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Supplement of

From emission scenarios to spatially resolved projections with a chain of computationally efficient emulators: coupling of MAGICC (v7.5.1) and MESMER (v0.8.3)

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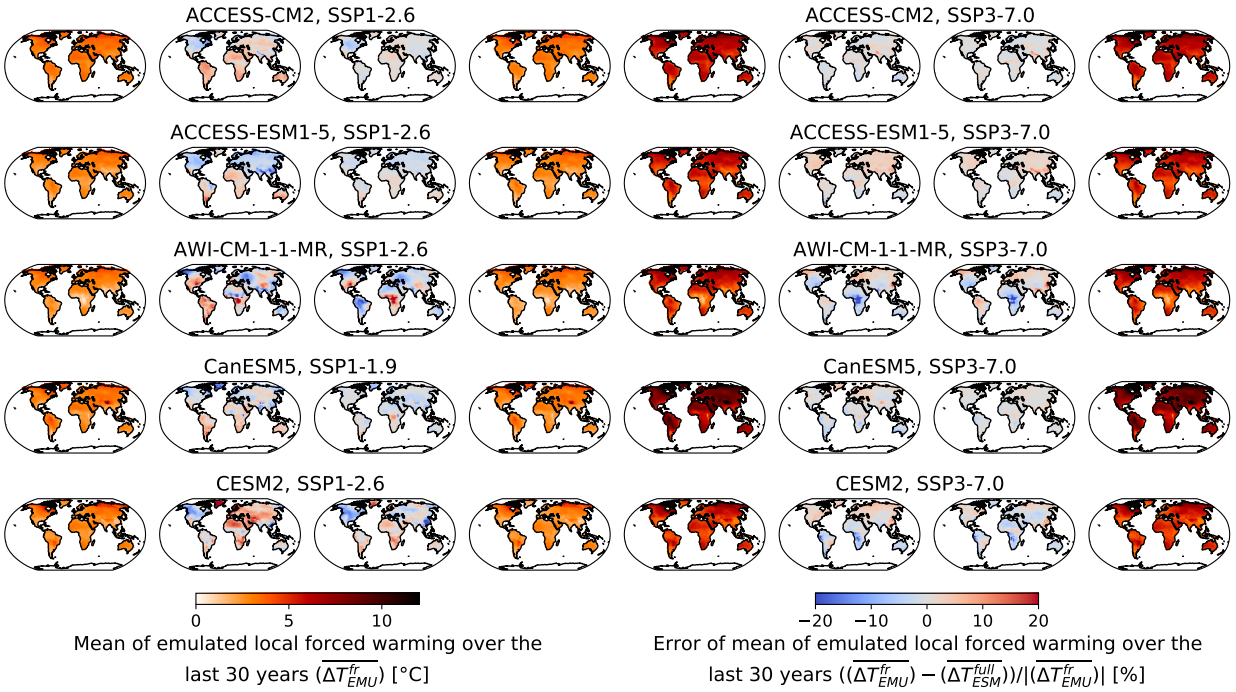

Figure S1. Mean of emulated local forced warming and performance with respect to ESM simulations for both MESMER configurations over the last 30 years of a low-emission (left) and a high-emission (right) scenario for five different ESMs (rows). The error shown here represents the deviation between the mean of the emulated forced warming and the mean temperature anomaly value across all available ESM initial-condition members for the scenario at hand and is normalized by the absolute value of the mean of the emulated forced warming. For each ESM and scenario combination, the map order reflects the column order in Fig. 3, with the first map showing the mean of the emulated forced warming of the default configuration, the second the error of the default configuration, the third the error of the additional predictors configuration, and the fourth the mean of the emulated forced warming of the additional predictors configuration.

