The Importance of Initial Conditions in Seasonal Predictions of Antarctic Sea Ice

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Supplementary figures

The following are the same figures from the main paper but using the OSI dataset instead of CDR.

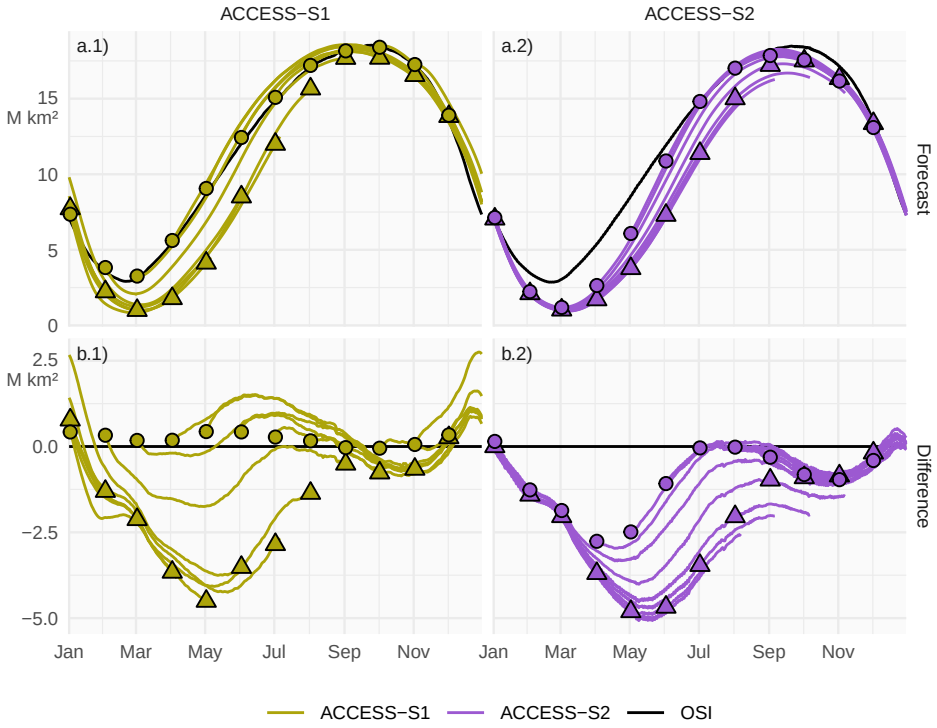

Figure A1: Row a: Pan-Antarctic daily mean sea-ice extent for all hindcasts initialised on the first of each calendar month for ACCESS-S1 (column 1; green) and ACCESS-S2 (column 2; purple). Observed mean sea-ice extent in each corresponding hindcast period is shown in black. Row b: Mean differences between the forecast and the observed values. Circles represent the initial conditions at the start of forecasts (i.e., the first of every month), and triangles represent the mean values at the lead time corresponding to the maximum lead time in S1 (between 213 and 216 days, depending on the month)

