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Supplement of

Seasonality and scenario dependence of rapid Arctic sea ice loss events in CMIP6 simulations

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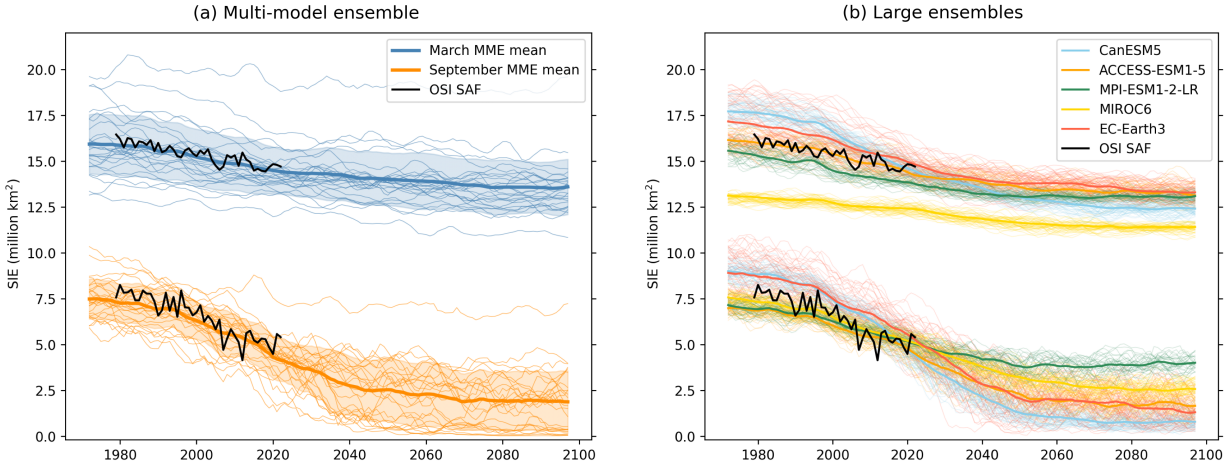

Figure S1. March (top lines) and September (bottom lines) 5-year running mean SIE evolution over the historical period and low emission scenario SSP1-2.6 for (a) the CMIP6 multi-model ensemble (26 models, 1 member per model), with thin lines representing individual models, thick lines the multi-model ensemble mean, and shaded areas one standard deviation across the multi-model ensemble, and (b) five large ensembles with thin lines representing individual ensemble members and thick lines the ensemble mean. The black lines show the observations from OSI-SAF.

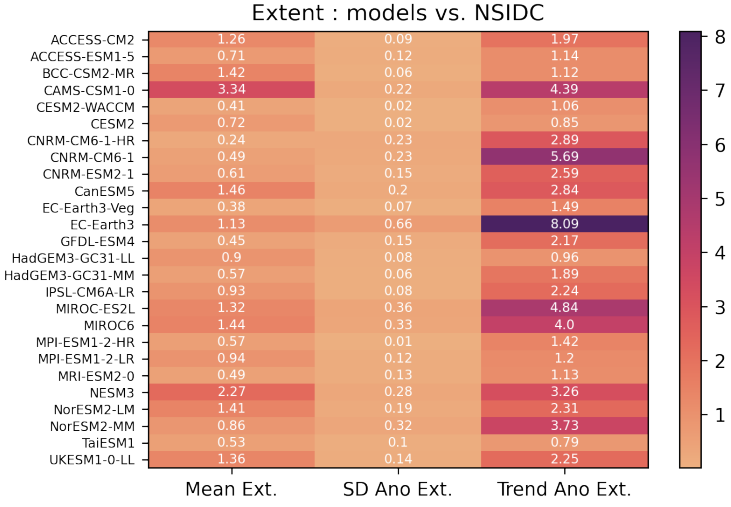

Figure S2. The SIE metrics of CMIP6 models calculated using SITool. The three columns correspond to model performance metrics on the mean state (Mean Ext.), standard deviation (SD Ano Ext.), and trend (Trend Ano Ext.) of monthly anomalies of the Arctic SIE during the period 1979–2014 compared to the NSIDC. Lower values indicate better skill.

