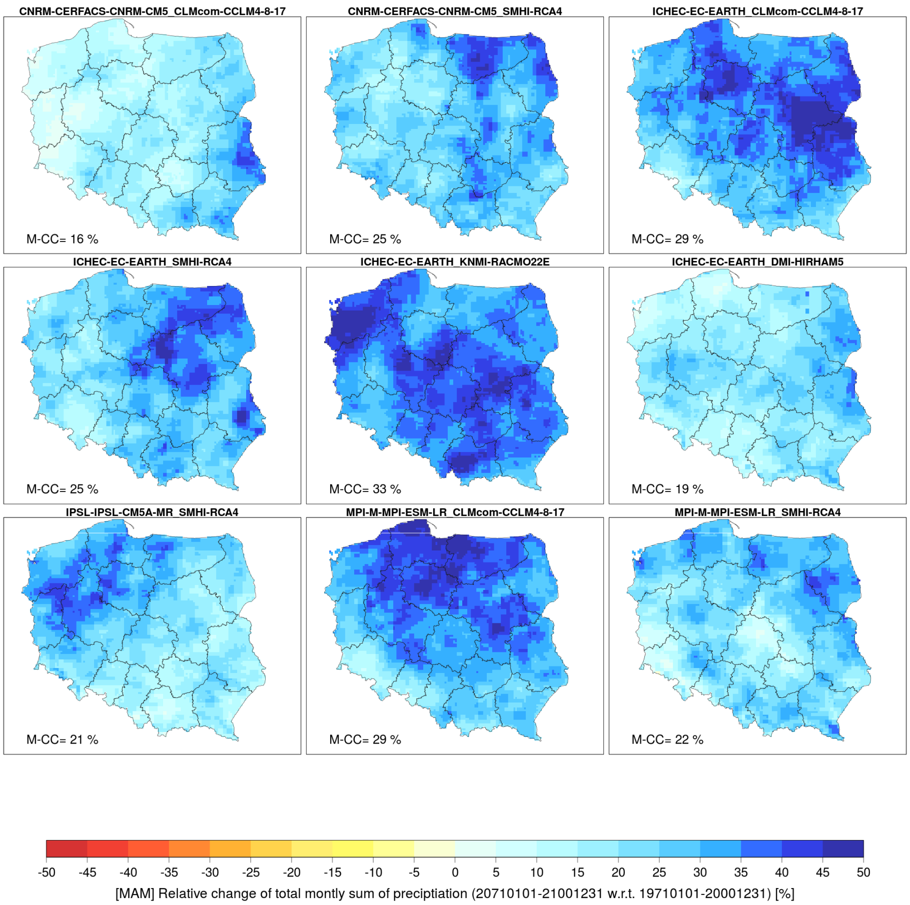

Fig. S74. Changes in projected spring means of monthly sums of precipitation by 2071–2100 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Summer - JJA

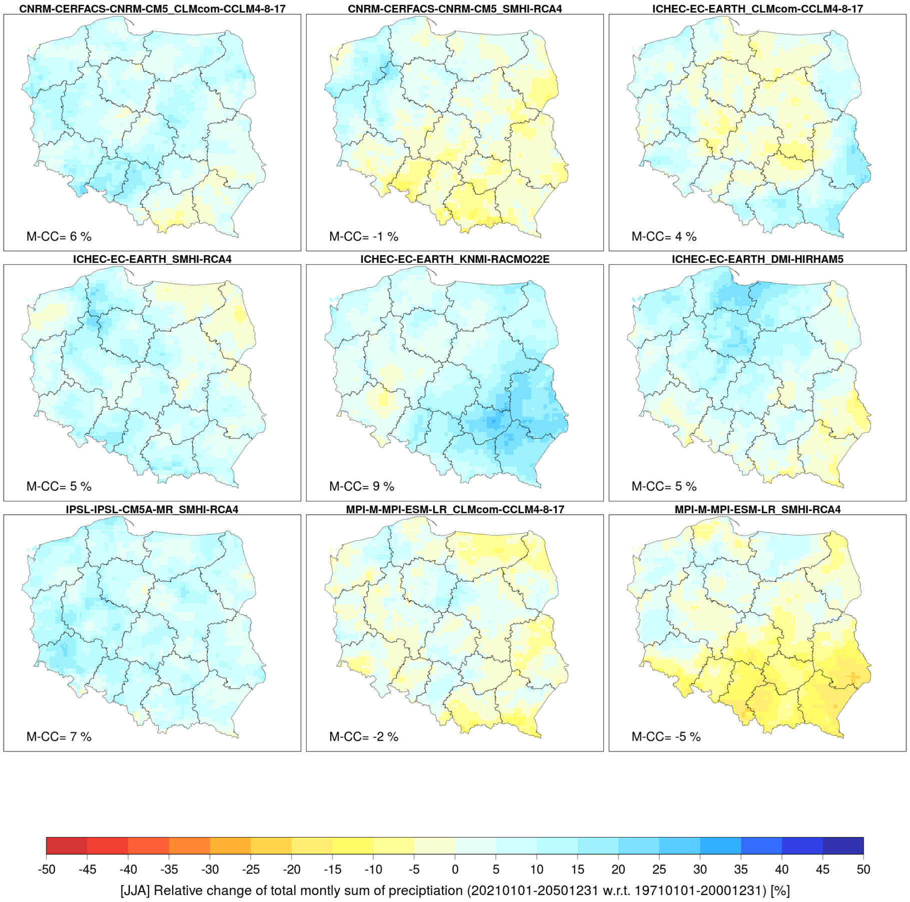

Fig. S75. Changes in projected summer means of monthly sums of precipitation by 2021–2050 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

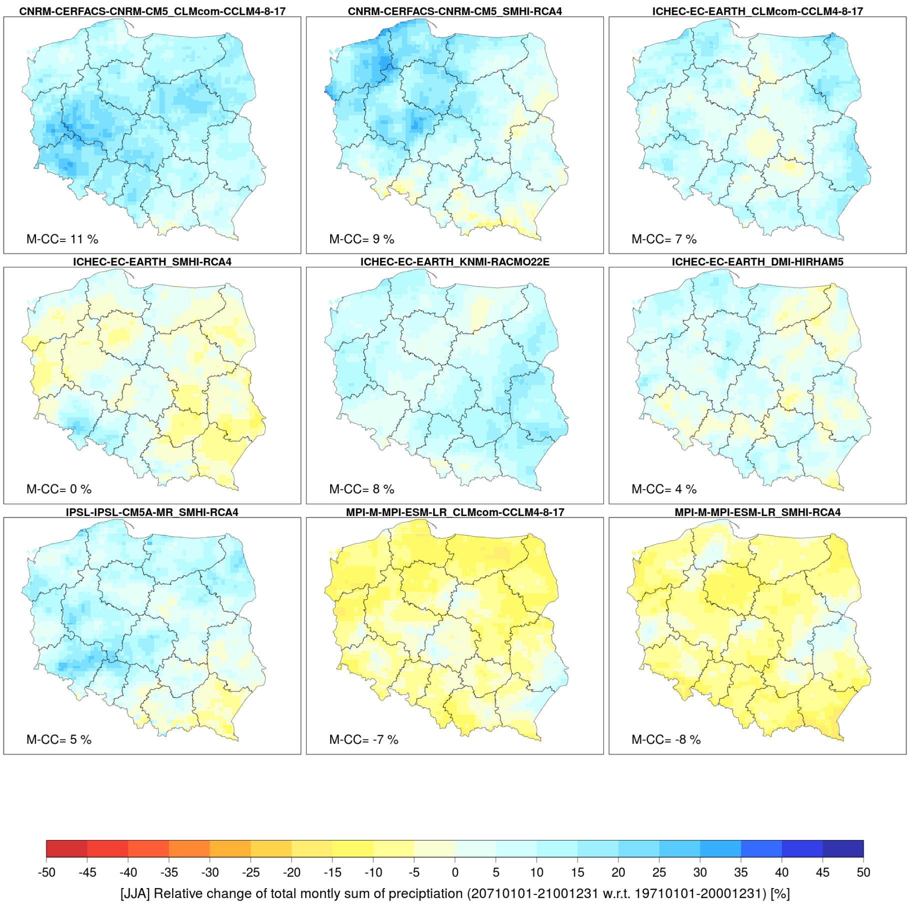

Fig. S76. Changes in projected summer means of monthly sums of precipitation by 2071–2100 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

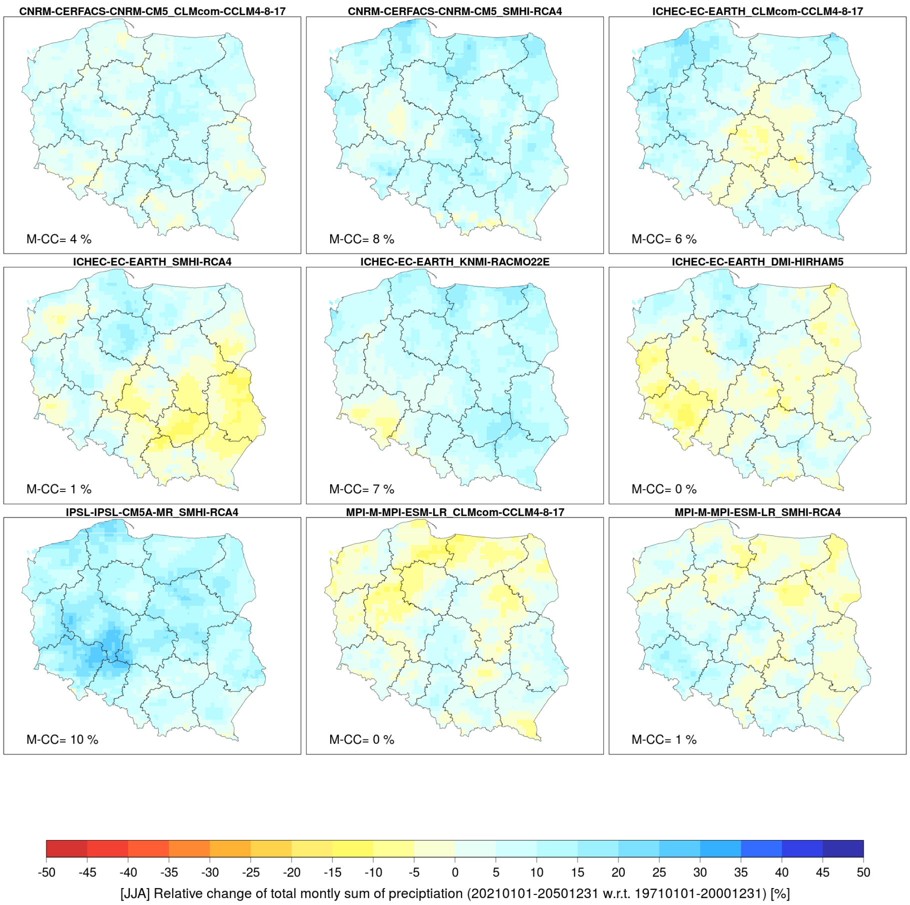

Fig. S77. Changes in projected summer means of monthly sums of precipitation by 2021–2050 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

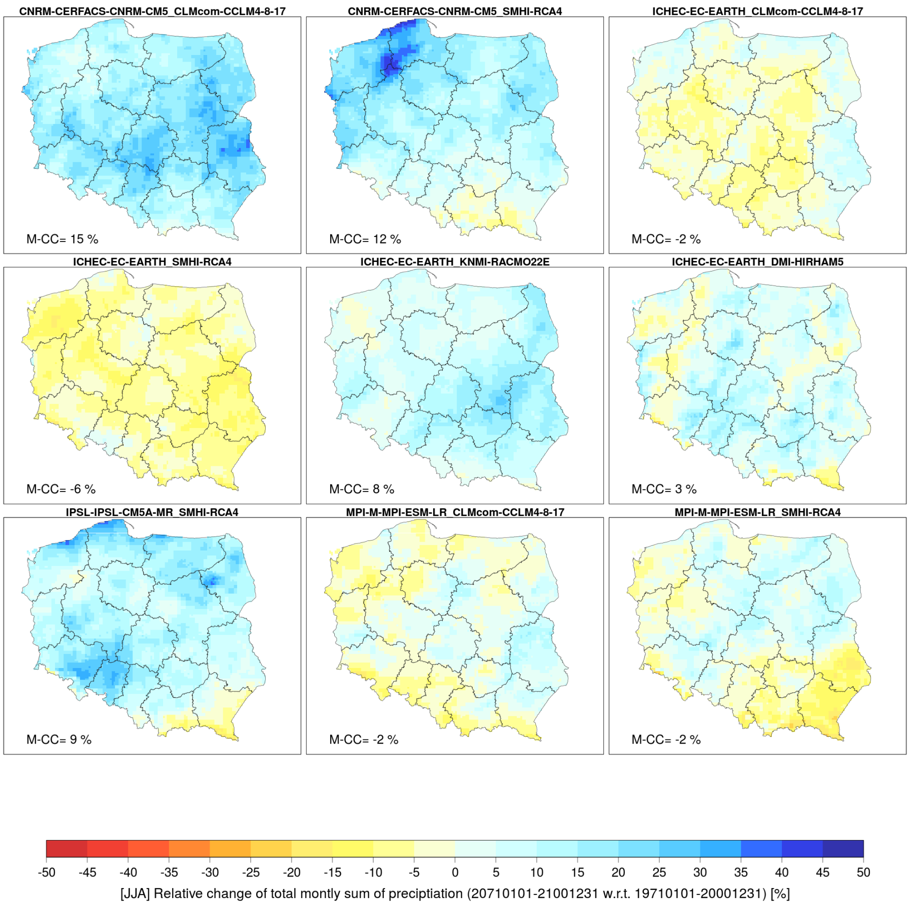

Fig. S78. Changes in projected summer means of monthly sums of precipitation by 2071–2100 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Autumn - SON

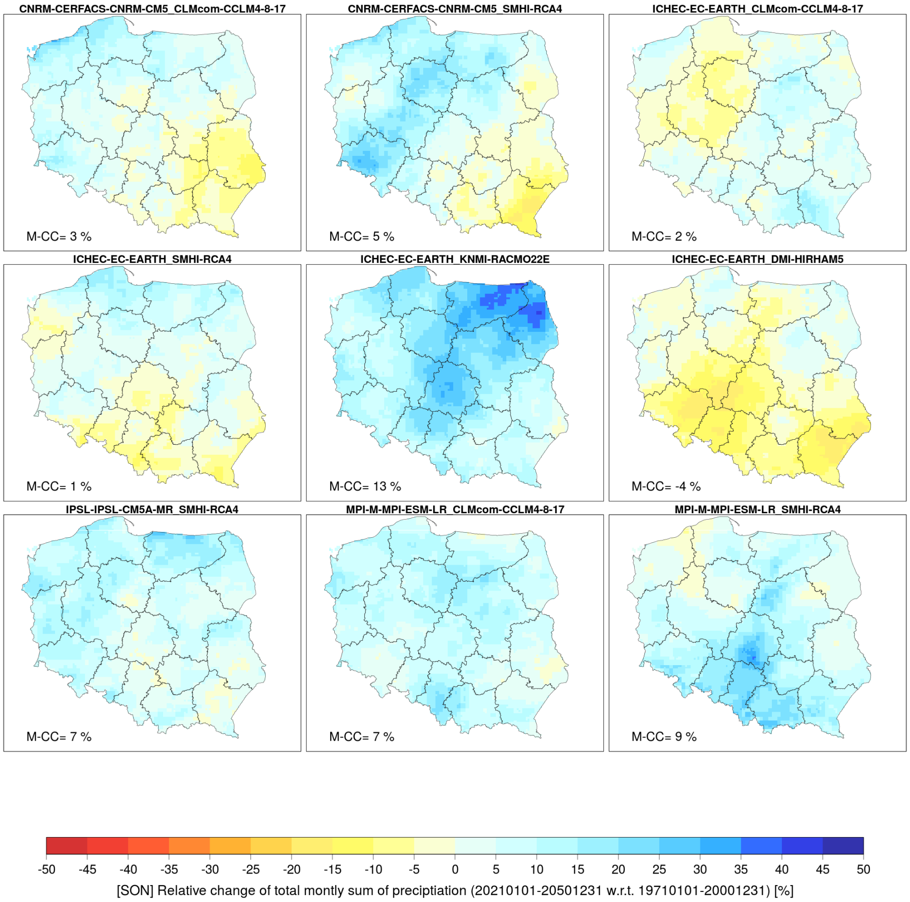

Fig. S79. Changes in projected autumn means of monthly sums of precipitation by 2021–2050 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