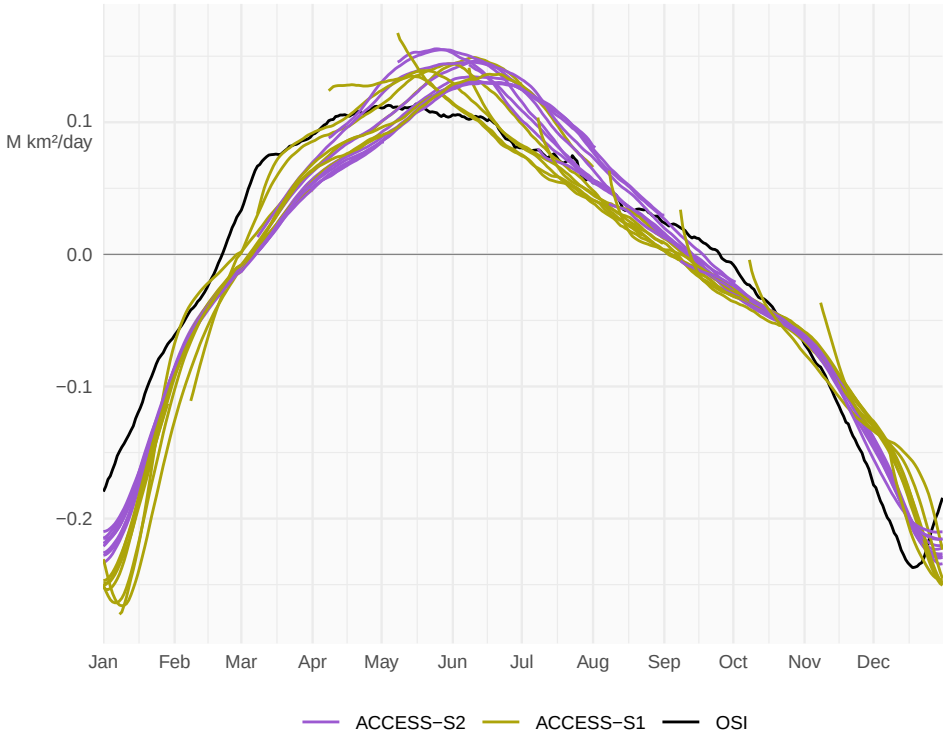

Figure A2: Mean daily sea-ice extent growth ($10^6 km^2/day$) in ACCESS-S1 (green) and ACCESS-S2 (purple) hindcasts and observations (black), computed as the mean daily differences in sea-ice extent between each date and the next for each forecast month. Values are smoothed with a 11-day running mean.

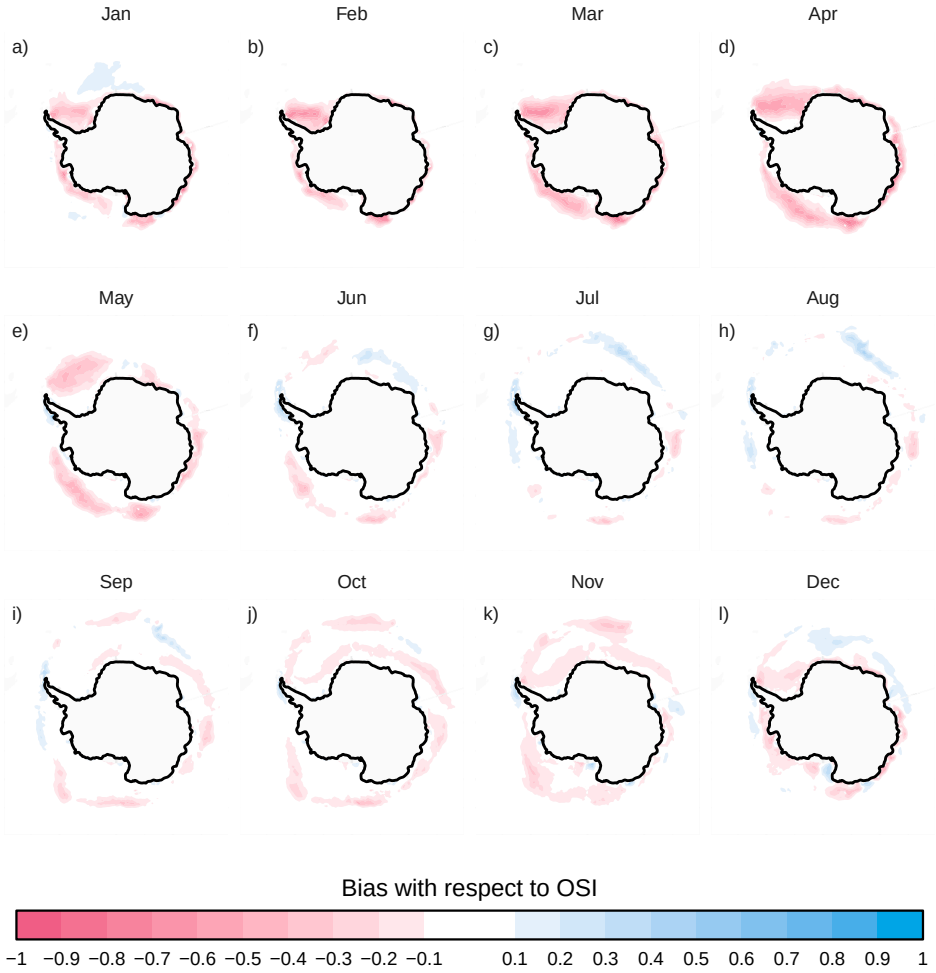

Figure A3: Ensemble mean difference between monthly sea-ice concentration of ACCESS-S2 ensemble mean forecast at 0-month lead time (monthly mean values forecasted from the forecast initialised at the first of the month) and observations (OSI).