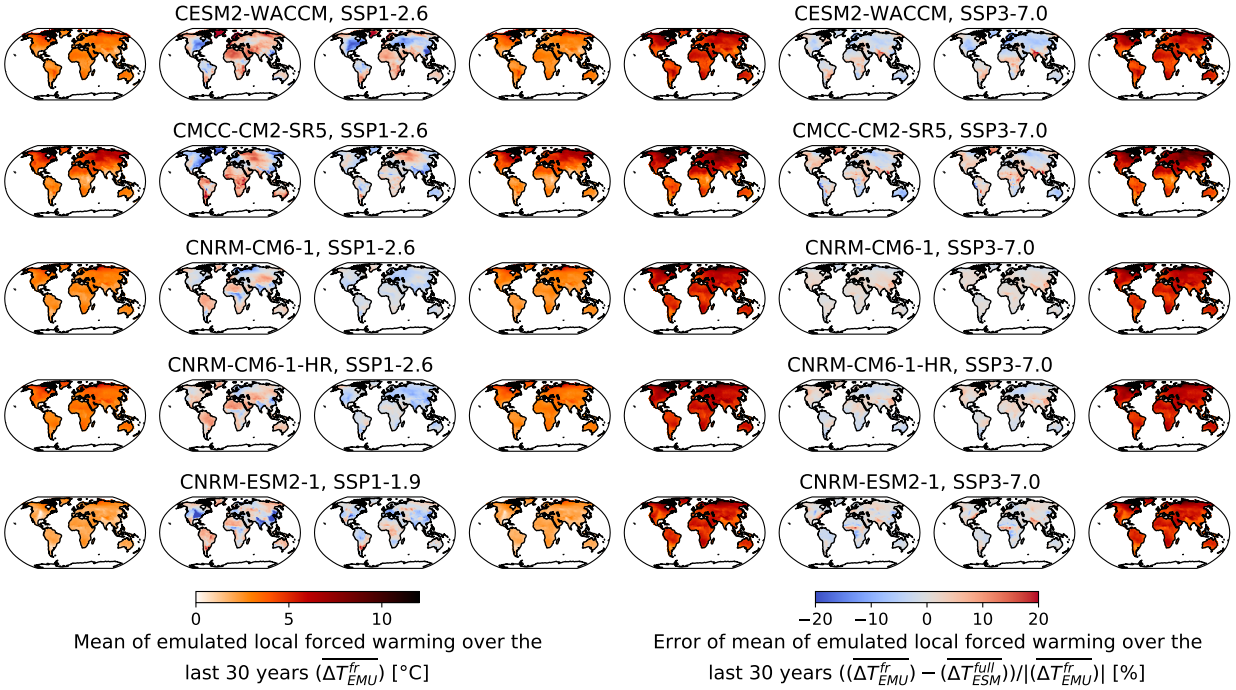

Figure S2. Same as Fig. S1 but for five different ESMs.

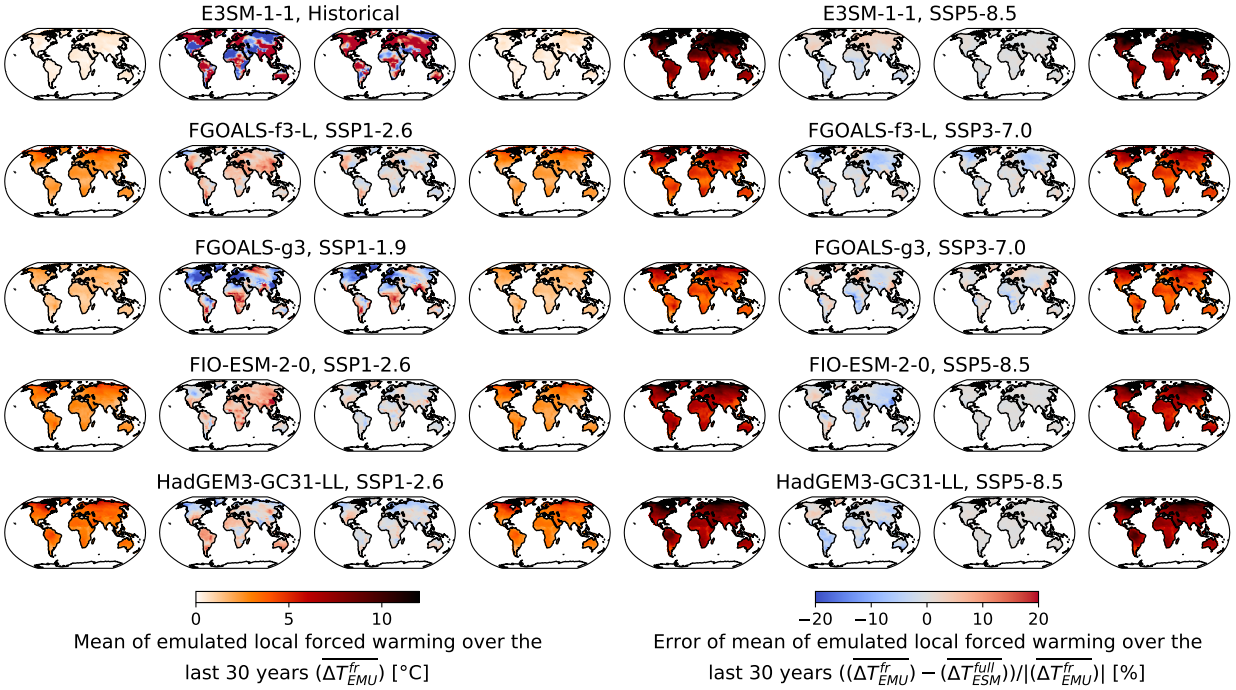

Figure S3. Same as Fig. S1 but for five different ESMs.