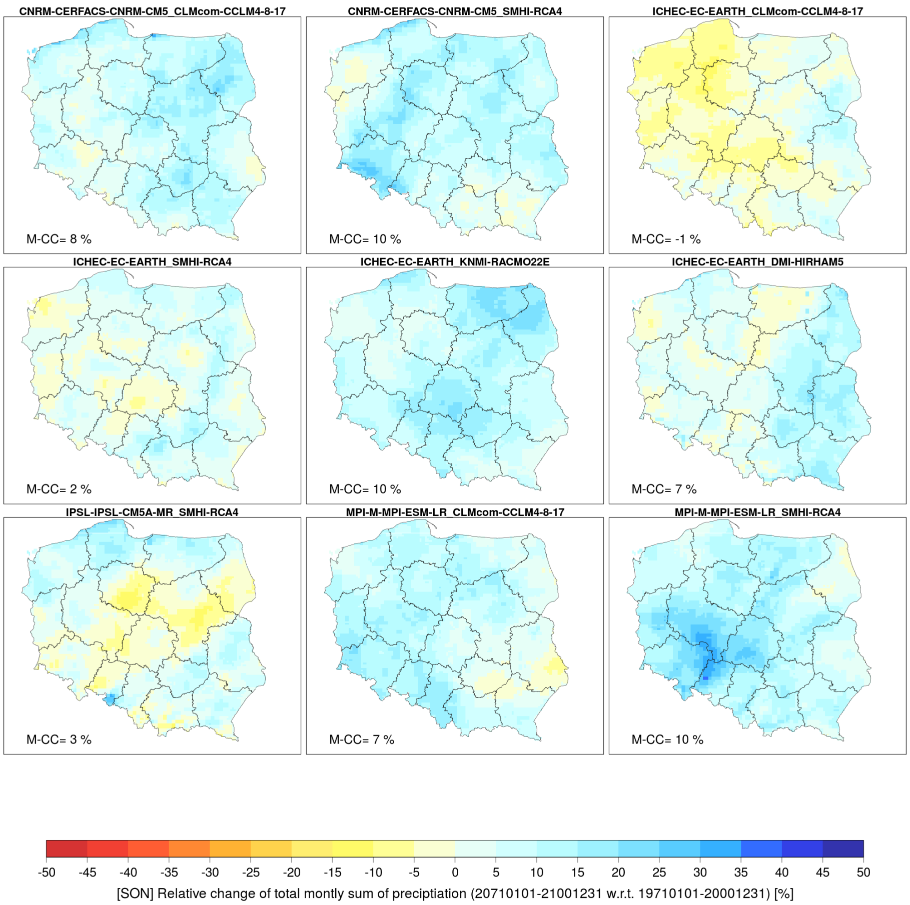

Fig. S80. Changes in projected autumn means of monthly sums of precipitation by 2071–2100 assuming the RCP4.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

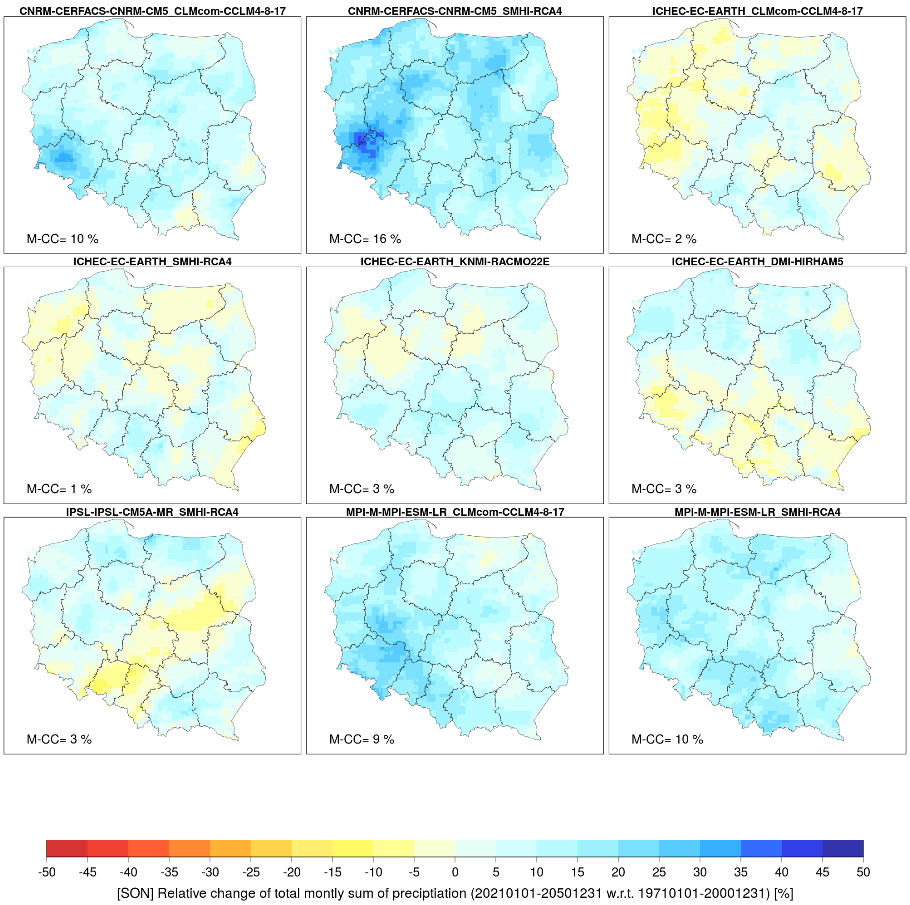

Fig. S81. Changes in projected autumn means of monthly sums of precipitation by 2021–2050 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

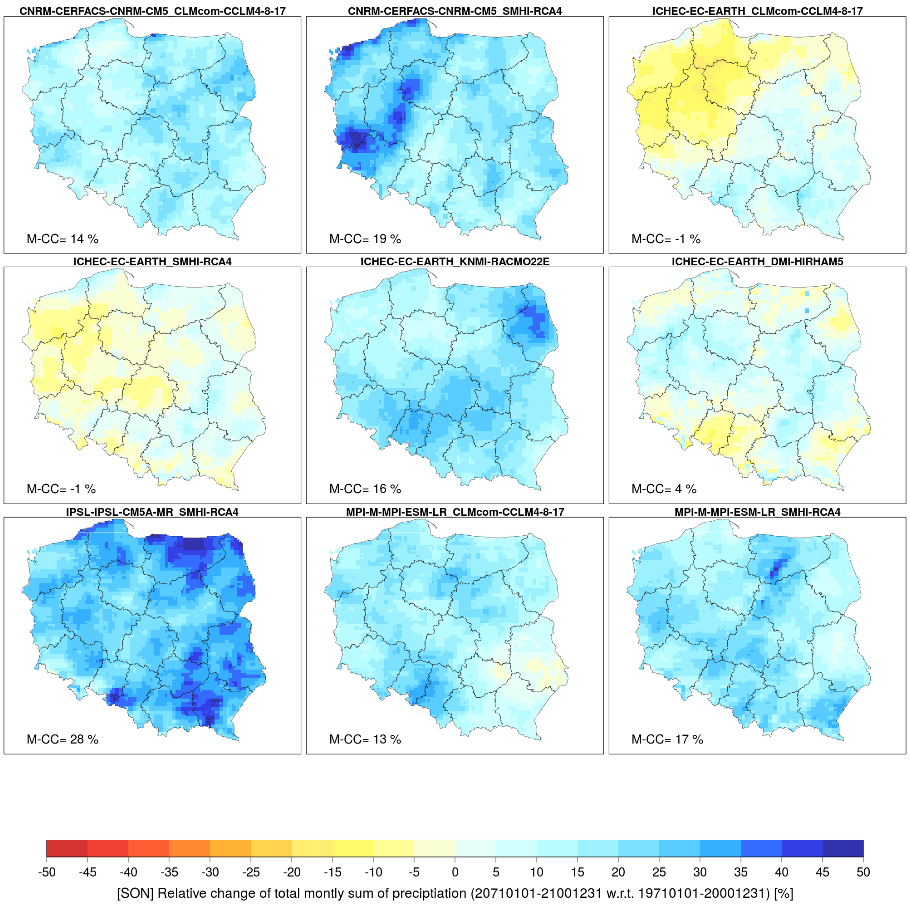

Fig. S82. Changes in projected autumn means of monthly sums of precipitation by 2071–2100 assuming the RCP8.5 scenario. The maps show relative changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

4.2.2 Projected minimum temperature

Annual

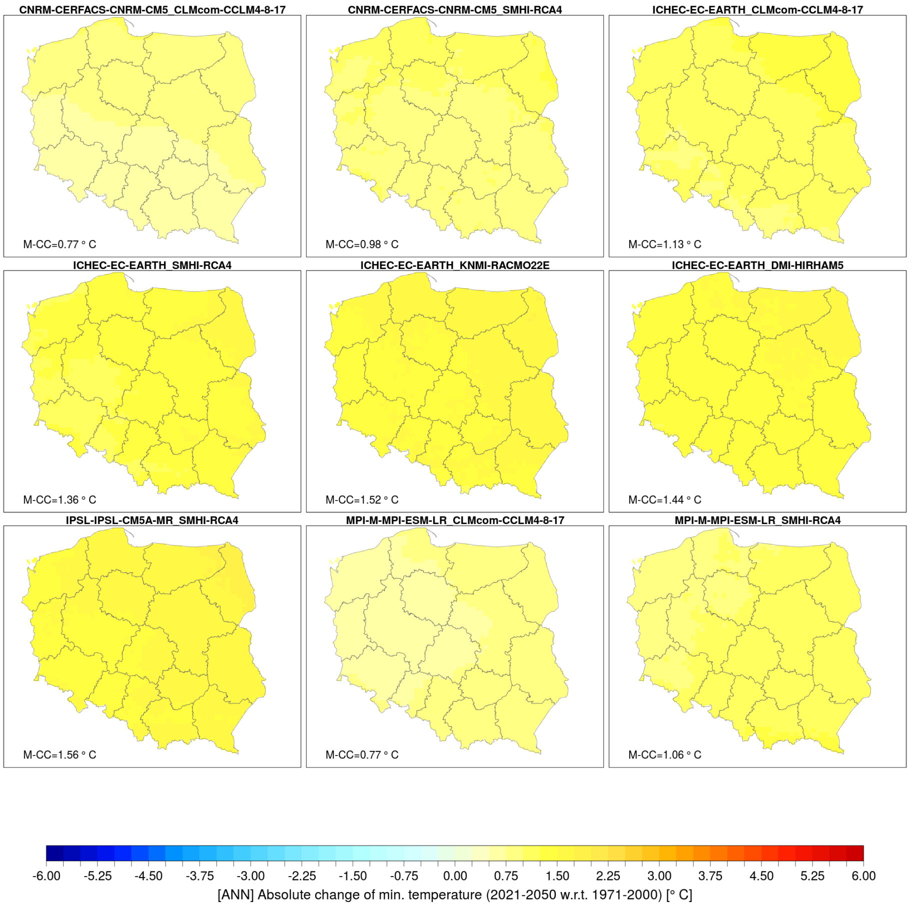

Fig. S83. Changes in projected annual means of daily minimum temperature by 2021–2050 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

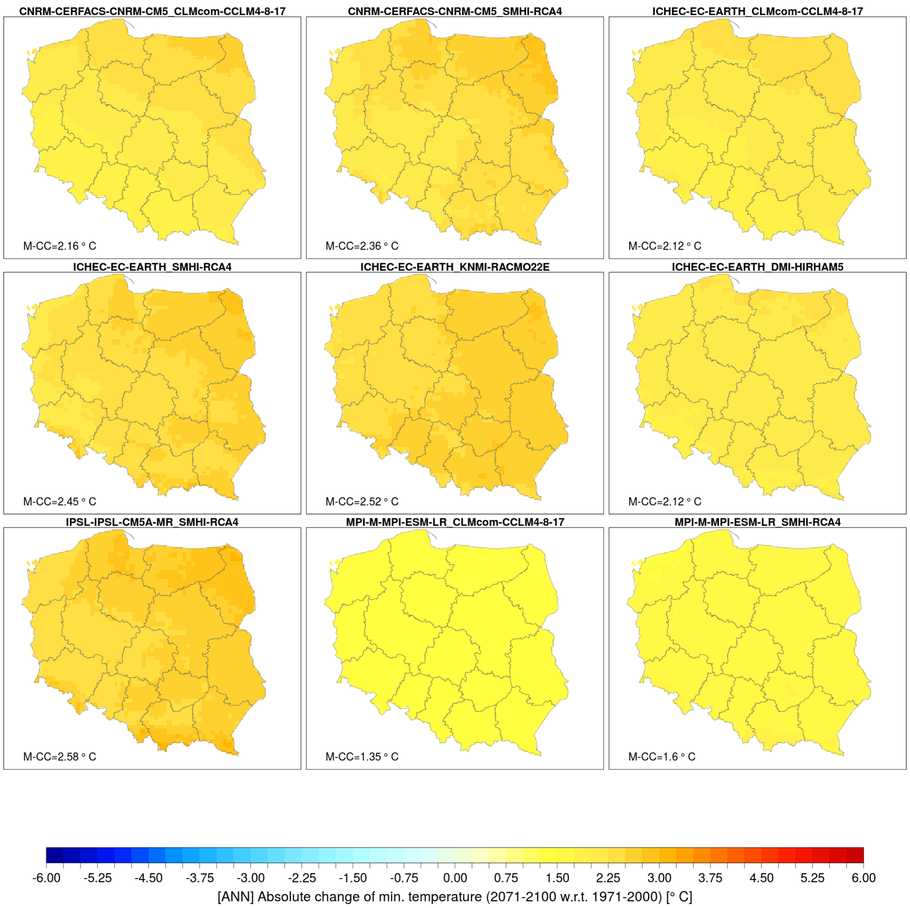

Fig. S84. Changes in projected annual means of daily minimum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

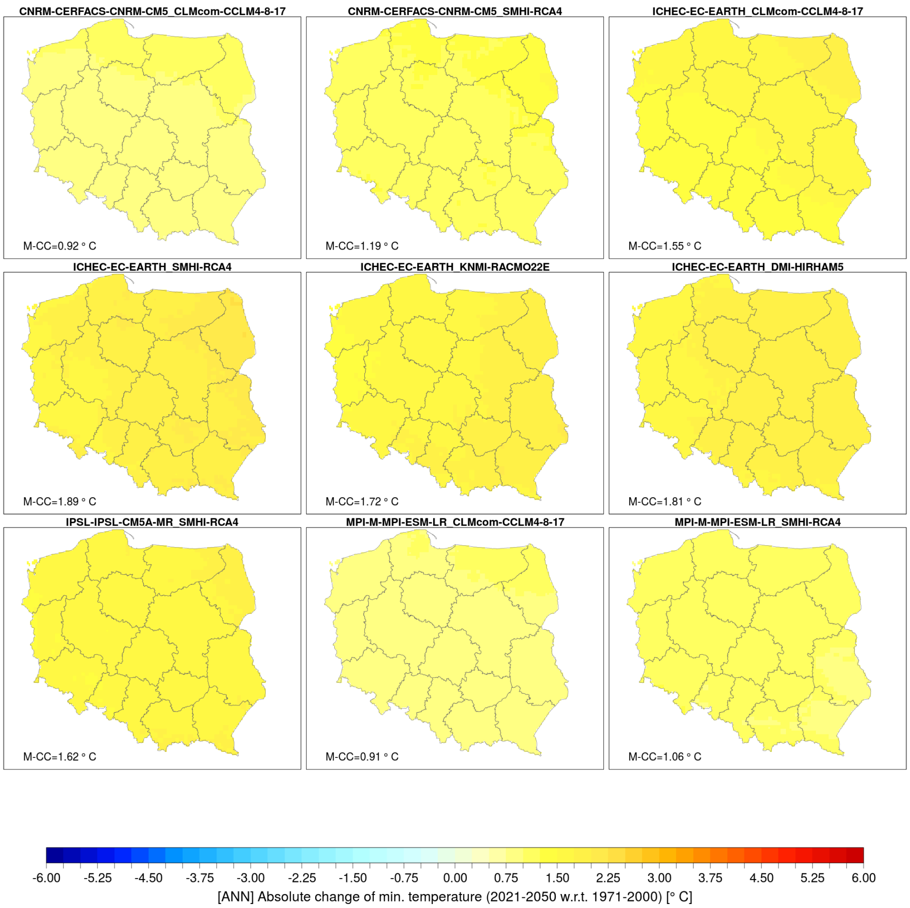

Fig. S85. Changes in projected annual means of daily minimum temperature by 2021–2050 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