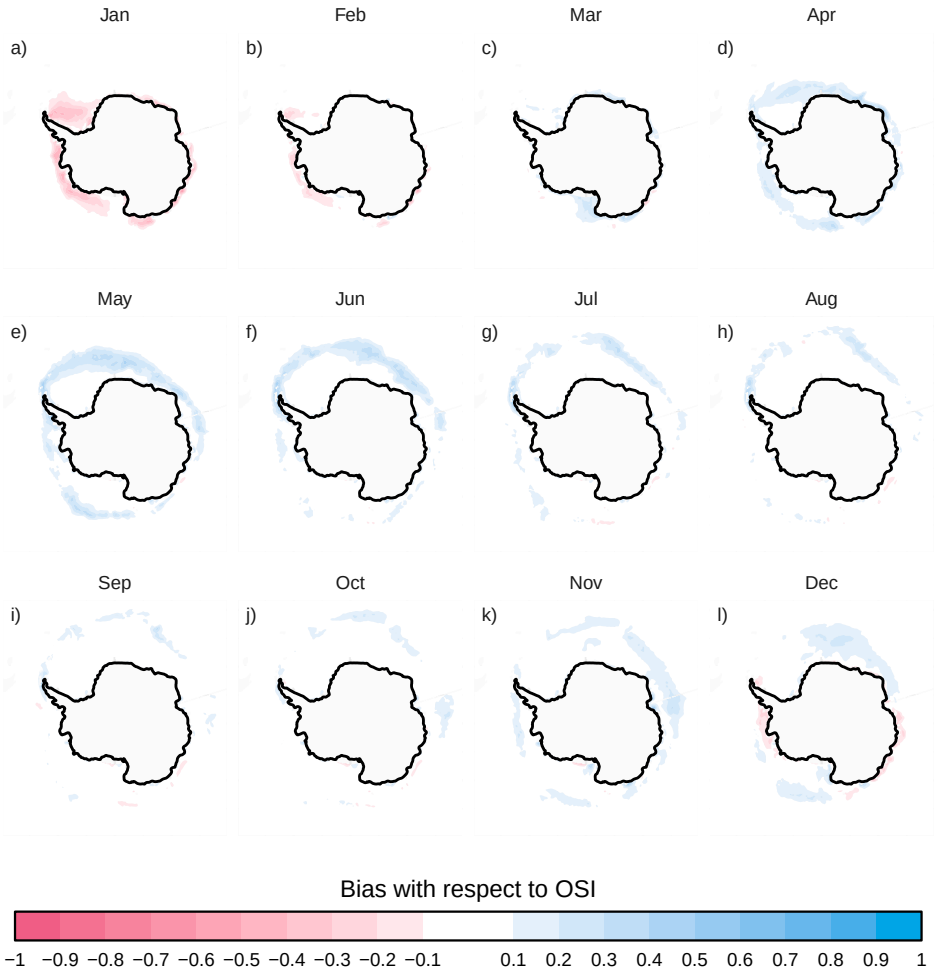

Figure A4: Same as Figure 3 but for ACCESS-S1.