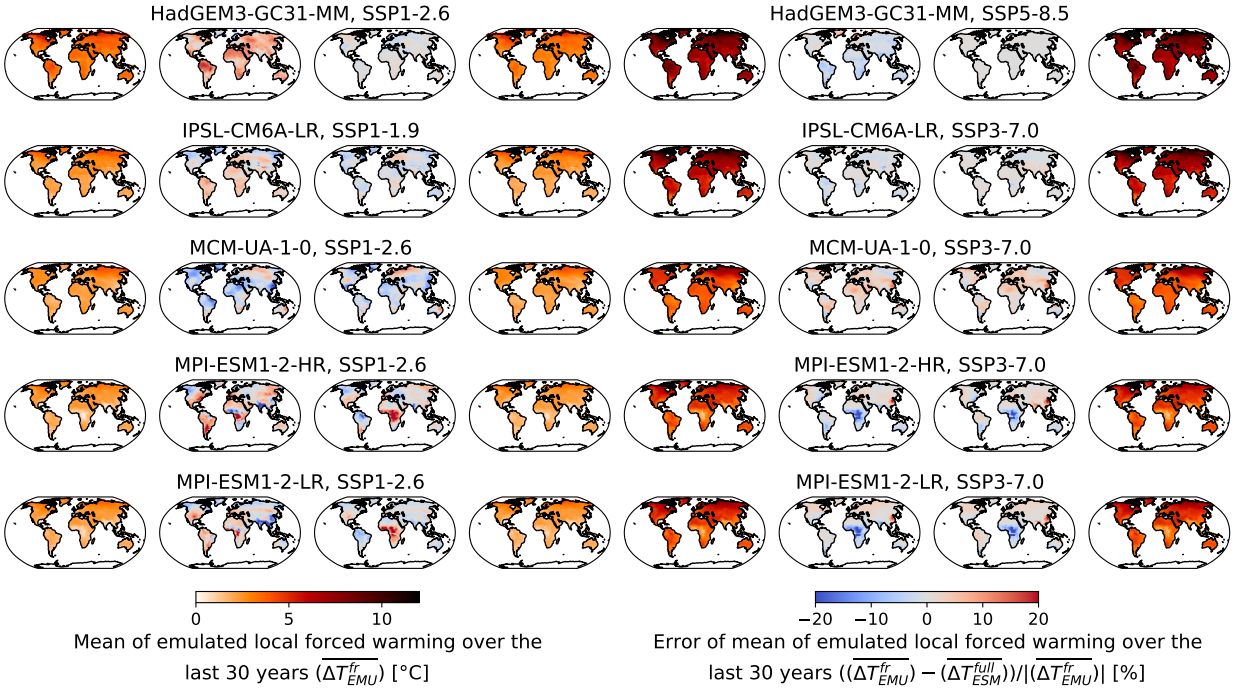

Figure S4. Same as Fig. S1 but for five different ESMs.

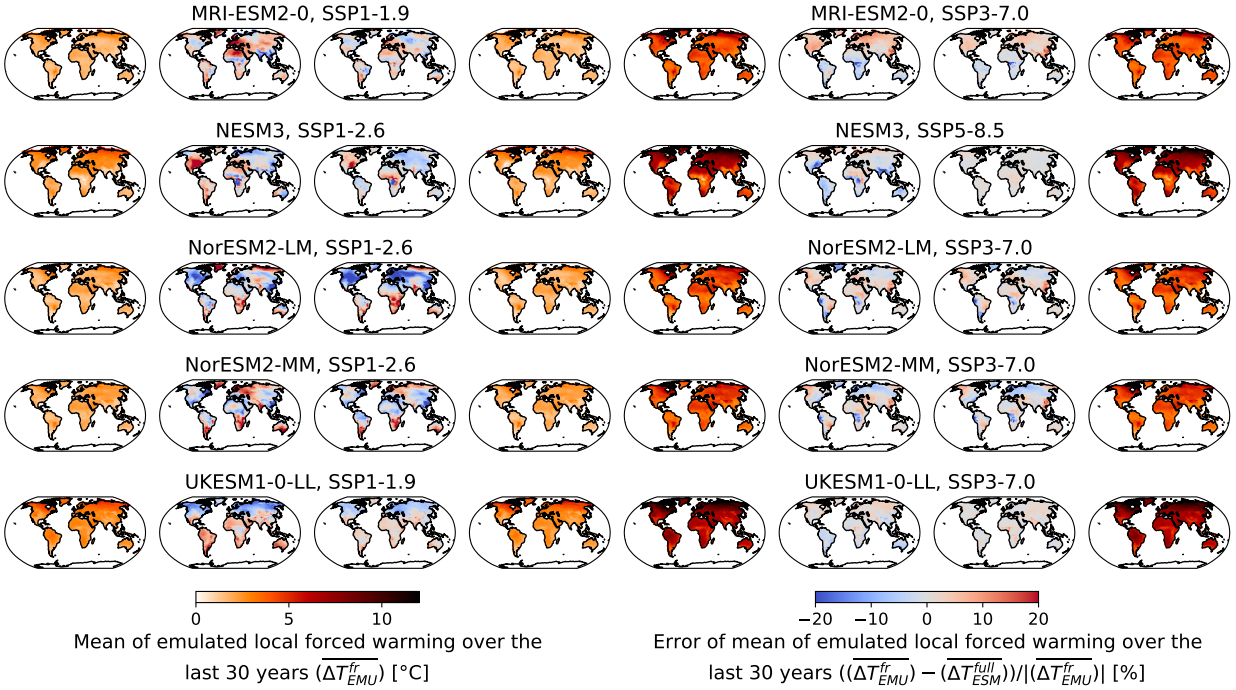

Figure S5. Same as Fig. S1 but for five different ESMs.