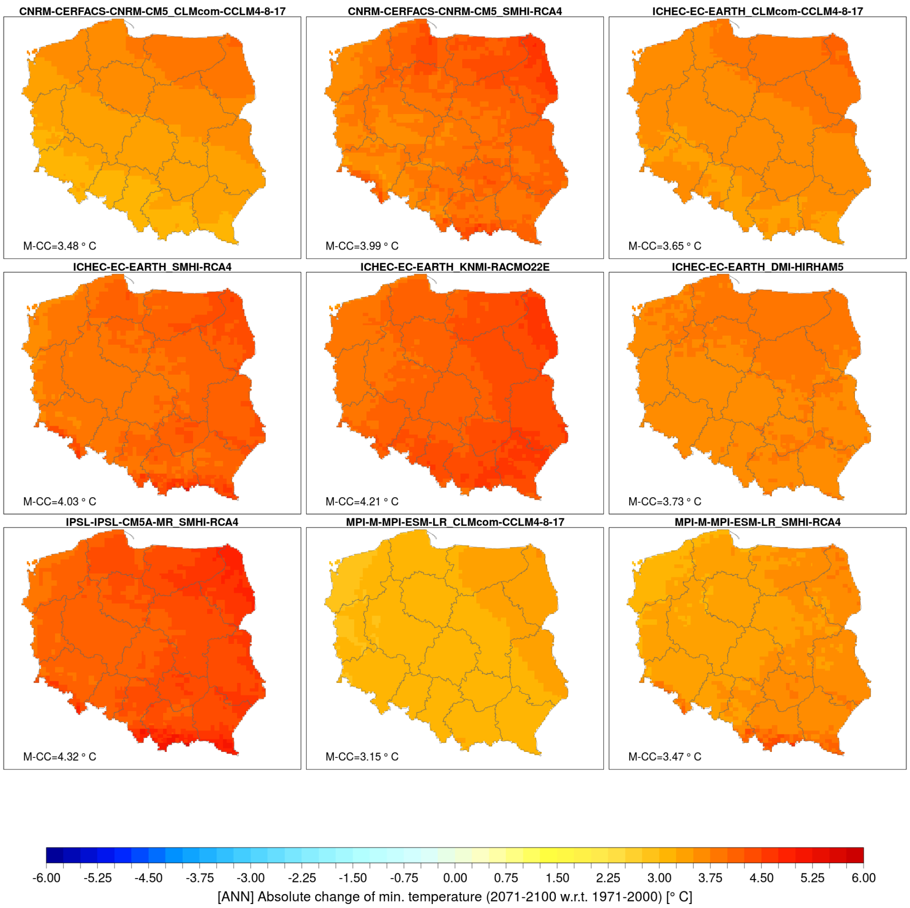

Fig. S86. Changes in projected annual means of daily minimum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Winter - DJF

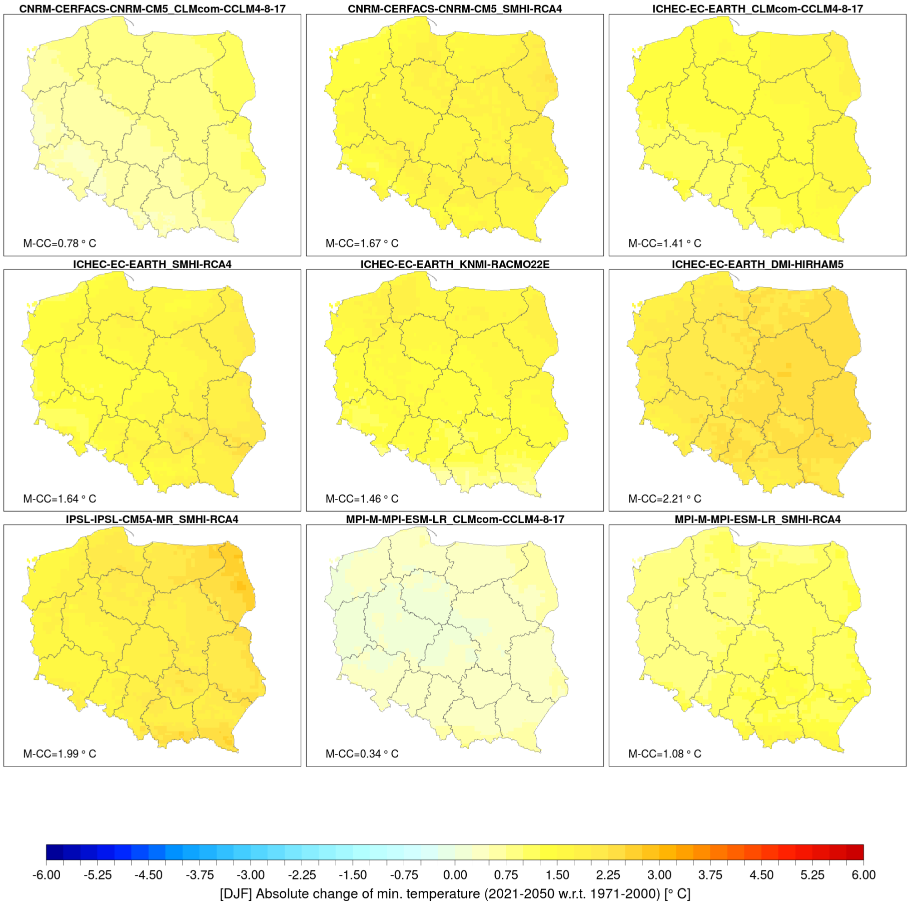

Fig. S87. Changes in projected winter means of daily minimum temperature by 2021–2050 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

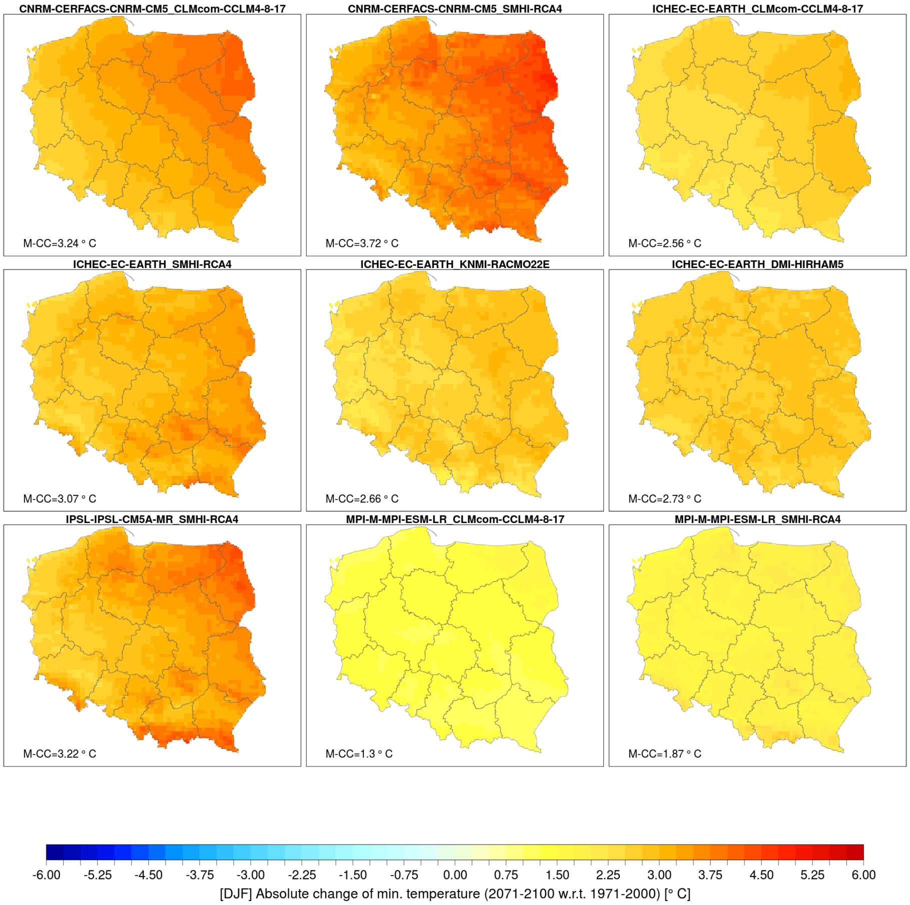

Fig. S88. Changes in projected winter means of daily minimum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

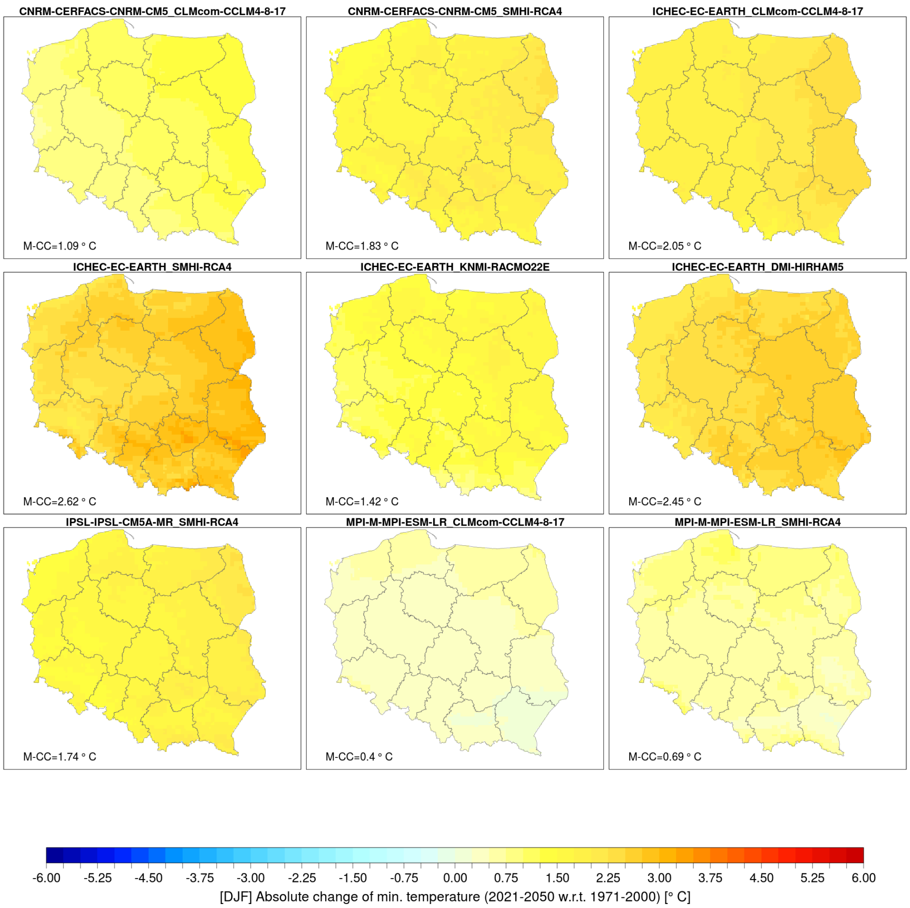

Fig. S89. Changes in projected winter means of daily minimum temperature by 2021–2050 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

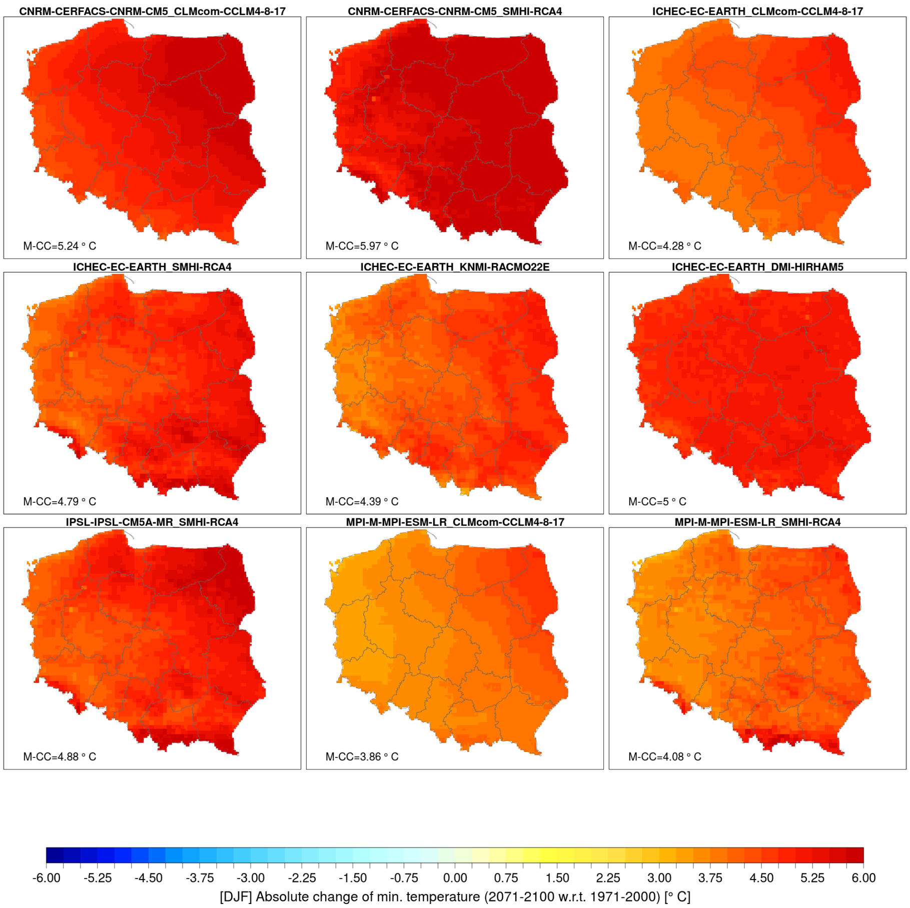

Fig. S90. Changes in projected winter means of daily minimum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Spring - MAM

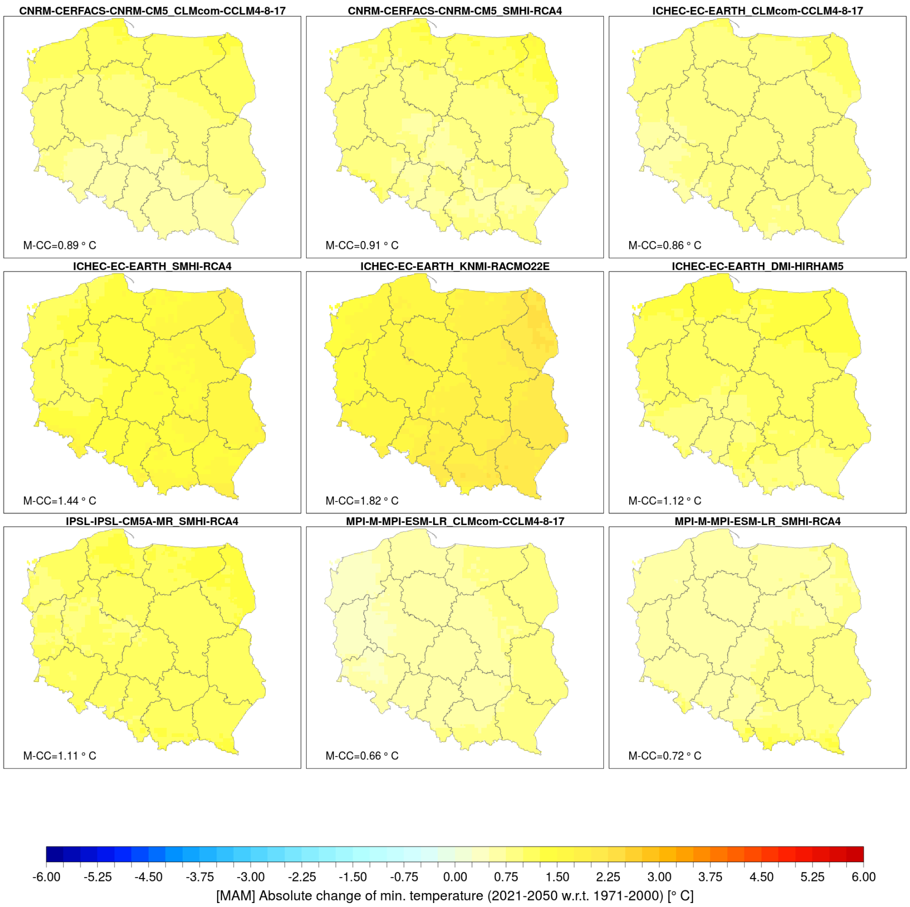

Fig. S91. Changes in projected spring means of daily minimum temperature by 2021–2050 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

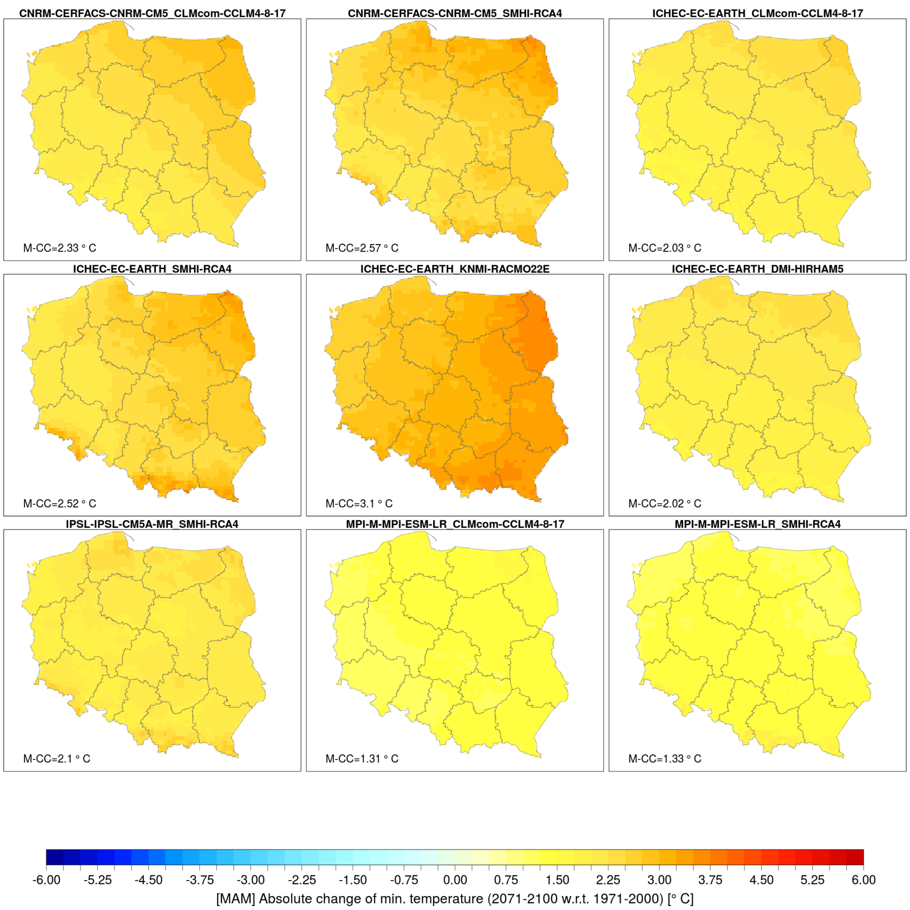

Fig. S92. Changes in projected spring means of daily minimum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