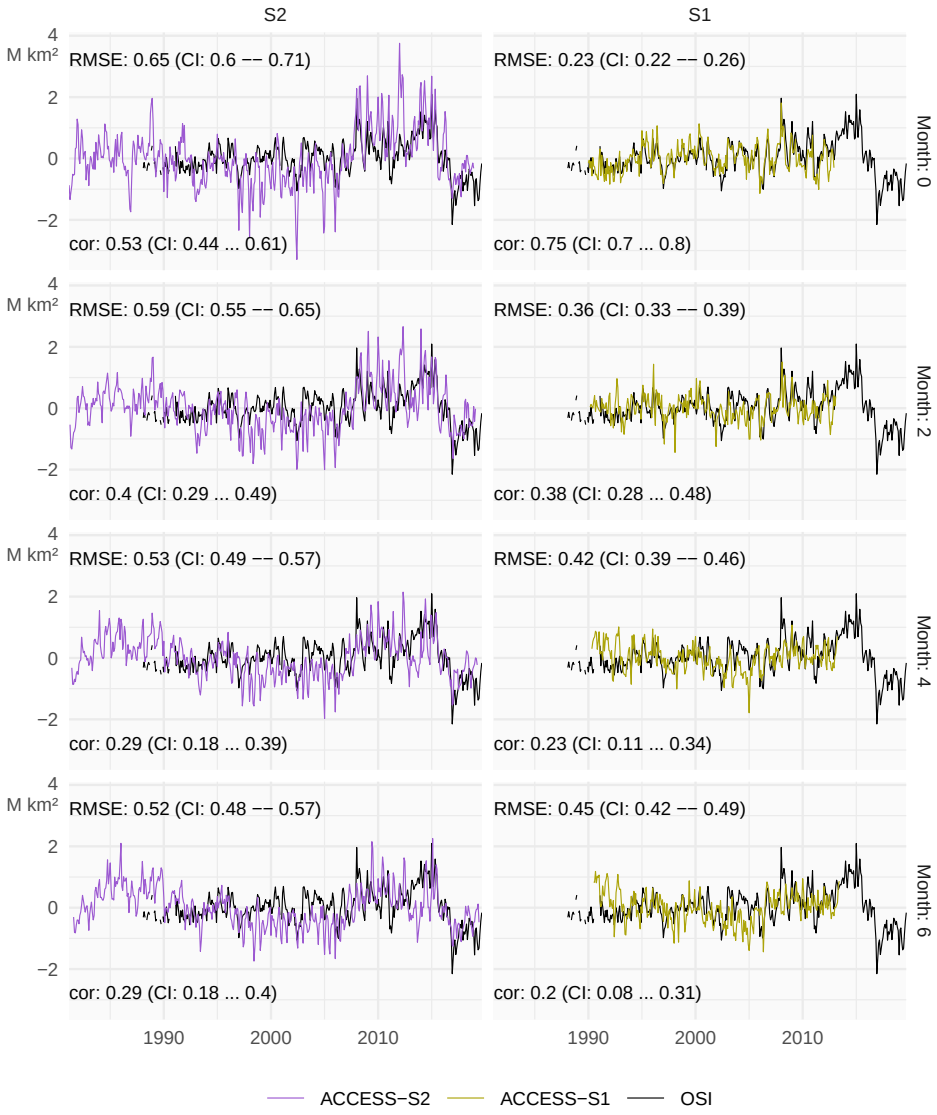

Figure A5: Monthly mean sea-ice extent anomalies of the observations (black) and forecasts from ACCESS-S1 (right column; purple) and ACCESS-S2 (left column; green) at lead times of 0, 2, 4, and 6 months. The RMSE and correlation during the overlapping period of ACCESS-S1 and ACCESS-S2 hindcasts (1990–2013) are shown on the top left and bottom left of each panel respectively.

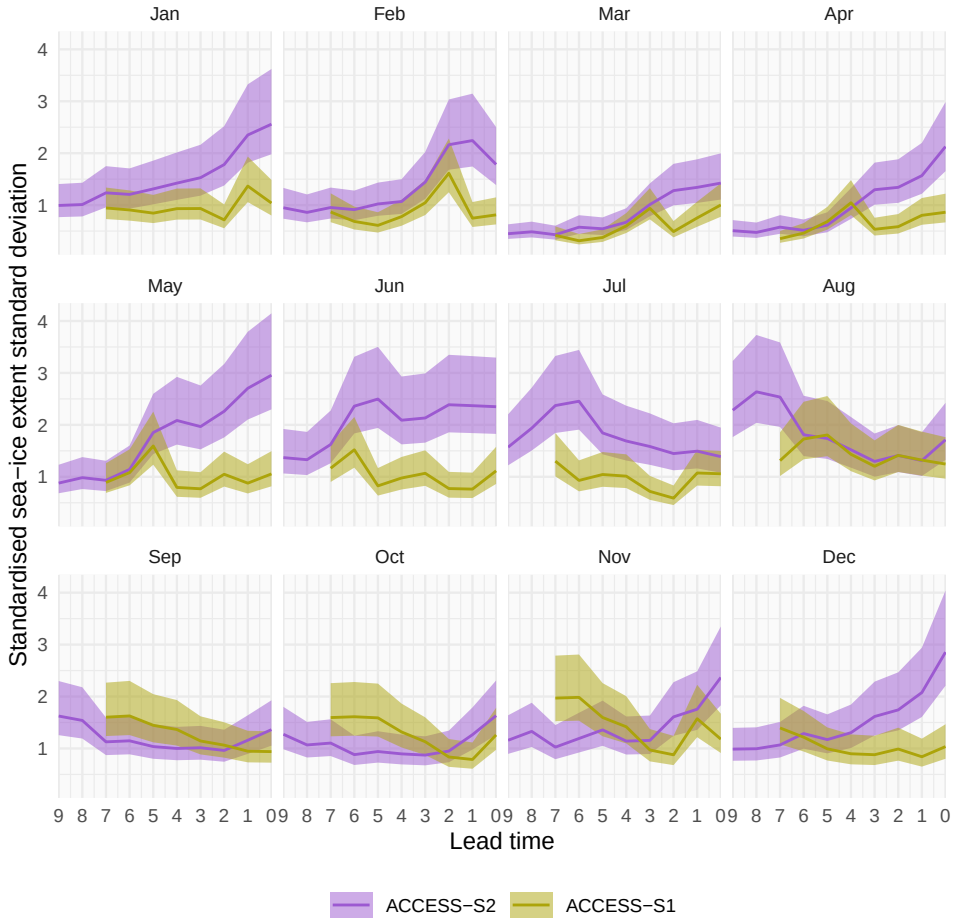

Figure A6: Interannual standard deviation with 95% confidence interval of monthly mean sea-ice extent forecasted for each month divided by that month's sea-ice extent observation standard deviation. ACCESS-S1 and ACCESS-S2 at different lead times. Each panel indicates the target month. Note the reverse horizontal axis.