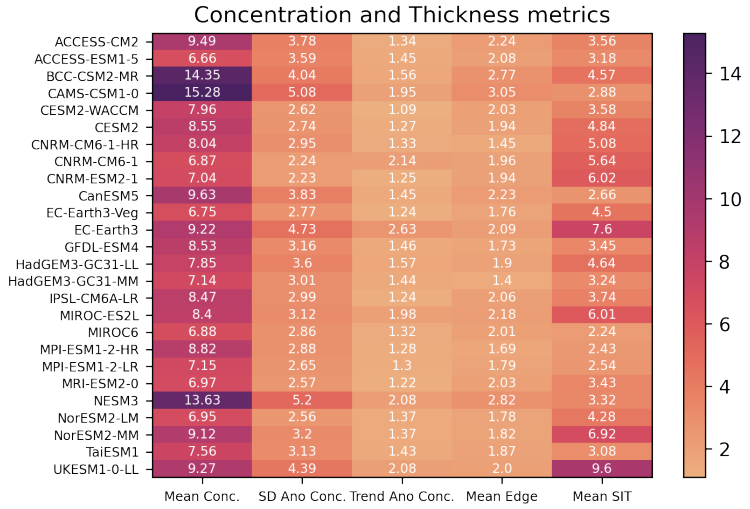

Figure S3. The SIC and SIT metrics of CMIP6 models calculated using SITool. The five columns correspond to model performance metrics on the Arctic SIC mean state (Mean Conc.), standard deviation (SD Ano Conc.), trend (Trend Ano Conc.), the mean state Arctic sea ice-edge location metric (Mean Edge), and the mean state of Arctic SIT of monthly anomalies (Mean SIT) during the period 1979–2014 compared to the NSIDC-0051 for SIC and PIOMAS reanalysis for SIT. Lower values indicate better skill.

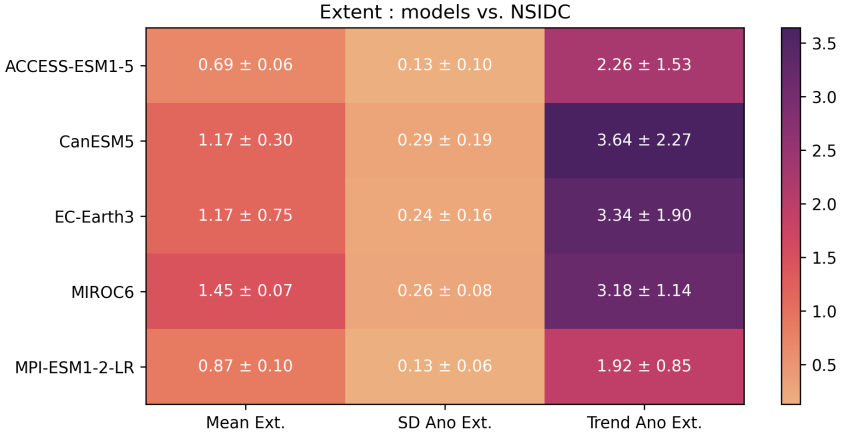

Figure S4. The SIE metrics of the five large ensembles calculated using SITool. Values in white represent the mean and one standard deviation over metrics for each member. The three columns correspond to model performance metrics on the mean state (Mean Ext.), standard deviation (SD Ano Ext.), and trend (Trend Ano Ext.) of monthly anomalies of the Arctic SIE during the period 1979–2014 compared to the NSIDC. Lower values indicate better skill.