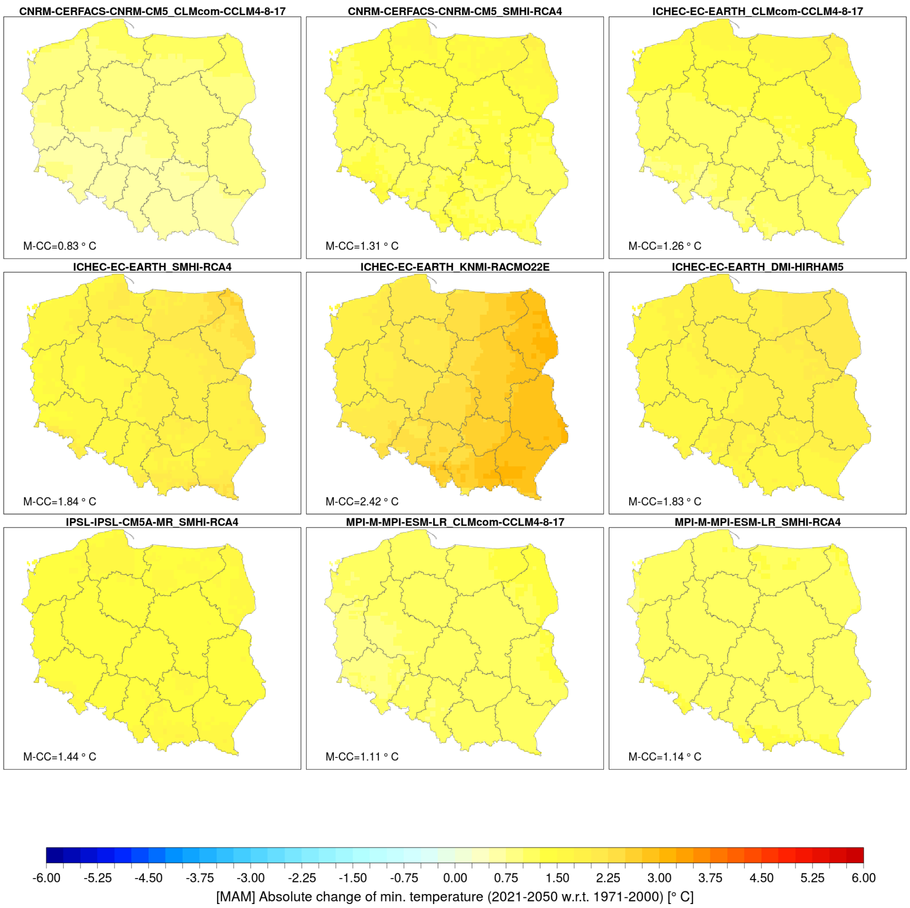

Fig. S93. Changes in projected spring means of daily minimum temperature by 2021–2050 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

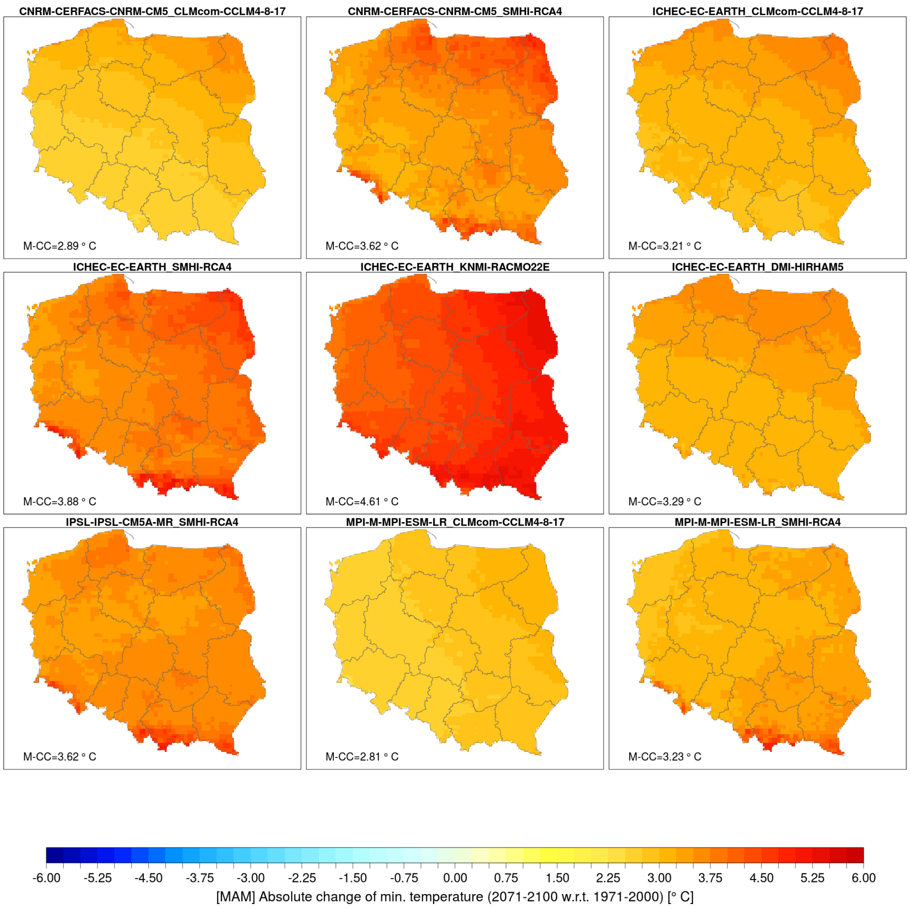

Fig. S94. Changes in projected spring means of daily minimum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Summer - JJA

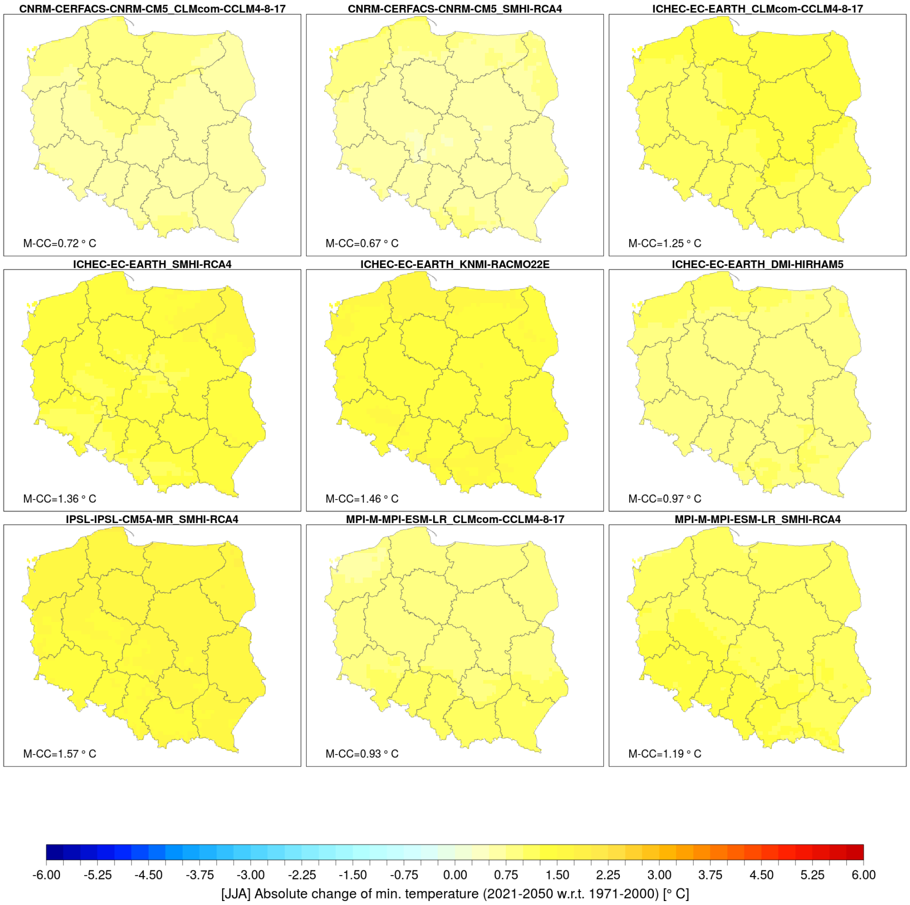

Fig. S95. Changes in projected summer means of daily minimum temperature by 2021–2050 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

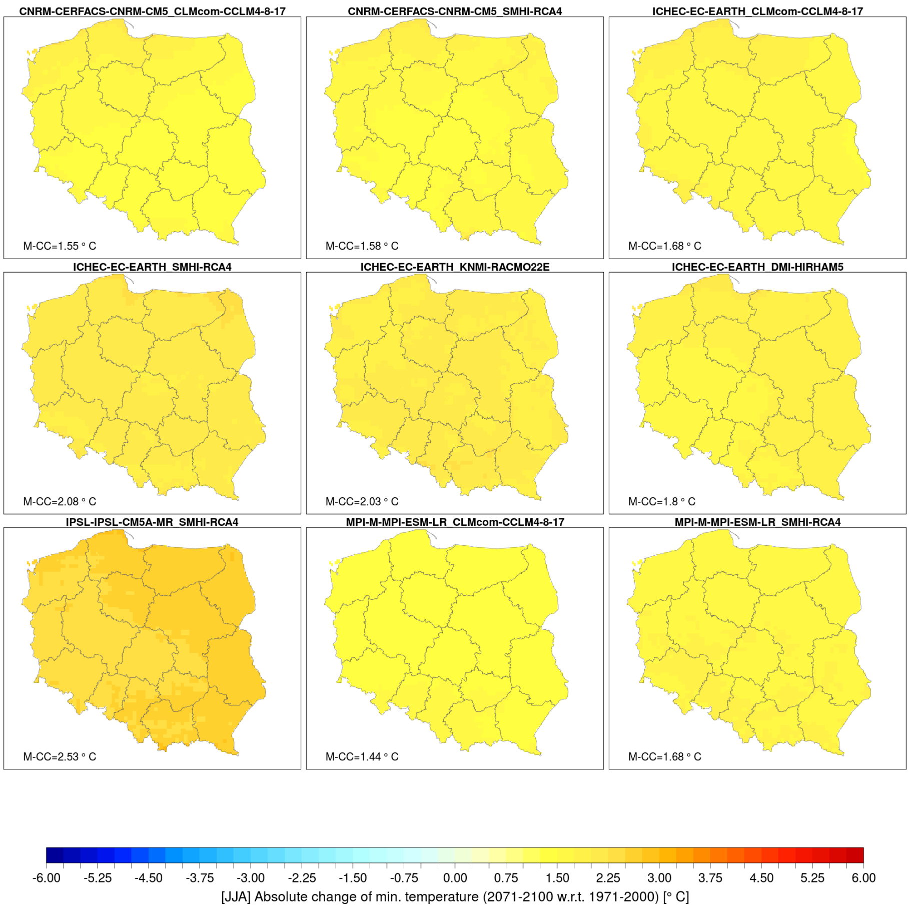

Fig. S96. Changes in projected summer means of daily minimum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

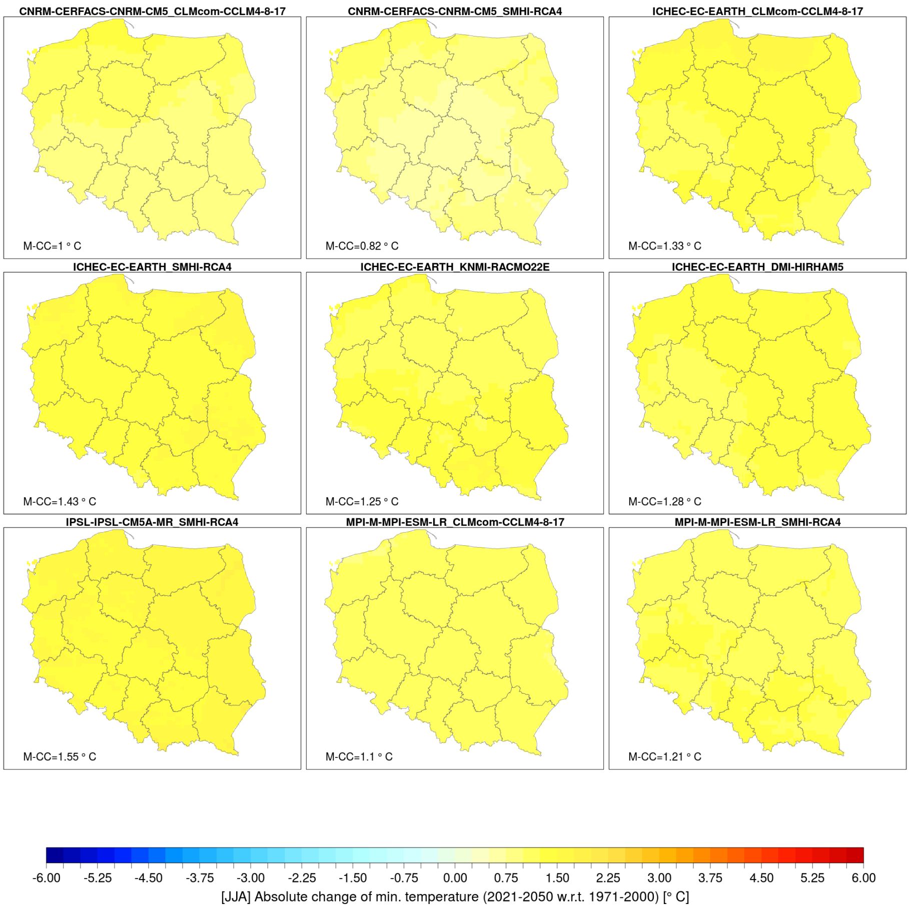

Fig. S97. Changes in projected summer means of daily minimum temperature by 2021–2050 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

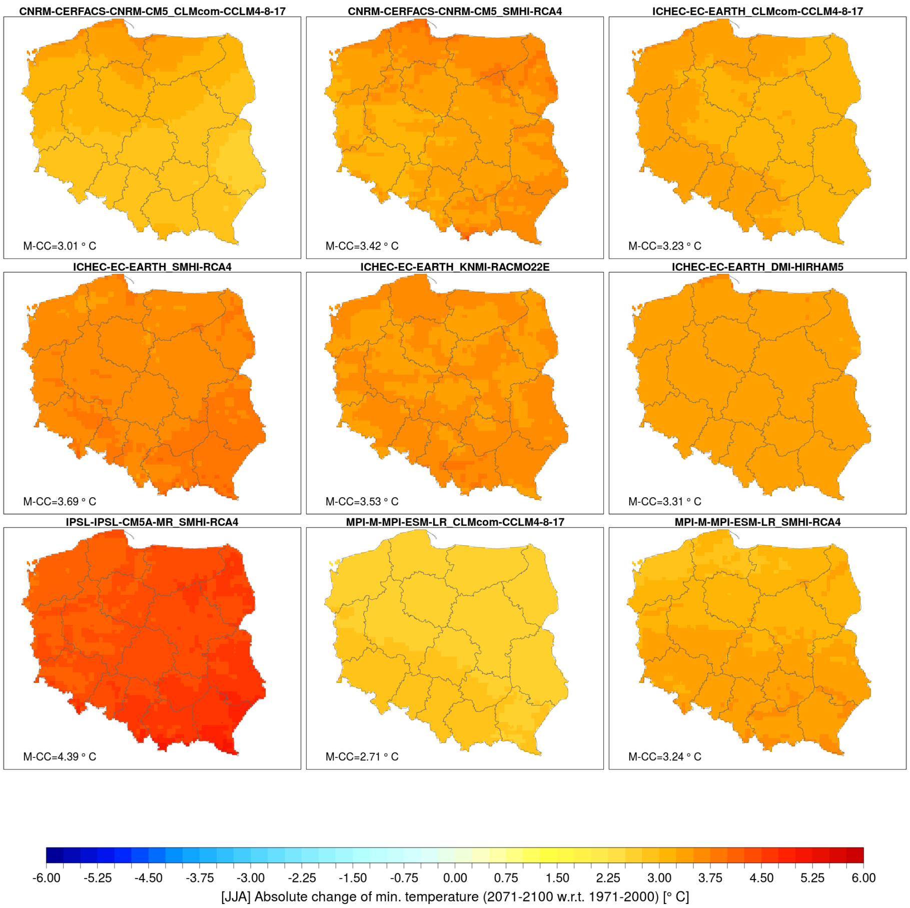

Fig. S98. Changes in projected summer means of daily minimum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Autumn - SON