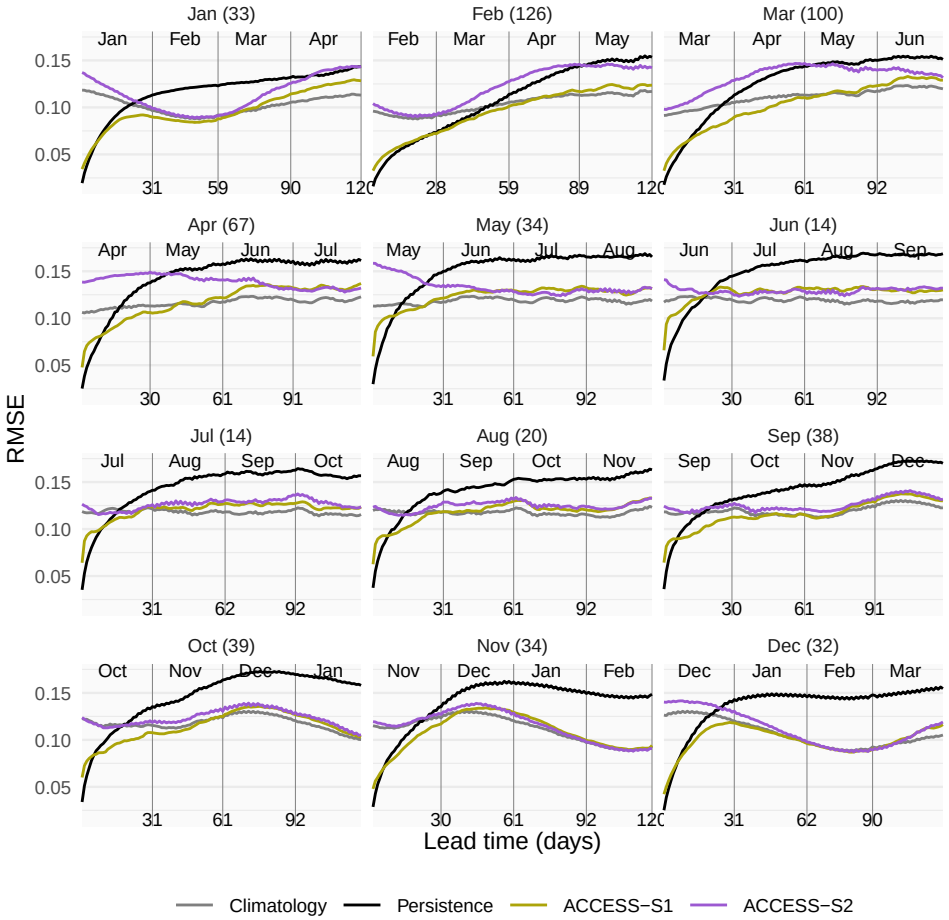

Figure A7: Mean RMSE of sea-ice concentration anomalies as a function of forecast lead time for all forecasts initialised on the first of each month compared with a reference forecast of persistence of anomalies (black) and climatology (gray). Only the first 120 days are shown. In parentheses, the shortest time at which ACCESS-S1 and ACCESS-S2 mean RMSE is not statistically different at the 99% confidence level.