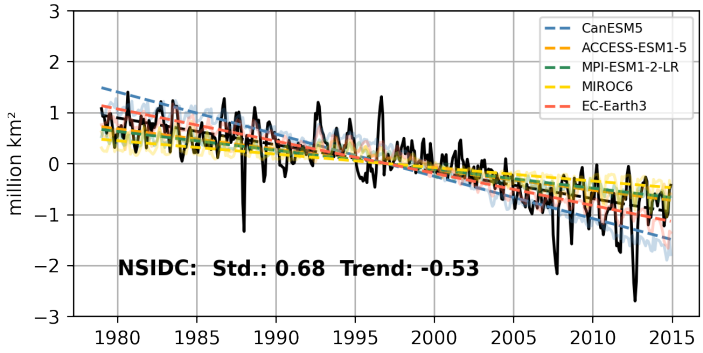

Figure S5. The 1979–2014 monthly anomalies of Arctic sea ice extent (million km^2) from observations (NSIDC; solid black) and the members of the five large ensembles with the mean trend in dashed lines. The standard deviation (Std, million km^2) and trend (million km^2 decade$^{-}1$) of the monthly anomalies of observational ice extent are displayed.

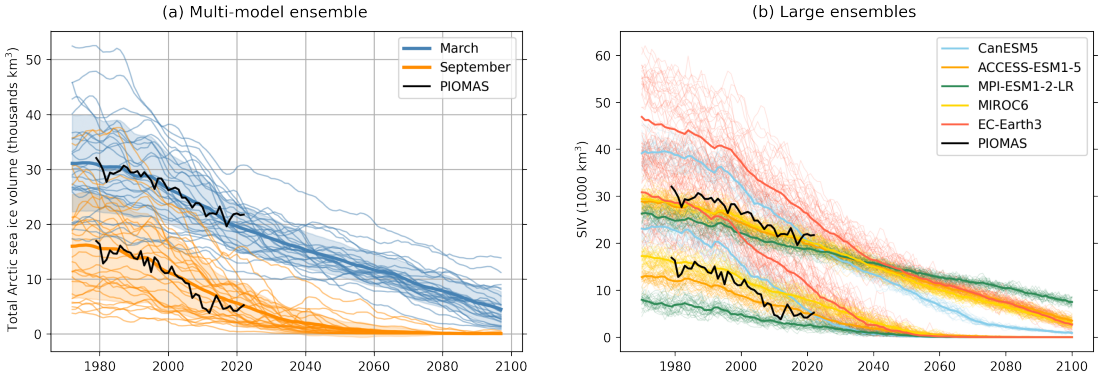

Figure S6. Same as Fig. 1 but for SIV. The black lines show the PIOMAS reanalysis data.