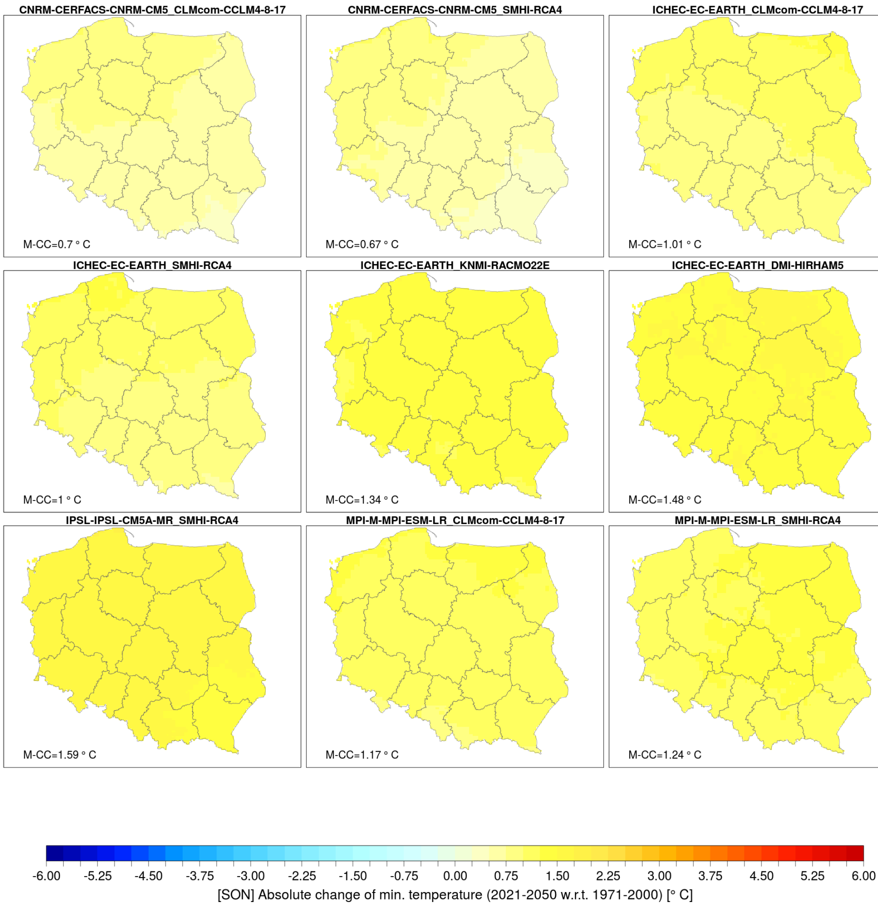

Fig. S99. Changes in projected autumn means of daily minimum temperature by 2021–2050 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

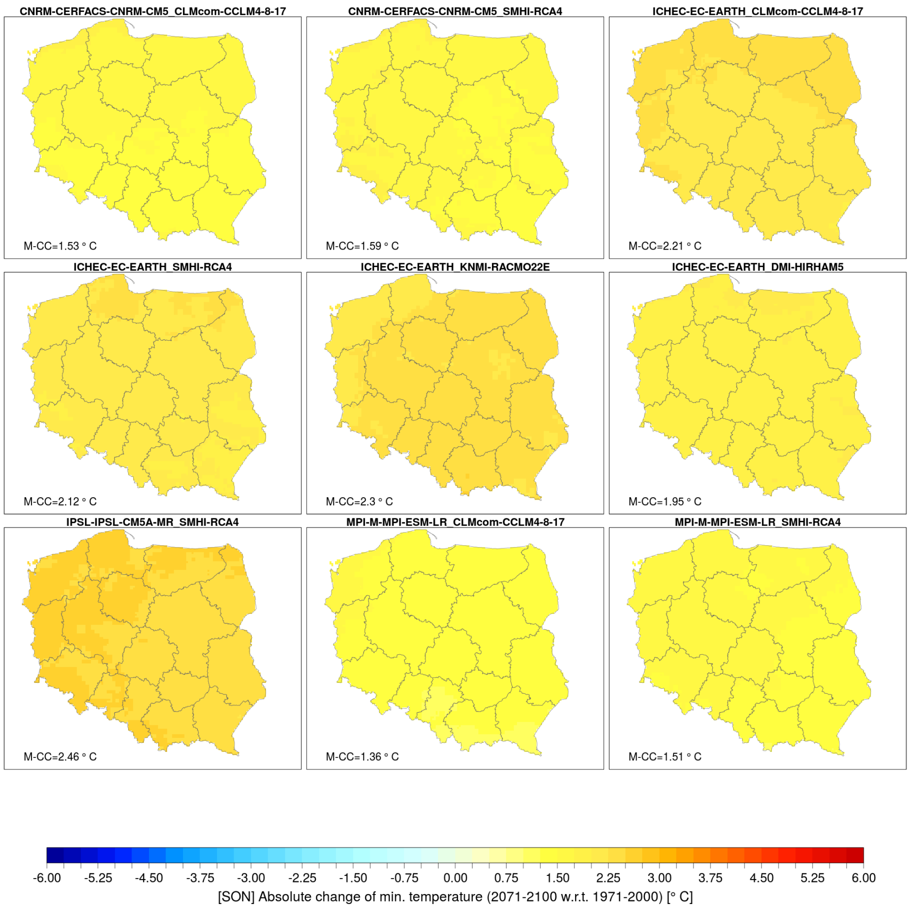

Fig. S100. Changes in projected autumn means of daily minimum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

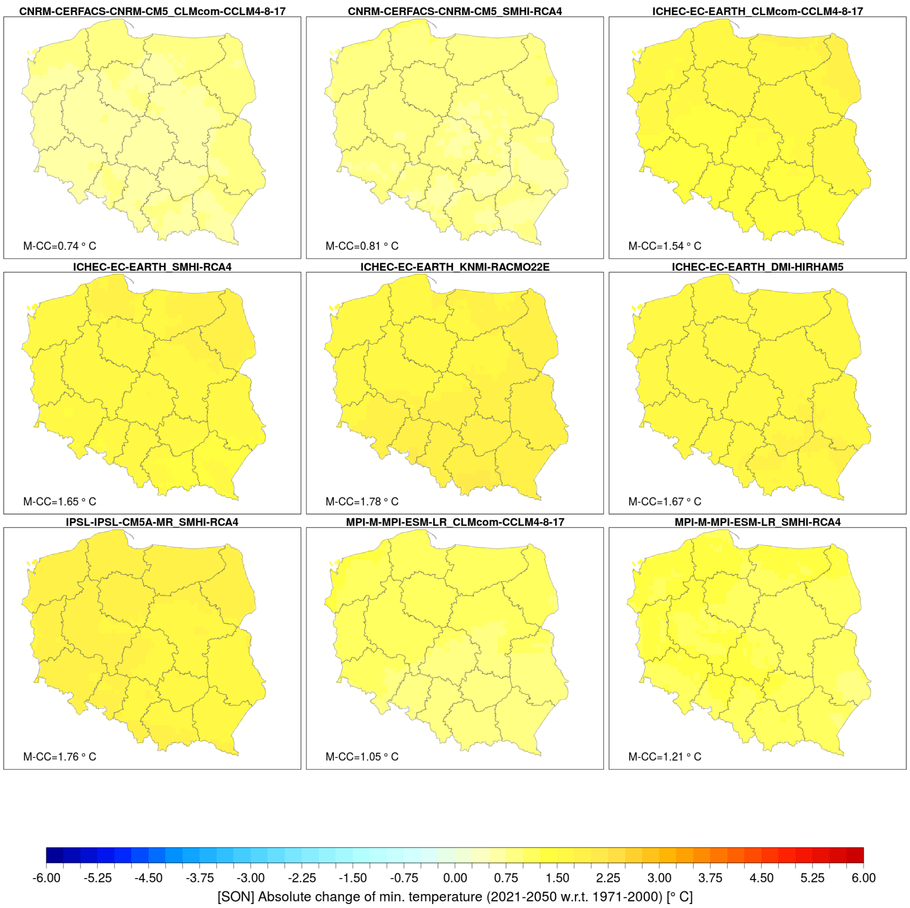

Fig. S101. Changes in projected autumn means of daily minimum temperature by 2021–2050 assuming the RCP8.5 scenario.The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

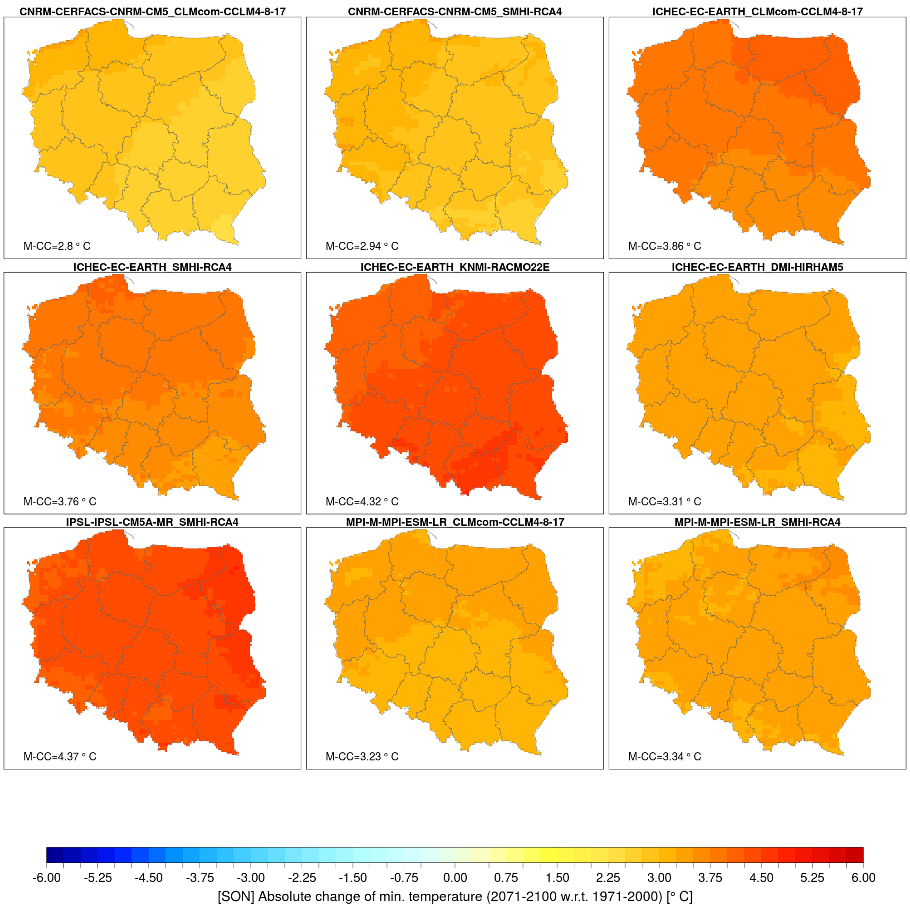

Fig. S102. Changes in projected autumn means of daily minimum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

4.2.3 Projected maximum temperature

Annual

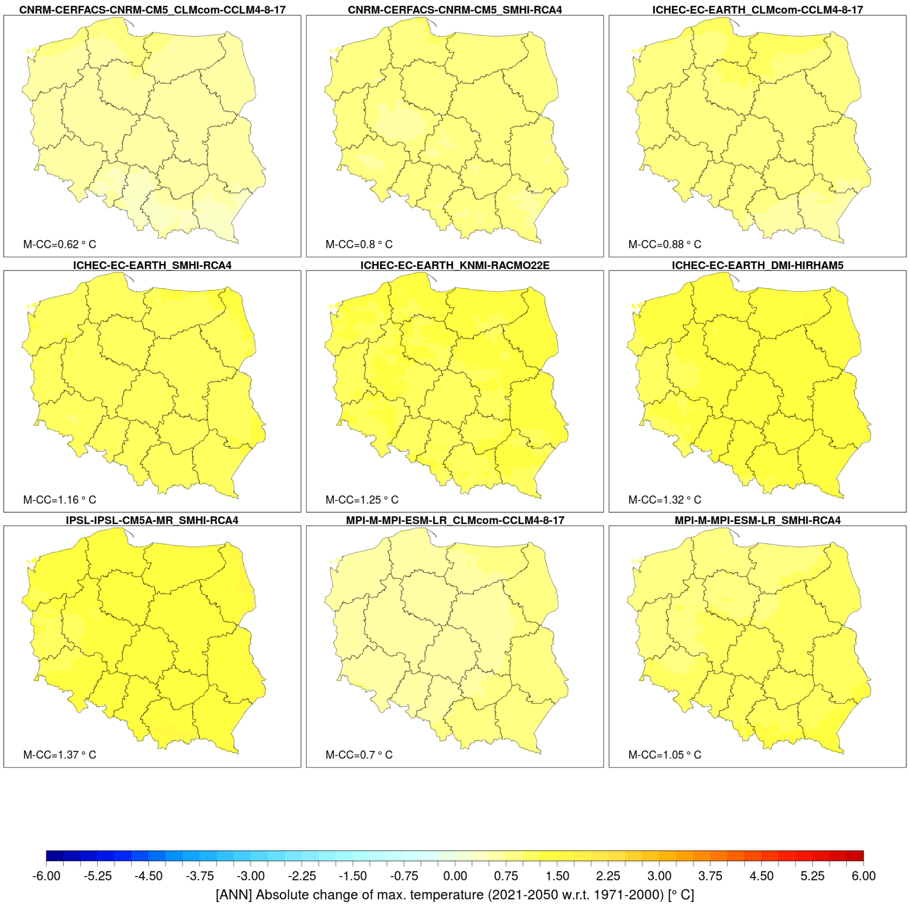

Fig. S103. Changes in projected annual means of daily maximum temperature by 2021–2050 assuming the RCP4.5 scenario.The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

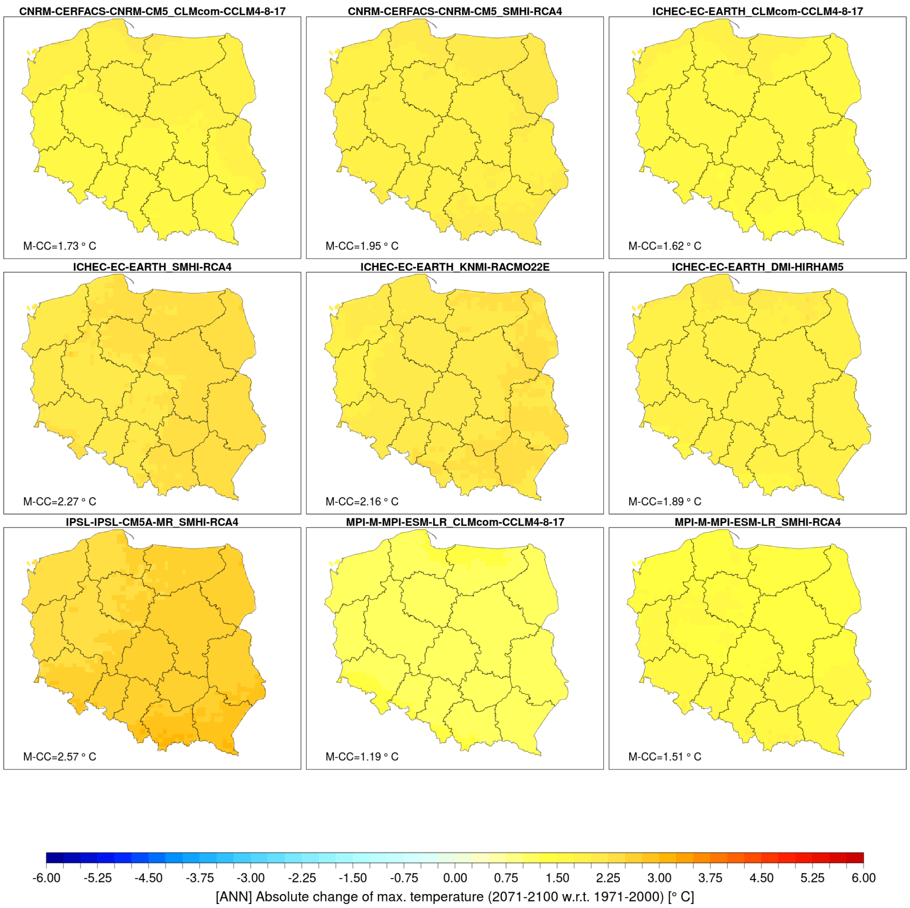

Fig. S104. Changes in projected annual means of daily maximum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