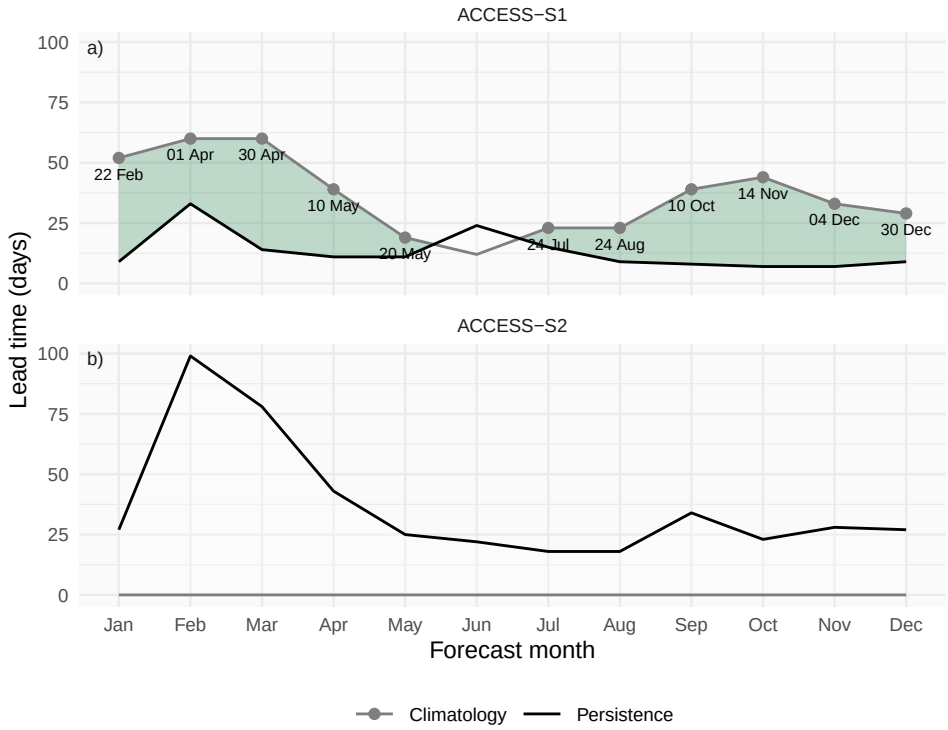

Figure A8: Minimum lead time at which each forecast's mean RMSE becomes larger than the lower bound of the 95% confidence interval of persistence forecast RMSE (black lines) and maximum lead time at which each forecast's mean RMSE remains lower than the lower bound of the 95% confidence interval of climatological forecast RMSE (gray lines). Green shading indicates the window where forecasts outperform both persistence (lead times longer than black line) and climatology (lead times shorter than gray line). Text labels show the date corresponding to the maximum lead time at which each forecast outperforms climatology.