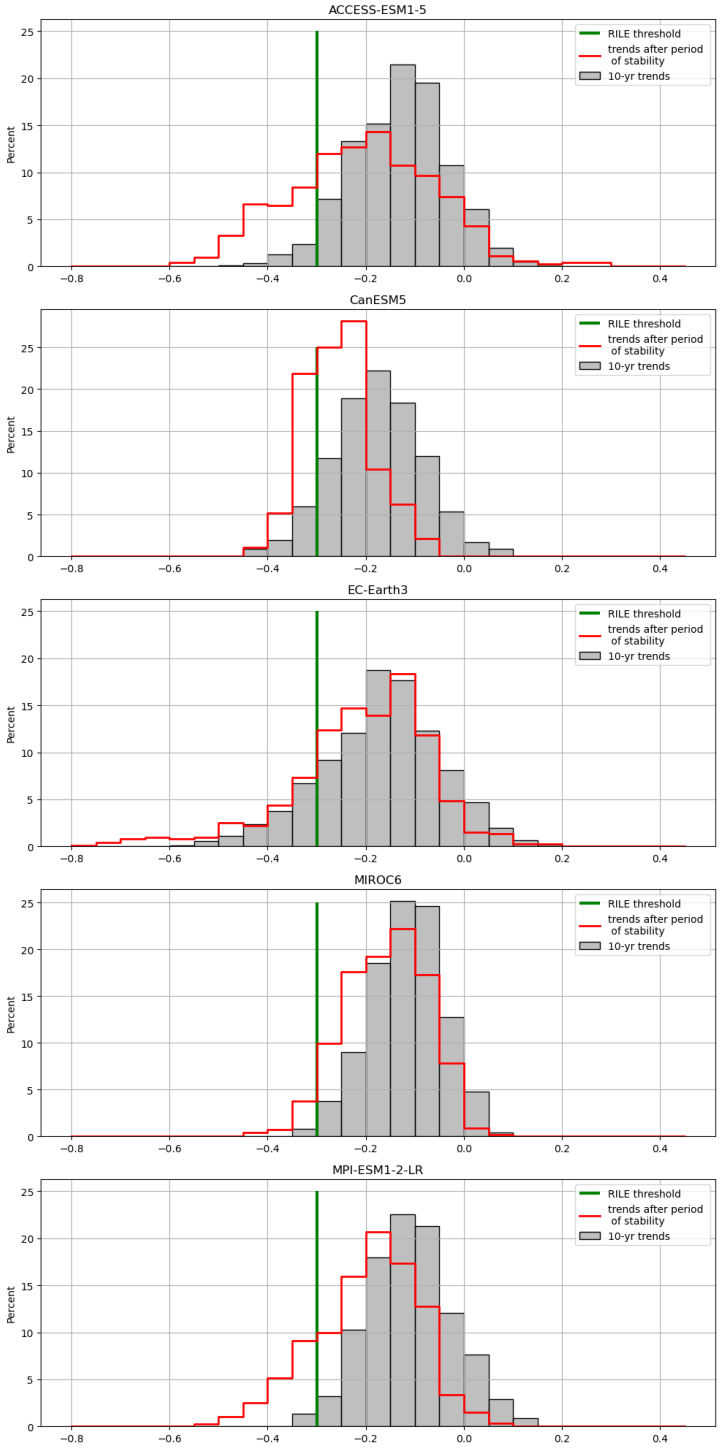

Figure S7. Same as Fig. 6 but for the five large ensembles following the SSP5-8.5 scenario. For all large ensembles, the distribution of trends after a period of stability is statistically different from all 10-year trends at the 95% significance level using a z-test.

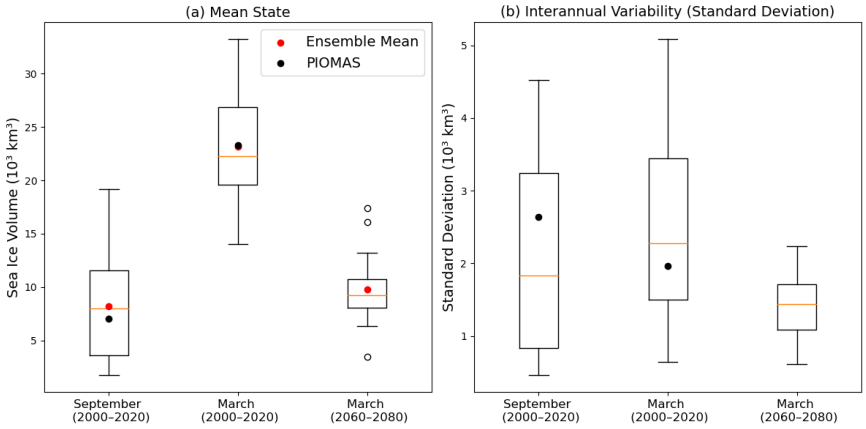

Figure S8. (a) Boxplots showing the mean Arctic SIV (10^3 km^3) for September (2000–2020), March (2000–2020) and March (2060–2080) for the CMIP6 multi-model ensemble using the historical (2000–2014) and SSP5-8.5 (2014–2020 and 2060–2080) simulations, with means (red dots) and PIOMAS observations (black dots) highlighted. (b) Boxplots of the interannual variability (standard deviation) of Arctic SIV for the CMIP6 multi-model ensemble for the same periods.