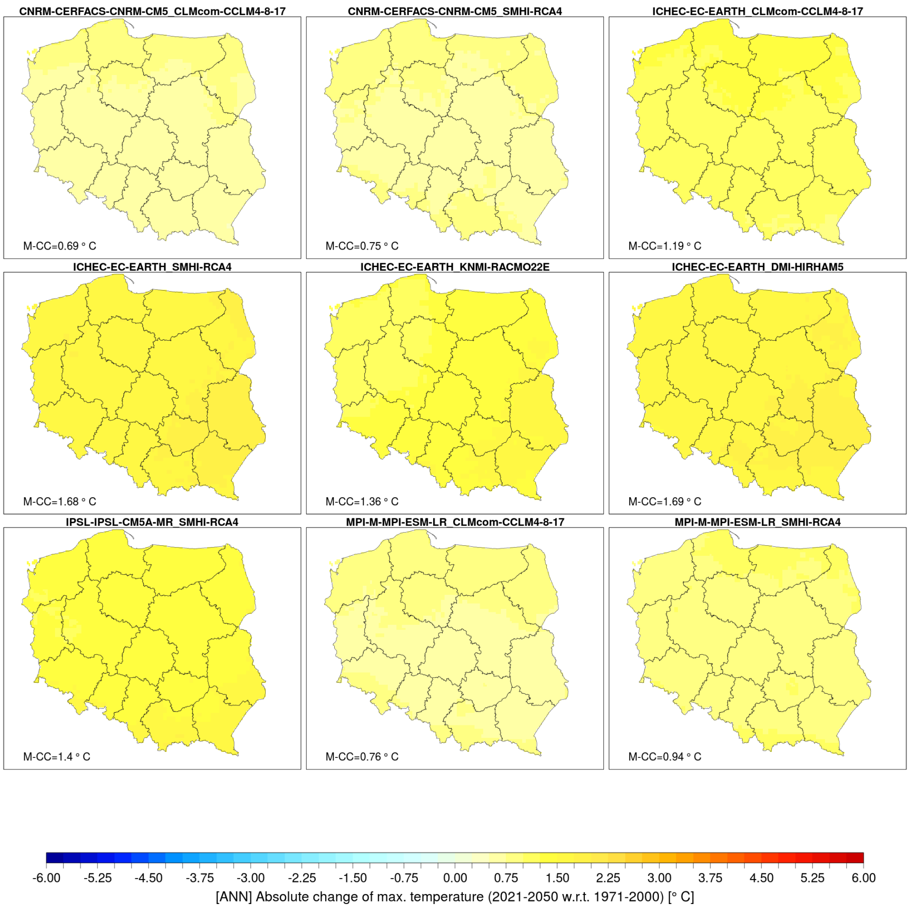

Fig. S105. Changes in projected annual means of daily maximum temperature by 2021–2050 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

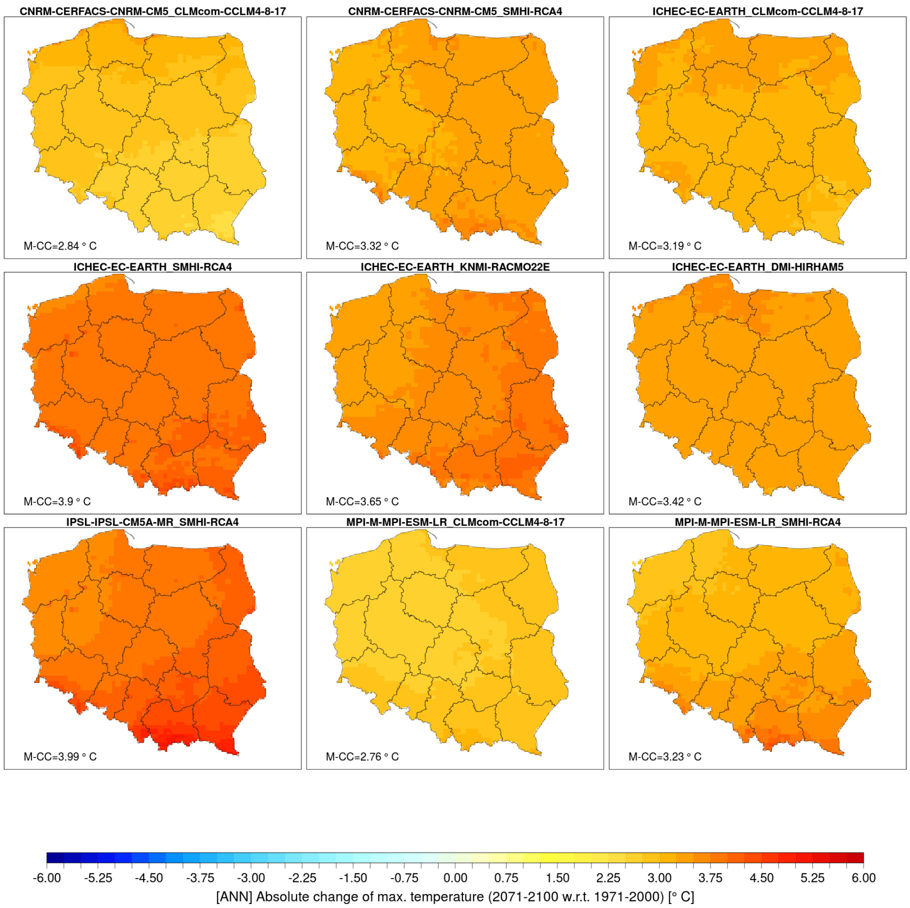

Fig. S106. Changes in projected annual means of daily maximum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Winter - DJF

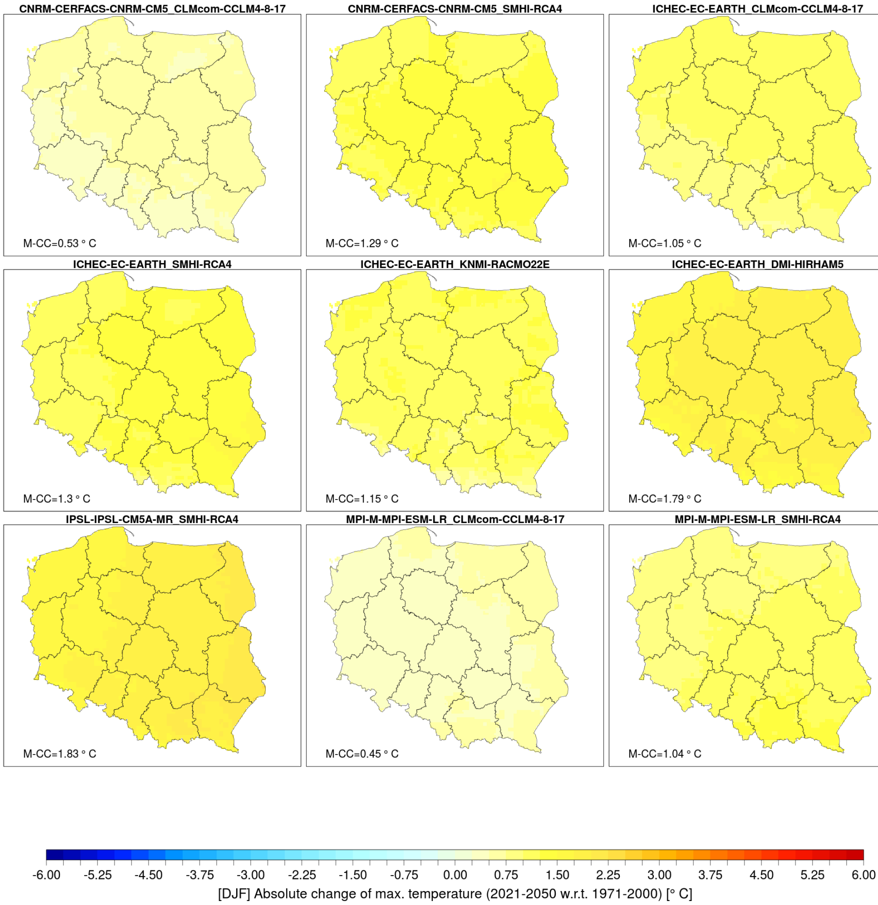

Fig. S107. Changes in projected winter means of daily maximum temperature by 2021–2050 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

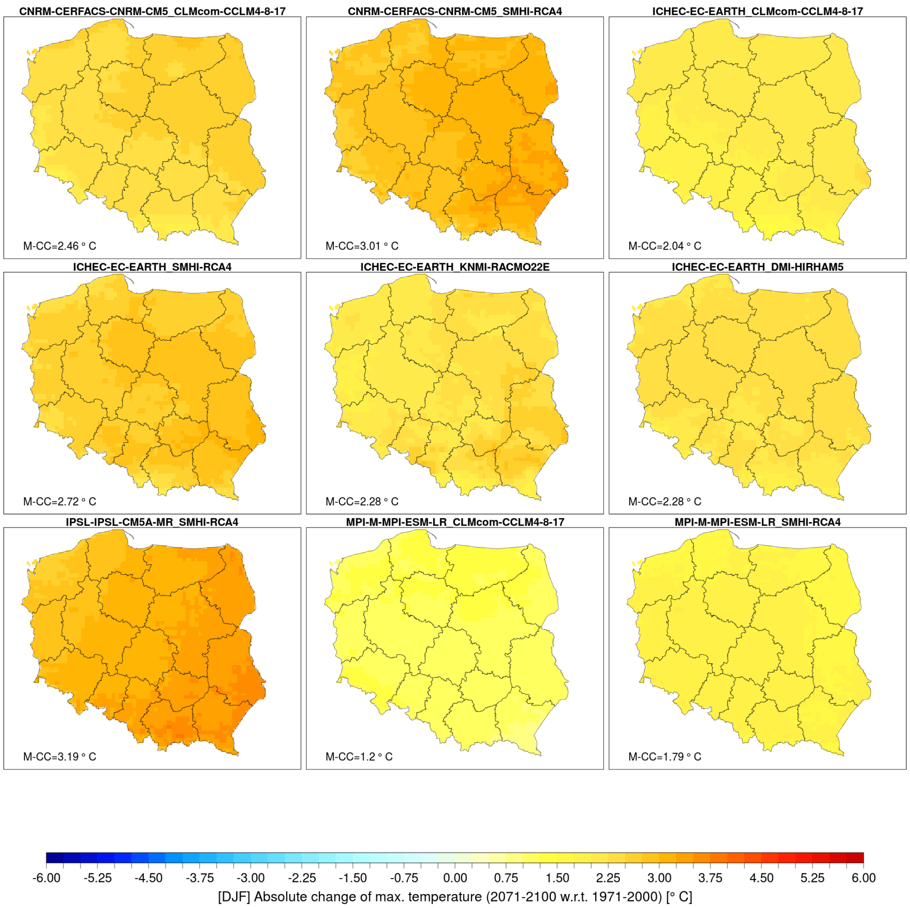

Fig. S108. Changes in projected winter means of daily maximum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

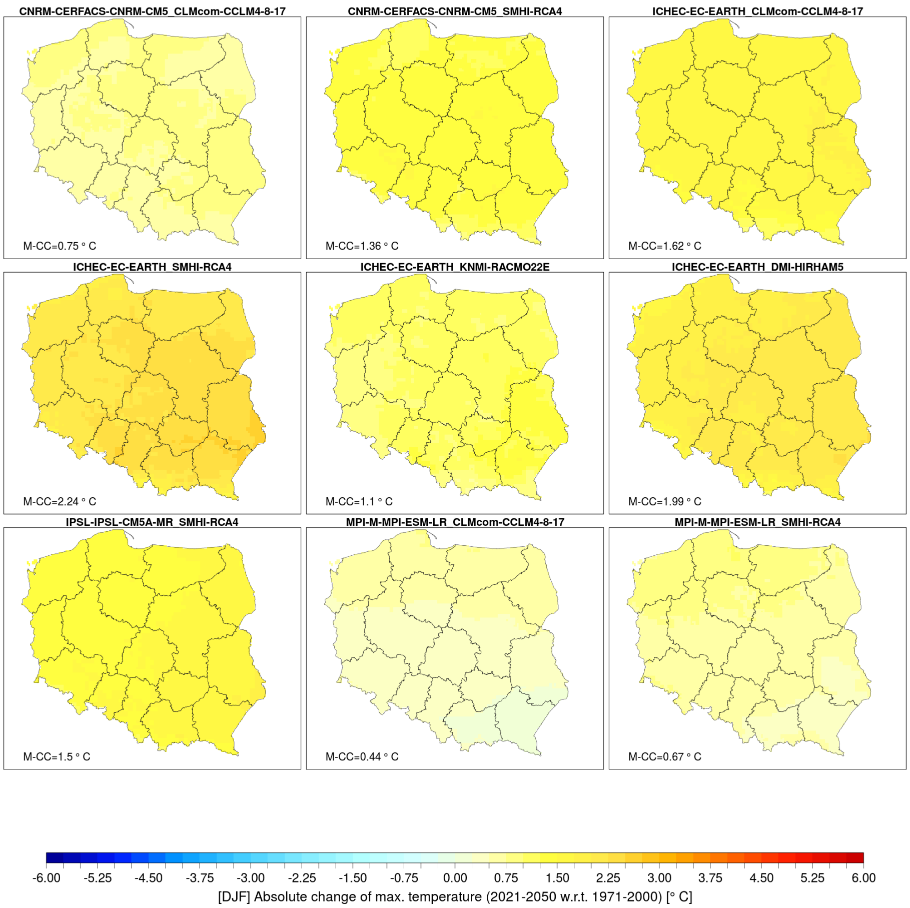

Fig. S109. Changes in projected winter means of daily maximum temperature by 2021–2050 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

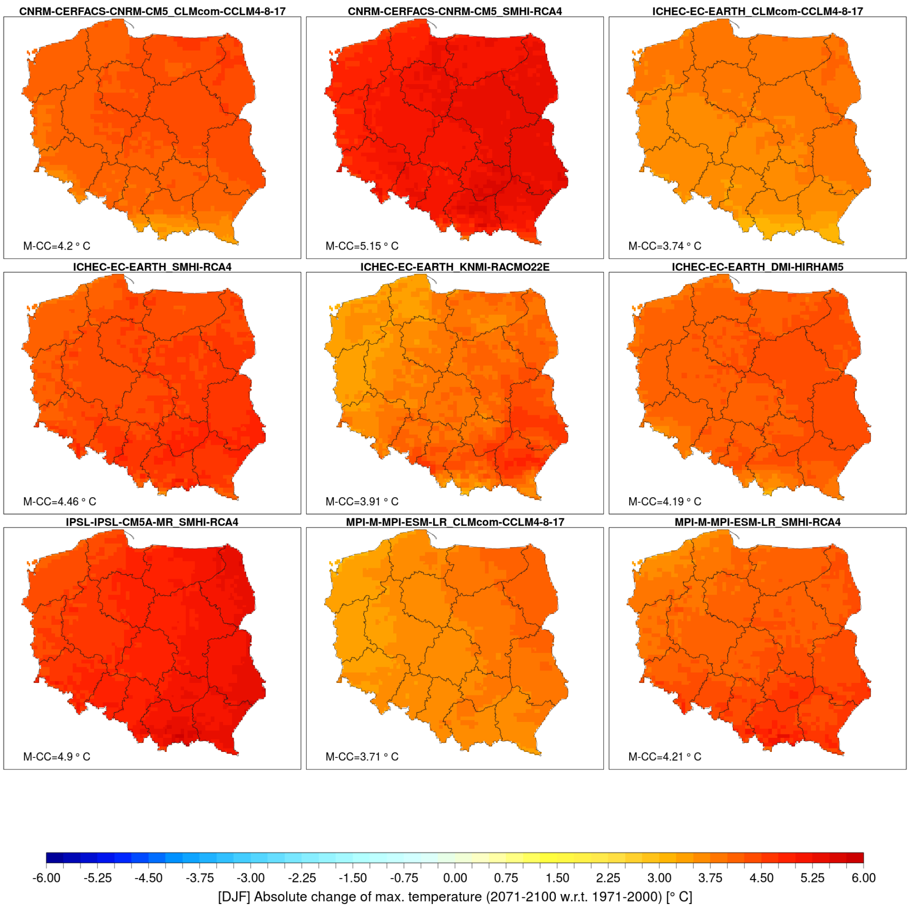

Fig. S110. Changes in projected winter means of daily maximum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Spring - MAM

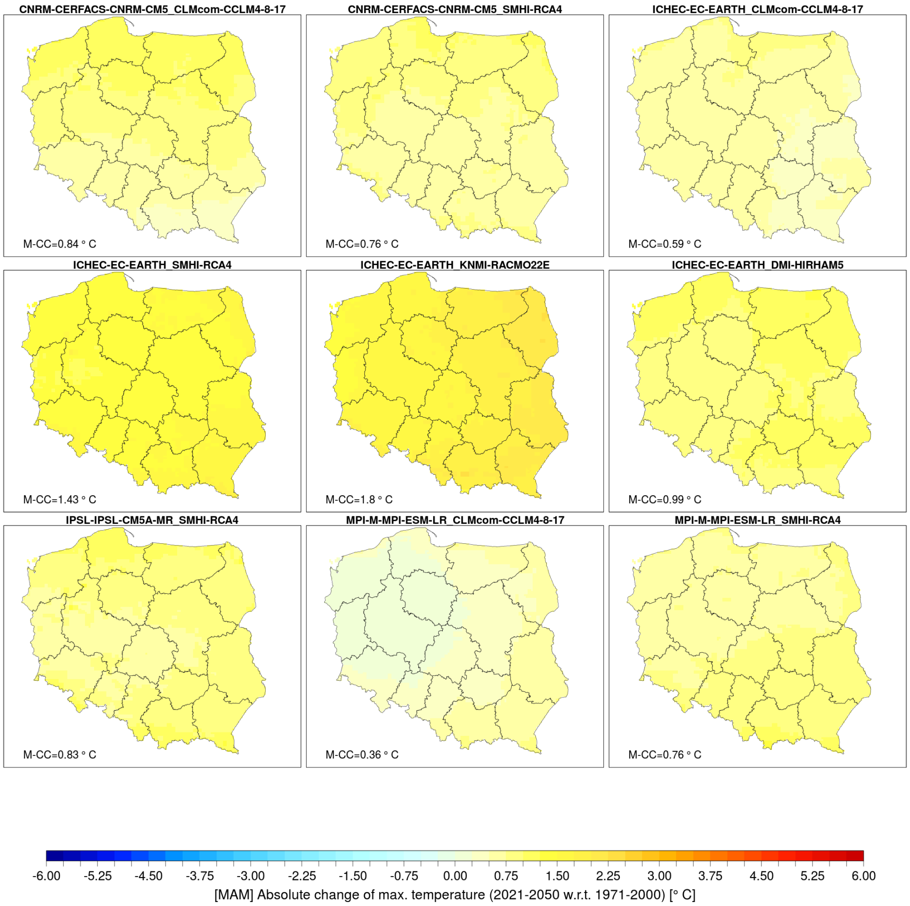

Fig. S111. Changes in projected spring means of daily maximum temperature by 2021–2050 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