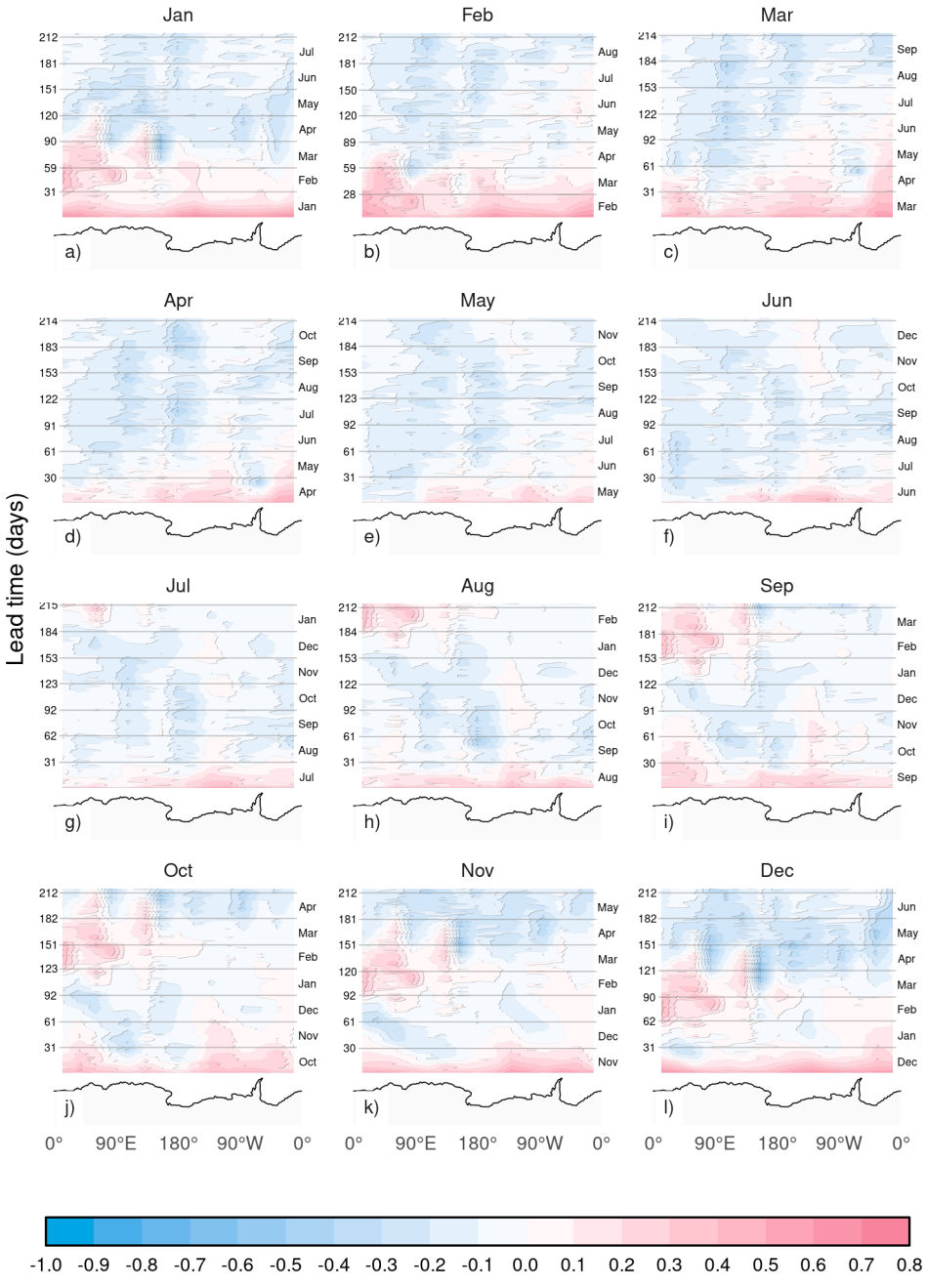

Figure A9: RMSE skill score of ACCESS-S1 forecasts with climatological forecast as reference computed on 15 meridional slices 24° wide as a function of lead time and longitude. Antarctica's coastline is shown at the bottom of each panel for reference.

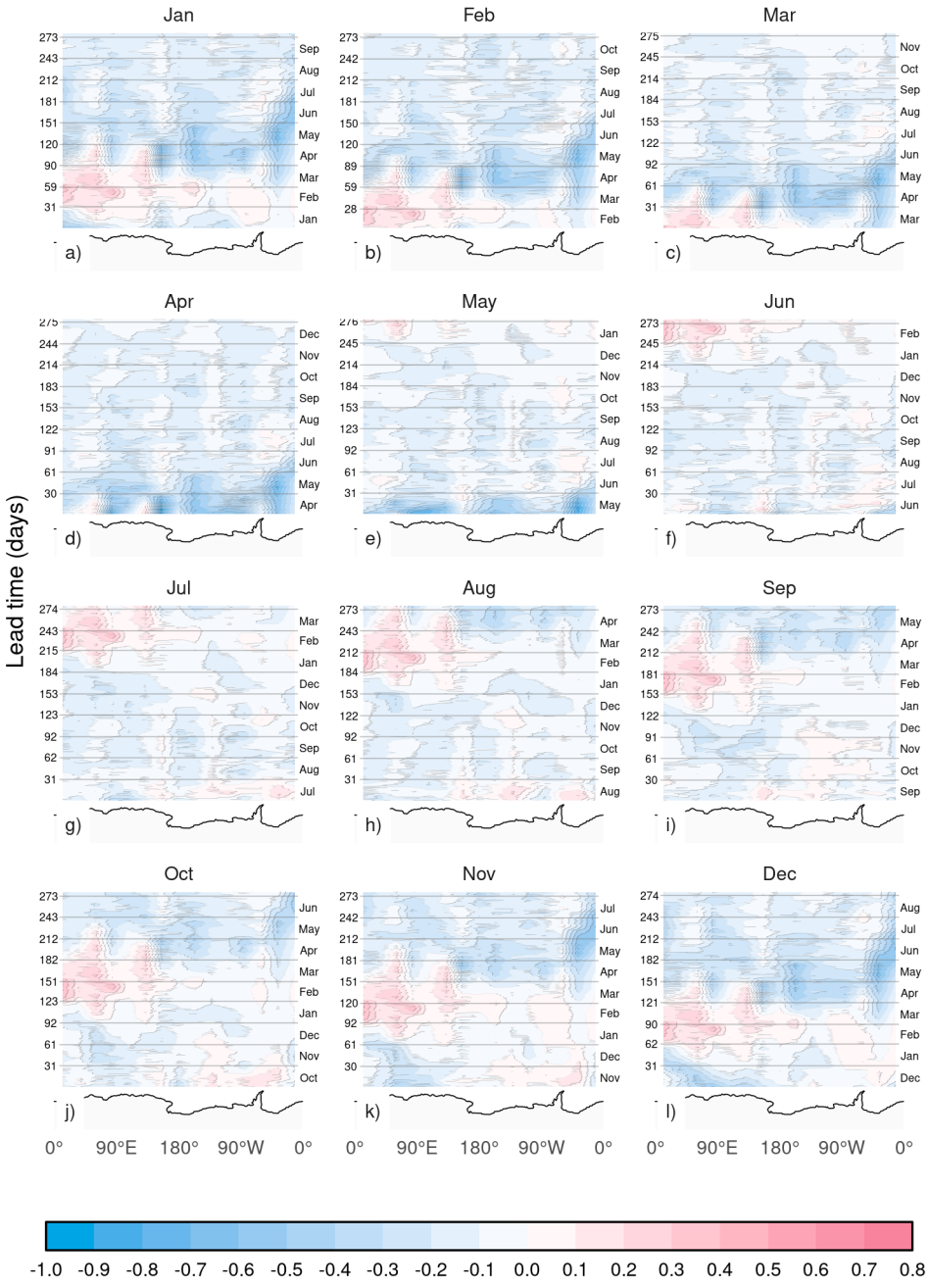

Figure A10: Same as Figure 11 but for ACCESS-S2.