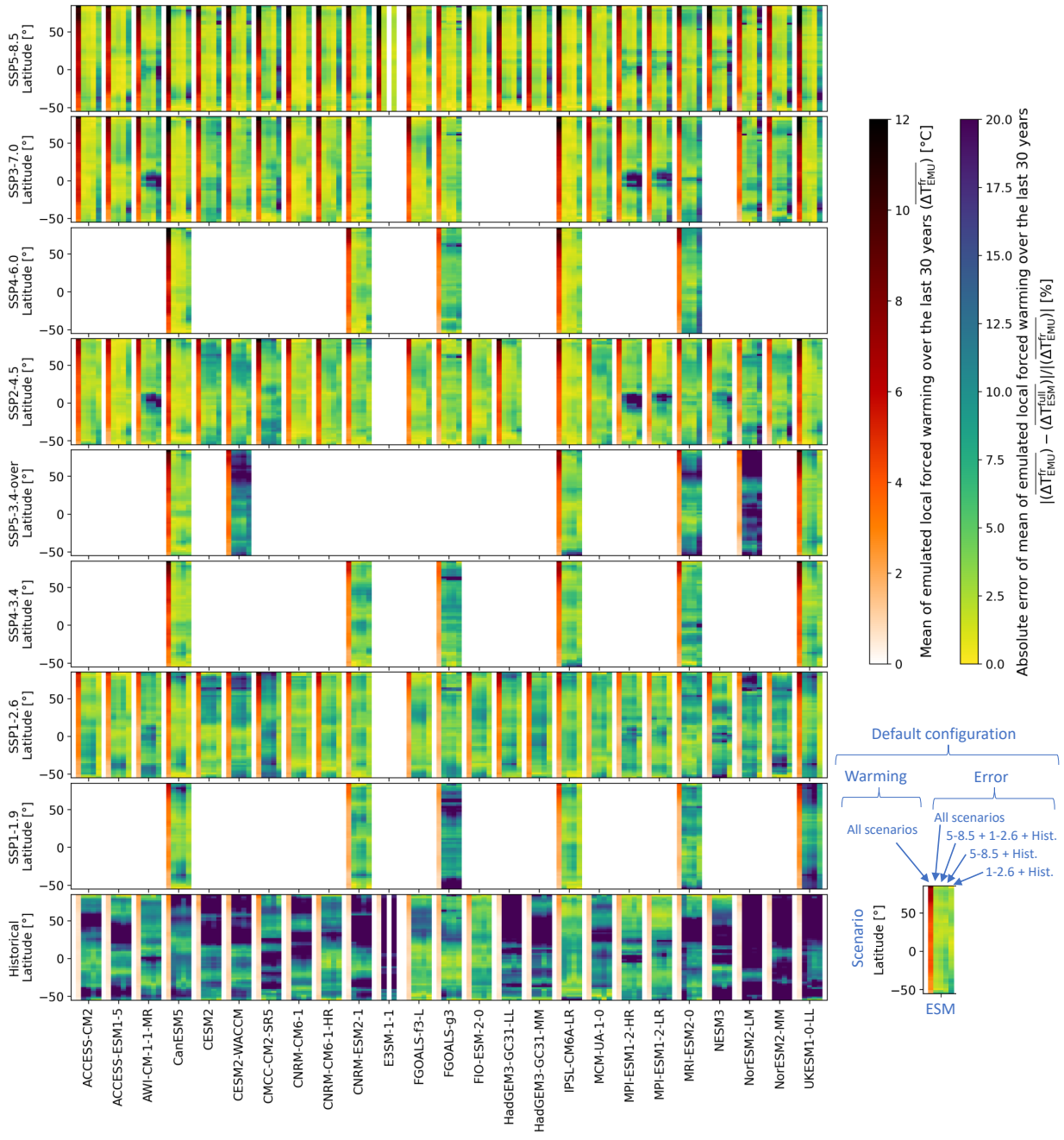

Figure S6. Latitudinally averaged grid-point-level mean of emulated local forced warming and performance with respect to ESM simulations over the last 30 years of each scenario for MESMER's default configuration with different numbers of training scenarios. The depicted warming is based on the emulations produced by MESMER trained on all available scenarios. The performance error is additionally displayed for MESMSER trained only on a high- and a low-emission pathway (SSP5-8.5 + SSP1-2.6 + Historical), solely on a high-emission pathway (SSP5-8.5 + Historical), and solely on a low-emission pathway (SSP1-2.6 + Historical). The error shown here represents the absolute deviation between the mean of the emulated forced warming and the mean temperature anomaly value across all available ESM initial-condition members for the scenario at hand and is normalized by the absolute value of the mean of the emulated forced warming.