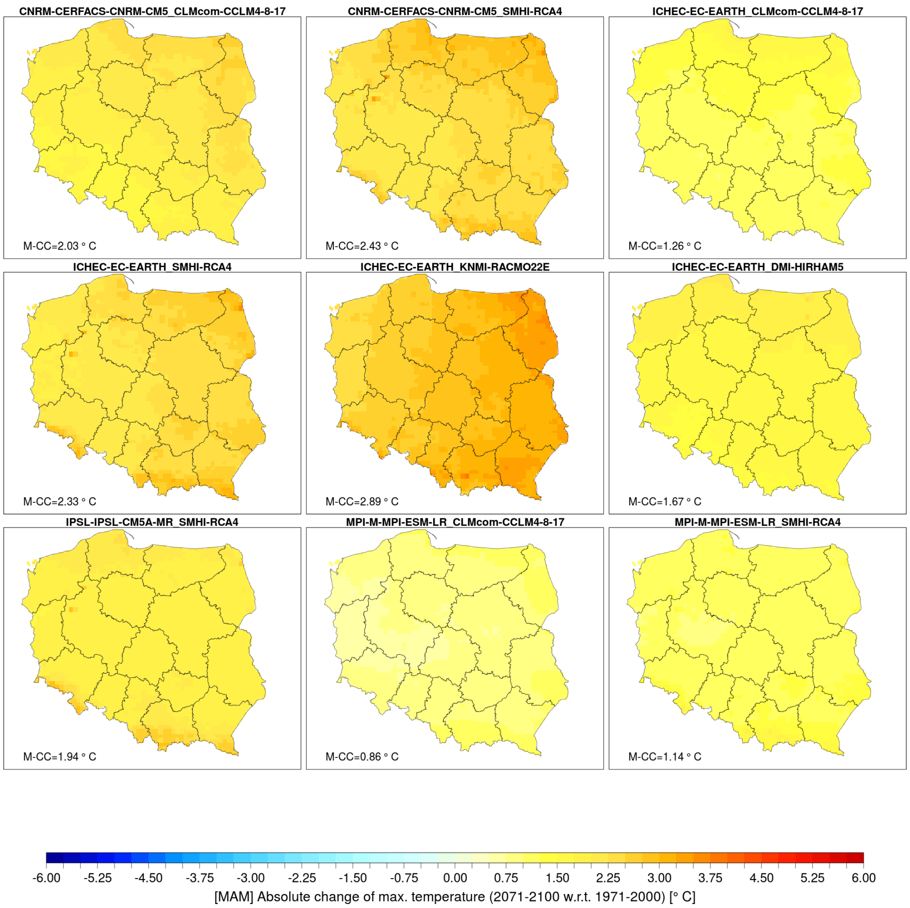

Fig. S112. Changes in projected spring means of daily maximum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

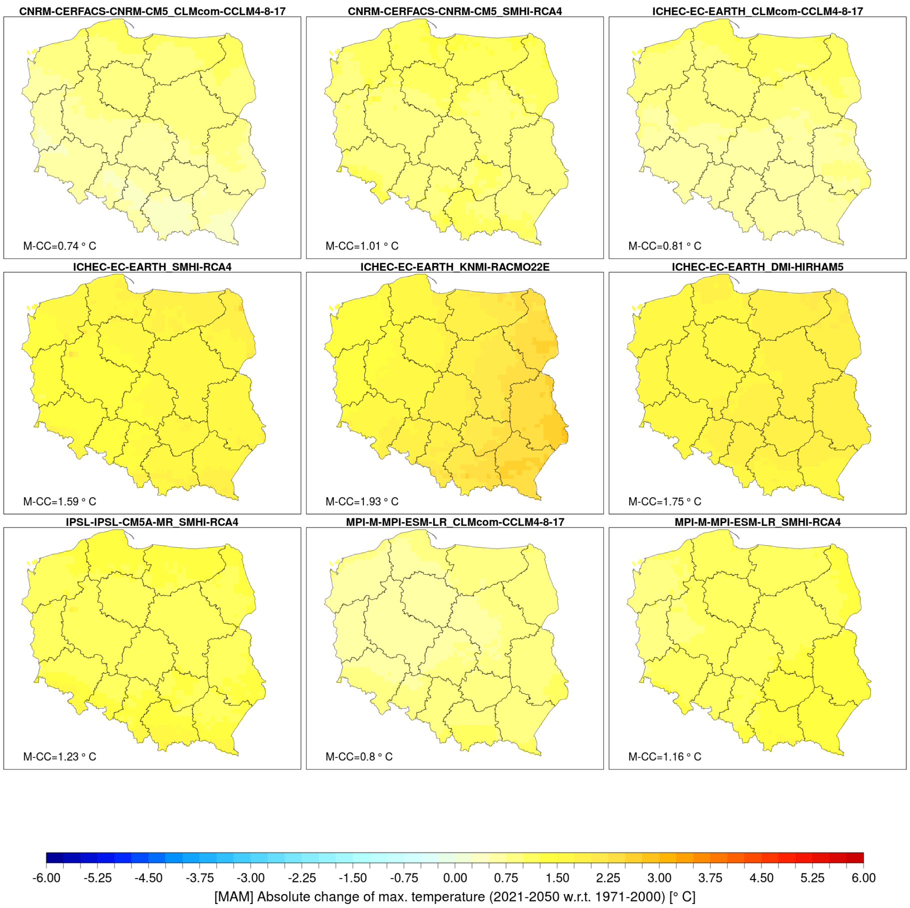

Fig. S113. Changes in projected spring means of daily maximum temperature by 2021–2050 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

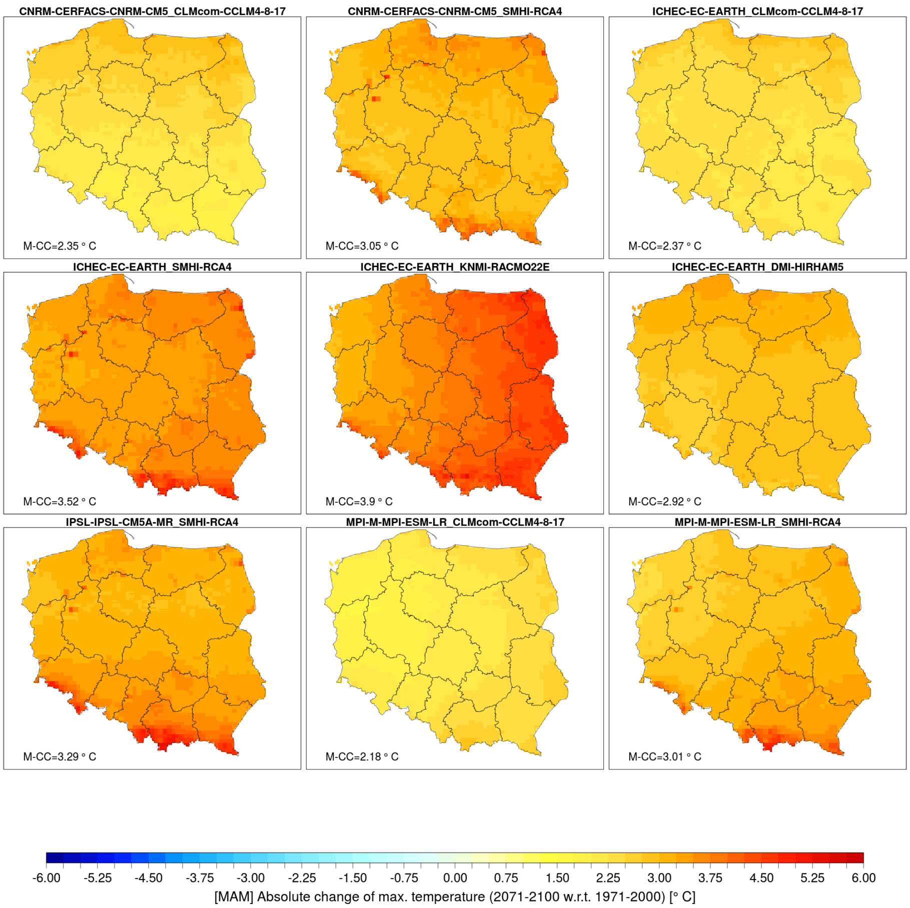

Fig. S114. Changes in projected spring means of daily maximum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

Summer - JJA

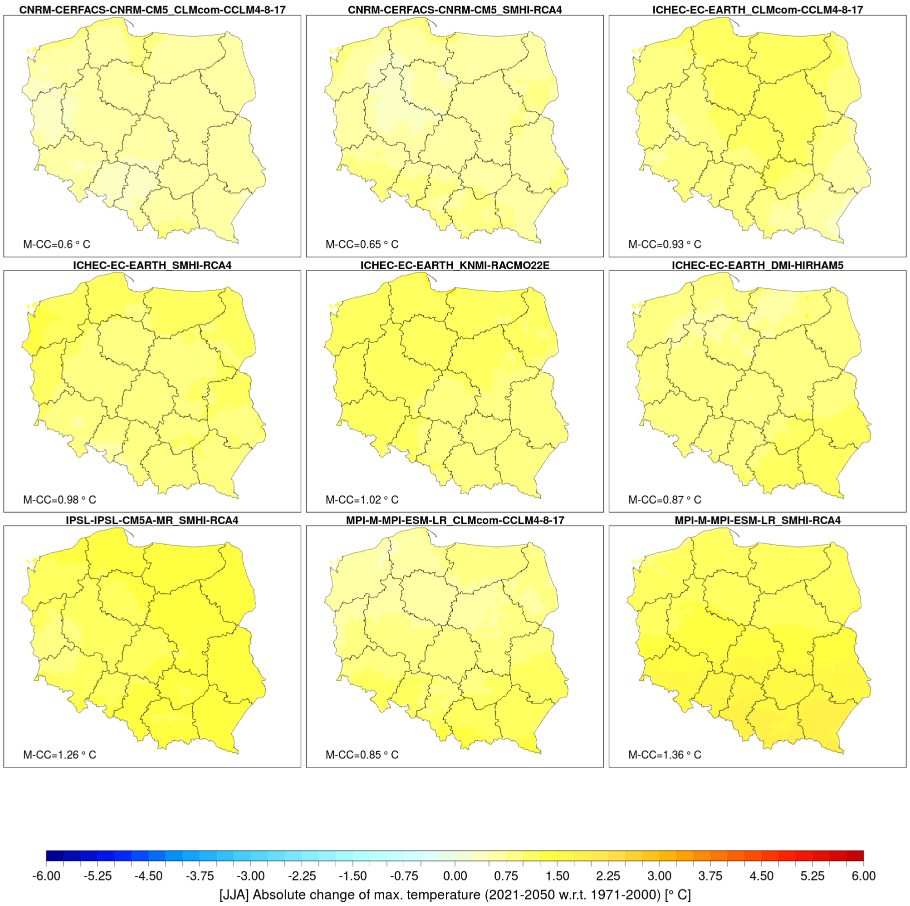

Fig. S115. Changes in projected summer means of daily maximum temperature by 2021–2050 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

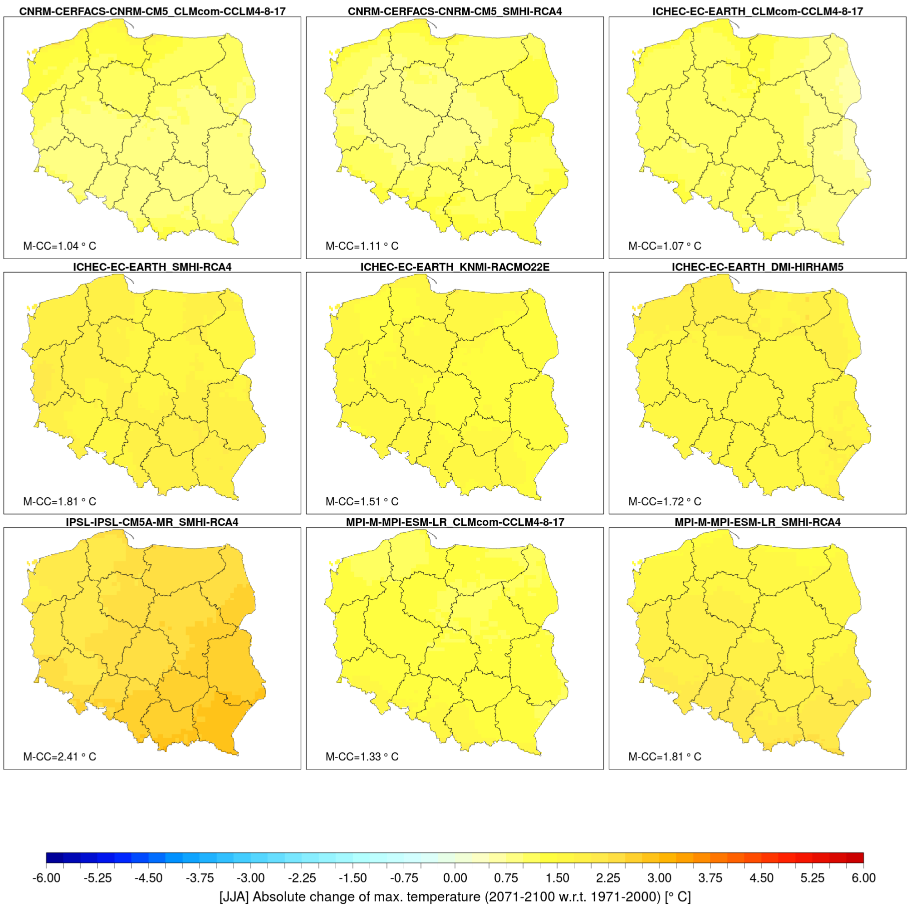

Fig. S116. Changes in projected summer means of daily maximum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

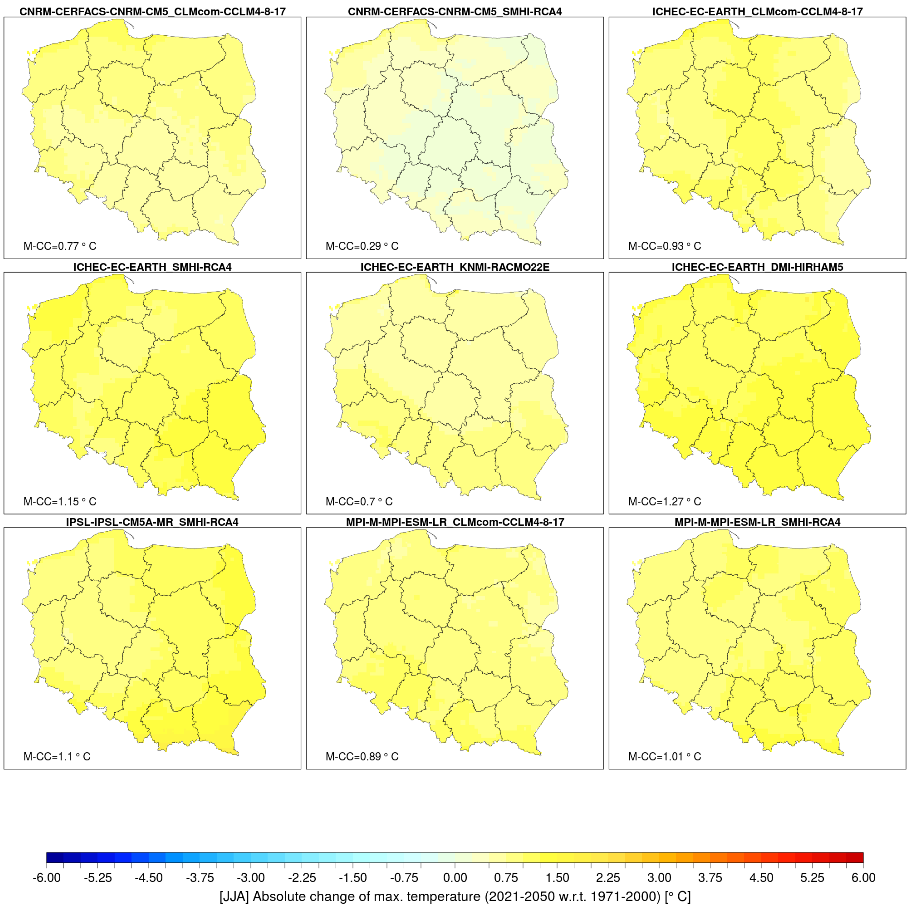

Fig. S117. Changes in projected summer means of daily maximum temperature by 2021–2050 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