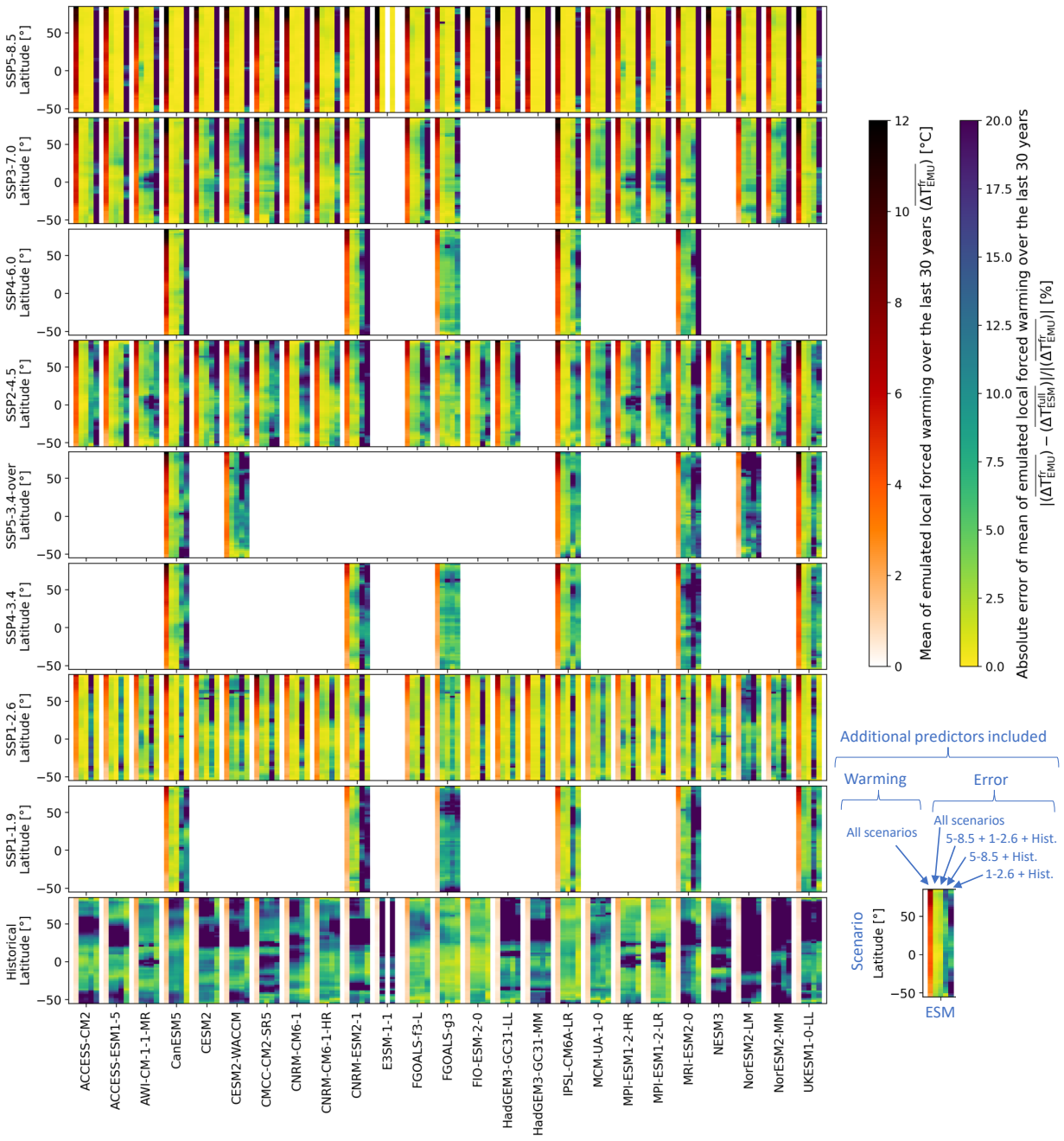

Figure S7. Same as Fig. S6 but for MESMER's additional predictors configuration.

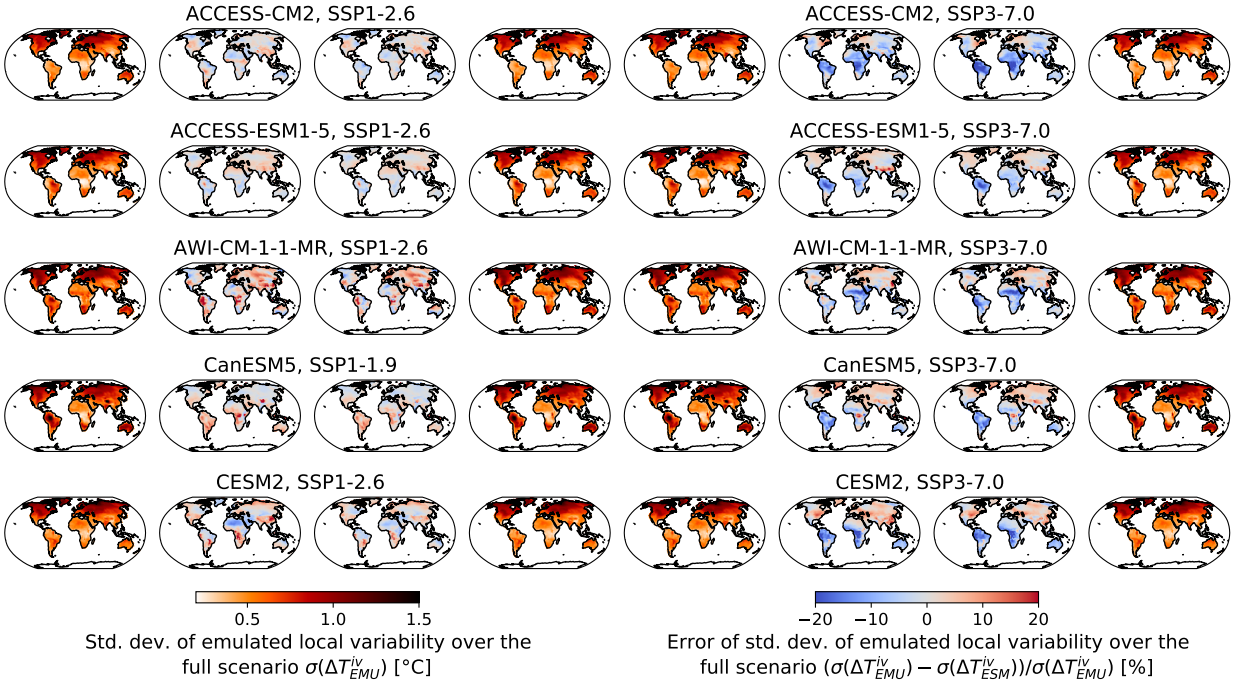

Figure S8. Standard deviation of emulated local variability and performance with respect to ESM simulations for both MESMER configurations over the full scenario period of a low-emission (left) and a high-emission (right) scenario for five different ESMs (rows). The standard deviation of the emulated local variability is computed based on 600 variability emulations for each ESM. To obtain local variability from ESM simulations, the emulated local forced warming is subtracted from every ESM simulation. Subsequently, the standard deviation of these estimates of ESM simulations' local variability is computed while employing all ESM initial-condition ensemble members available for the scenario at hand. The error shown here represents the deviation between the standard deviation of the emulated variability and the standard deviation of the ESMs' variability normalized by the standard deviation of the emulated variability. For each ESM and scenario combination, the map order reflects the column order in Fig. 4, with the first map showing the standard deviation of the emulated variability of the default configuration, the second the error of the default configuration, the third the error of the additional predictors configuration, and the fourth the standard deviation of the emulated variability of the additional predictors configuration.