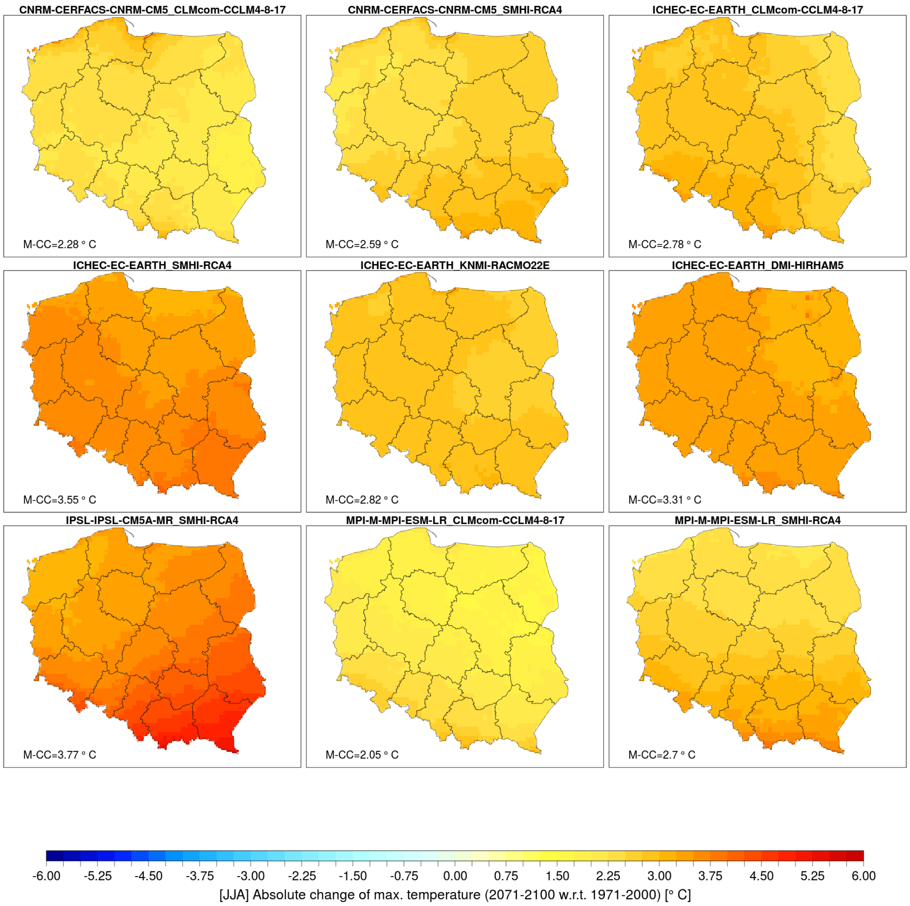

Fig. S118. Changes in projected summer means of daily maximum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

75 Autumn - SON

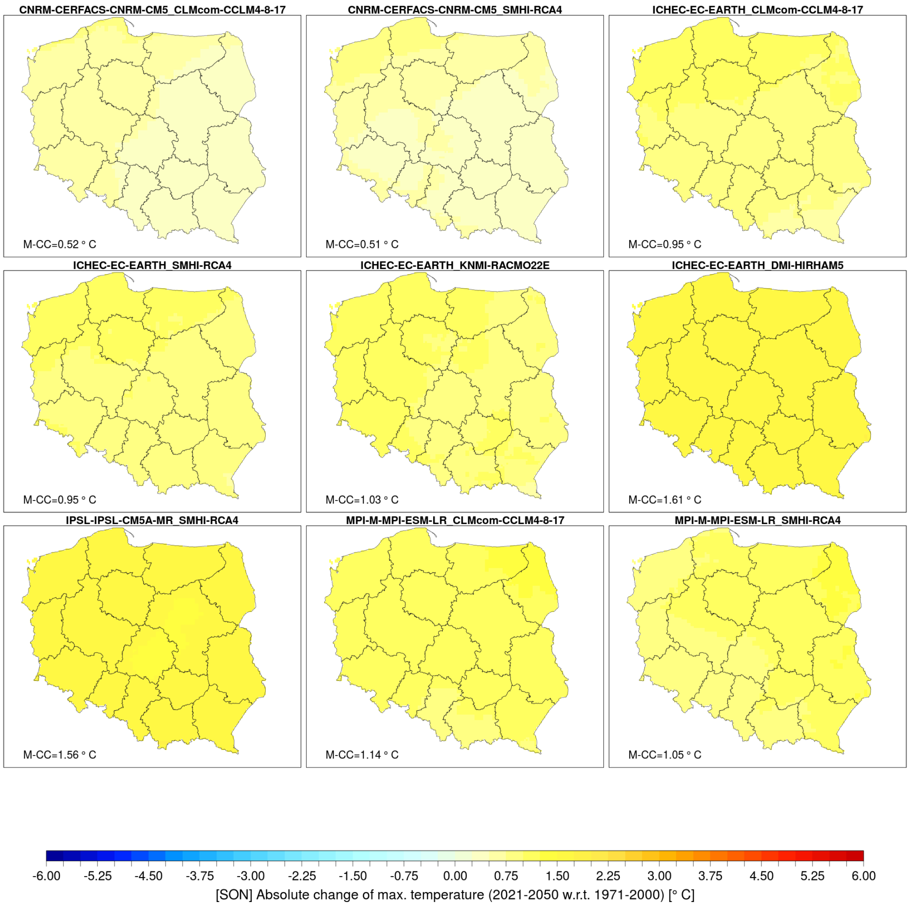

Fig. S119. Changes in projected autumn means of daily maximum temperature by 2021–2050 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

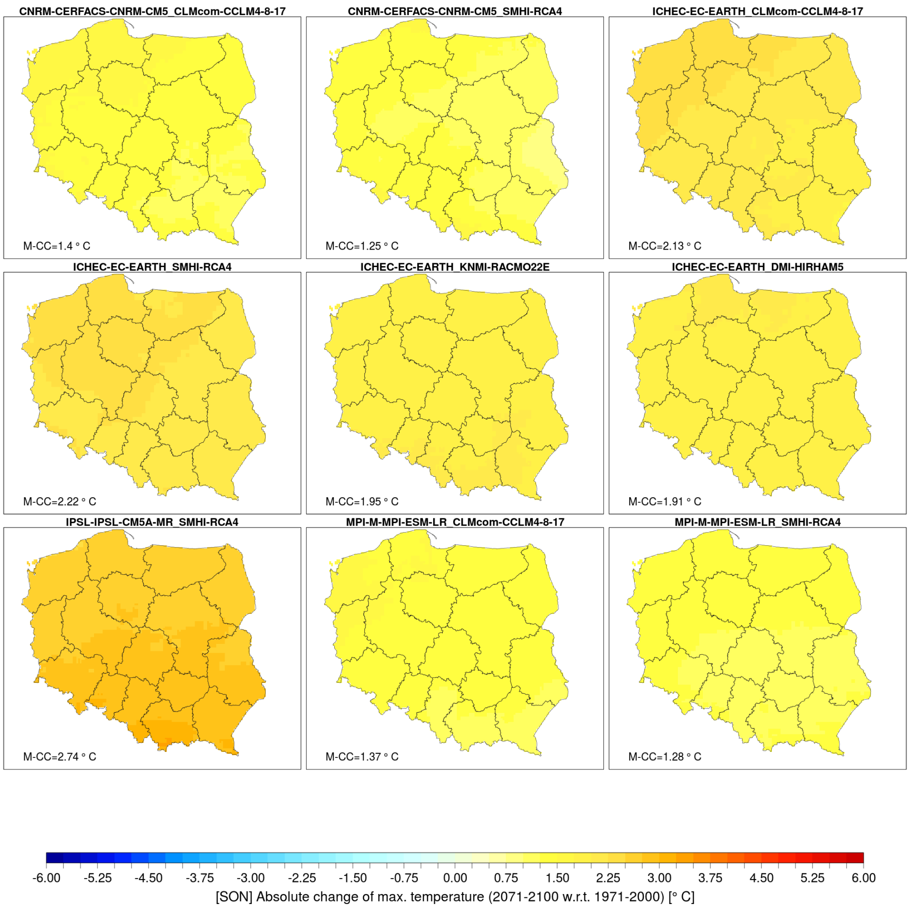

Fig. S120. Changes in projected autumn means of daily maximum temperature by 2071–2100 assuming the RCP4.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

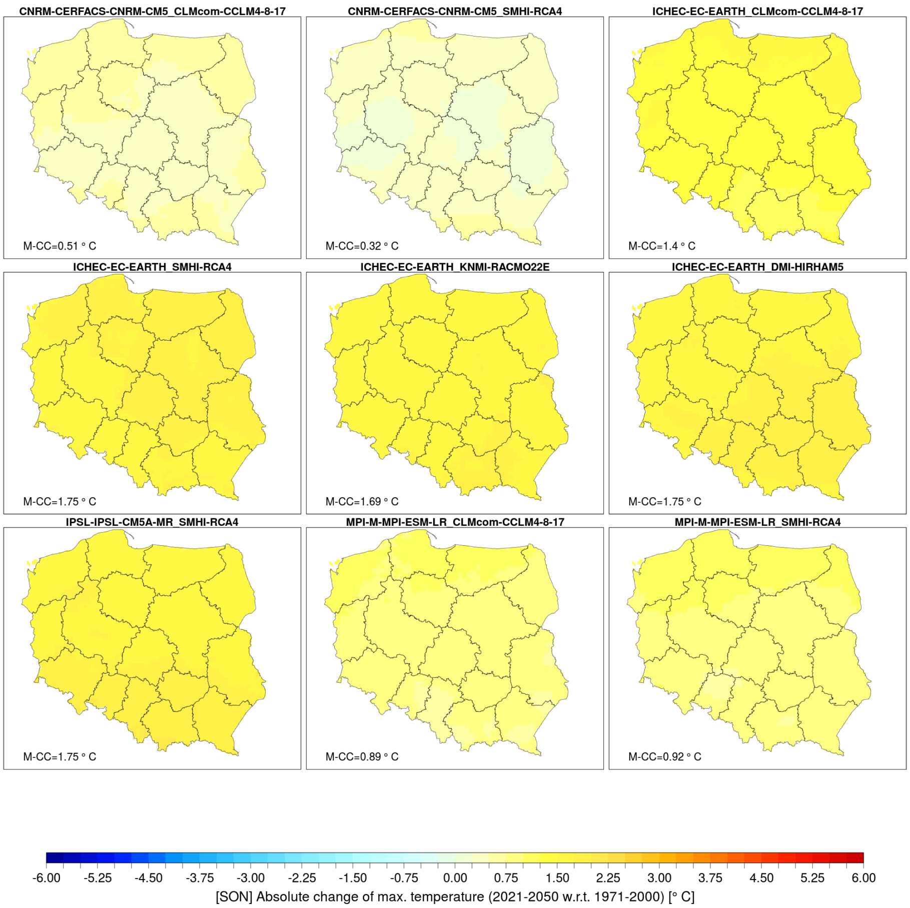

Fig. S121. Changes in projected autumn means of daily maximum temperature by 2021–2050 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

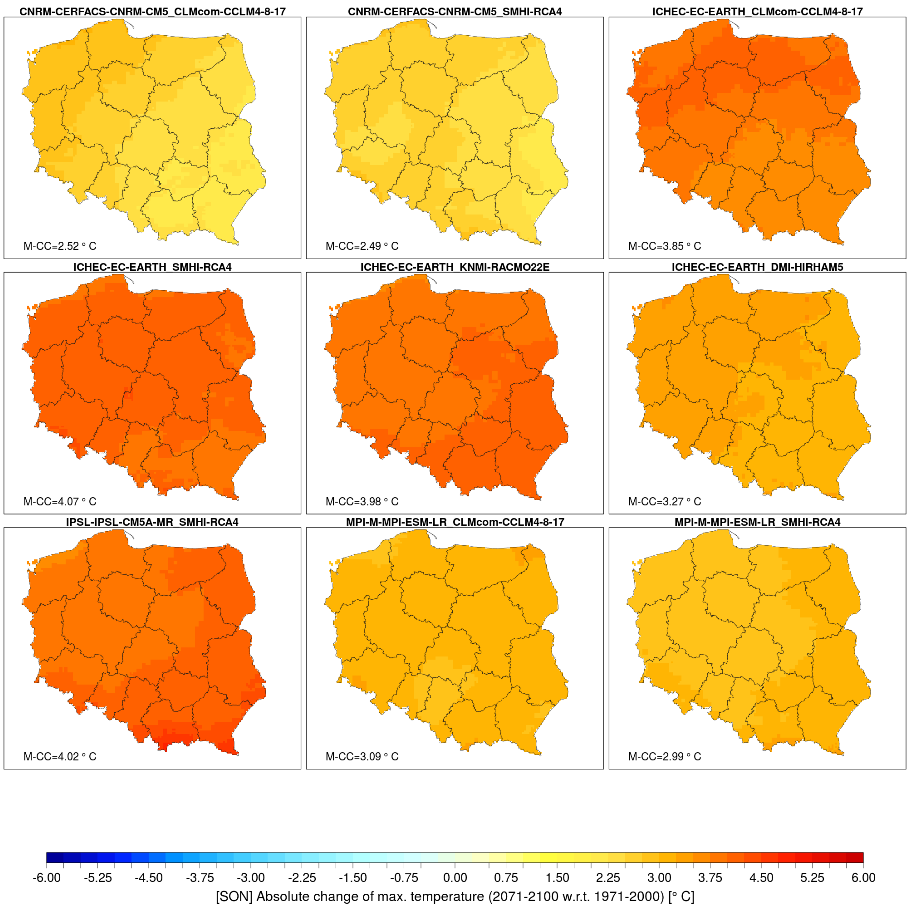

Fig. S122. Changes in projected autumn means of daily maximum temperature by 2071–2100 assuming the RCP8.5 scenario. The maps show absolute changes with regards to the historical period (1971–2000) for all nine adjusted simulations.

5 Data Provenance and Structure

The data was produced by the Norwegian Meterological Institute within the CHASE-PL project. The bias-adjusted files were stored in NetCDF4 format and compiled using the Climate and Forecast (CF) conventions. The data were made available at the 4TU.Centre for Research Data (Mezghani et al., 2016). The files consisted of nine bias-adjusted regional climate model simulations of daily (minimum and maximum) temperature and precipitation for a spatial domain covering the union of Poland and the Vistula and Odra basins for one historical and two future time periods assuming the RCP4.5 and RCP8.5 scenarios. There are 135 files and the total size is 127GB. Nevertheless, the full dataset covering the continuous time period (i.e. 1950–2100) can be obtained upon request to the Norwegian Meteorological Institute. CPLCP-GDPT5 dataset is publicly available at http://dx.doi.org/10.4121/uuid:e940ec1a-71a0-449e-bbe3-29217f2ba31d.

6 Competing interests

The authors declare that they have no conflict of interest.

7 Team list

J. E. Haugen designed the bias-adjust experiment and A. Dobler developed the model code and performed the corrections. A. Mezghani estimated the projected changes over Poland and prepared the manuscript with contributions from all co-authors.

Acknowledgements. We acknowledge the Polish–Norwegian Research Programme operated by the National Centre for Research and Development (NCBiR) under the Norwegian Financial Mechanism 2009–2014 for financial support of the project CHASE-PL (Climate change impact assessment for selected sectors in Poland) in the framework of project contract no. Pol-Nor/200799/90/2014 and the World Climate Research Programme's Working Group on Regional Climate, and the Working Group on Coupled Modelling, former coordinating body of CORDEX and responsible panel for CMIP5. We also thank the climate modelling groups (listed in Table 1 of this paper) for producing and making available their model output. We also acknowledge the Earth System Grid Federation infrastructure – an international effort led by the US Department of Energy's Program for Climate Model Diagnosis and Intercomparison, the European Network for Earth System Modelling, and other partners in the Global Organization for Earth System Science Portals (GO-ESSP). Co-author M. Piniewski is additionally grateful for support from the Alexander von Humboldt Foundation and the Ministry of Science and Higher Education of the Republic of Poland. Finally, we would like to thank the two reviewers, Joanna Wibig and Mirosław Mitus, for their respective positive and constructive comments that helped to improve the paper.

References

Mezghani, A., Dobler, A., and Haugen, J.: CHASE-PL Climate Projections–Gridded Daily Precipitation and Temperature Dataset at 5 km resolution for Poland, Norwegian Meteorological Institute, Oslo, Norway. Dataset., doi:https://doi.org/10.4121/uuid:e940ec1a-71a0-449e-bbe3-29217f2ba31d, 2016.

TEXT TEXT TEXT TEXT ?