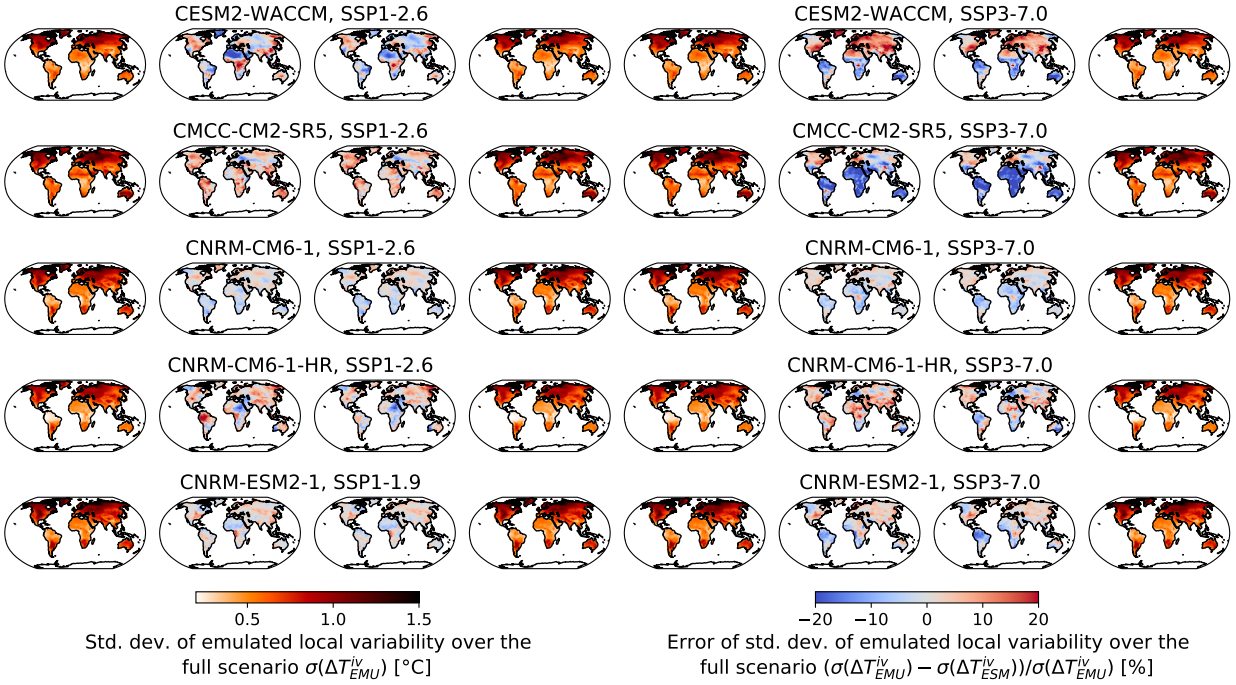

Figure S9. Same as Fig. S8 but for five different ESMs.

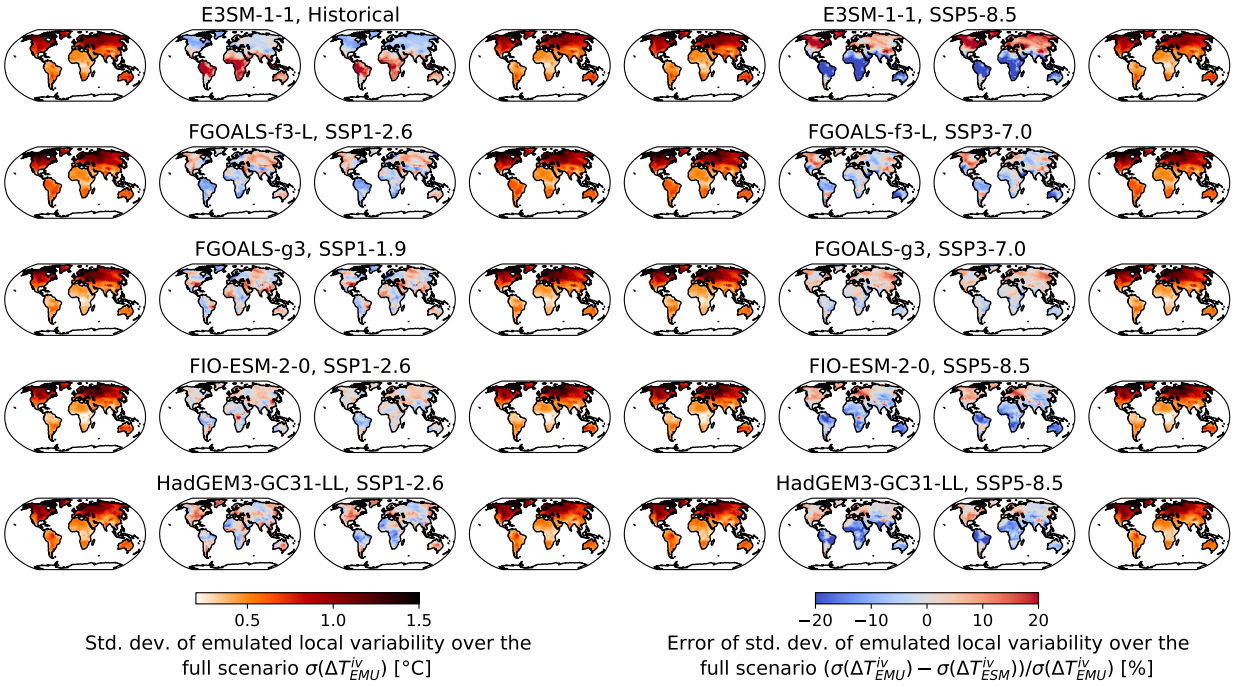

Figure S10. Same as Fig. S8 but for five different ESMs.

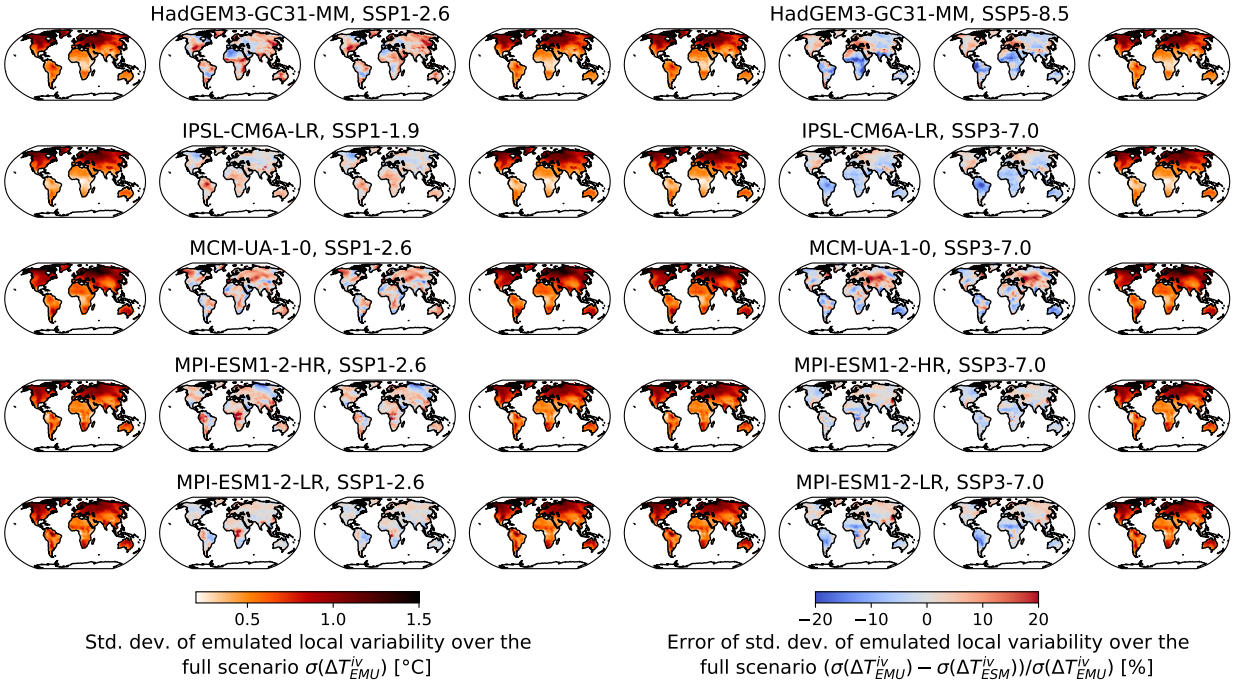

Figure S11. Same as Fig. S8 but for five different ESMs.

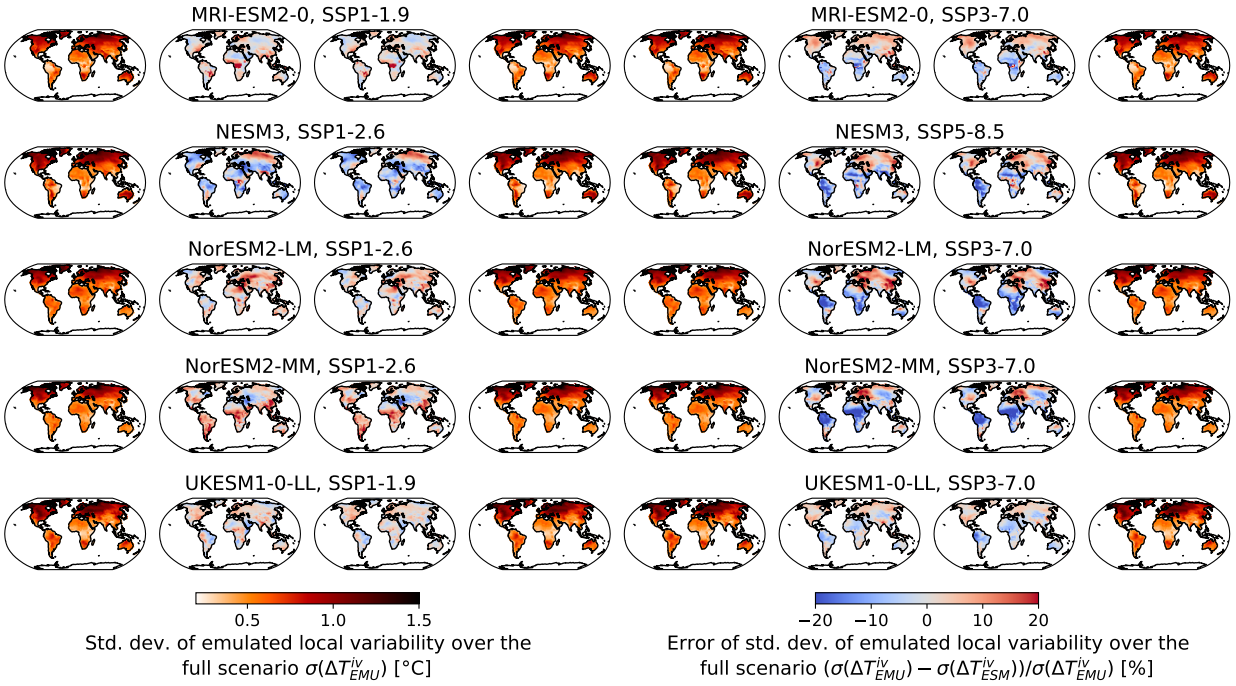

Figure S12. Same as Fig. S8 but for five different ESMs.