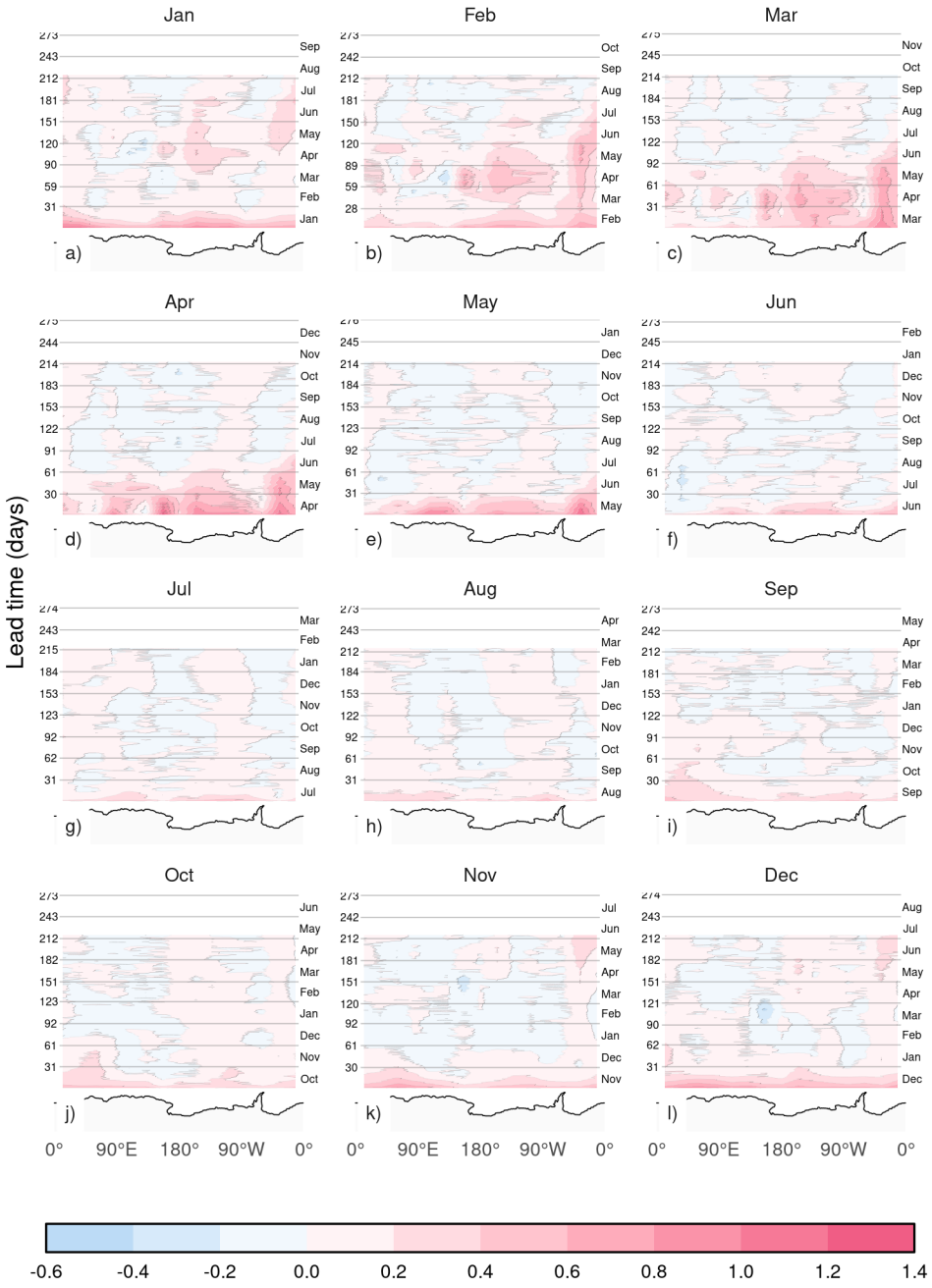

Figure A11: Same as Figure 11 but for the difference between ACCESS-S1 and ACCESS-S2.

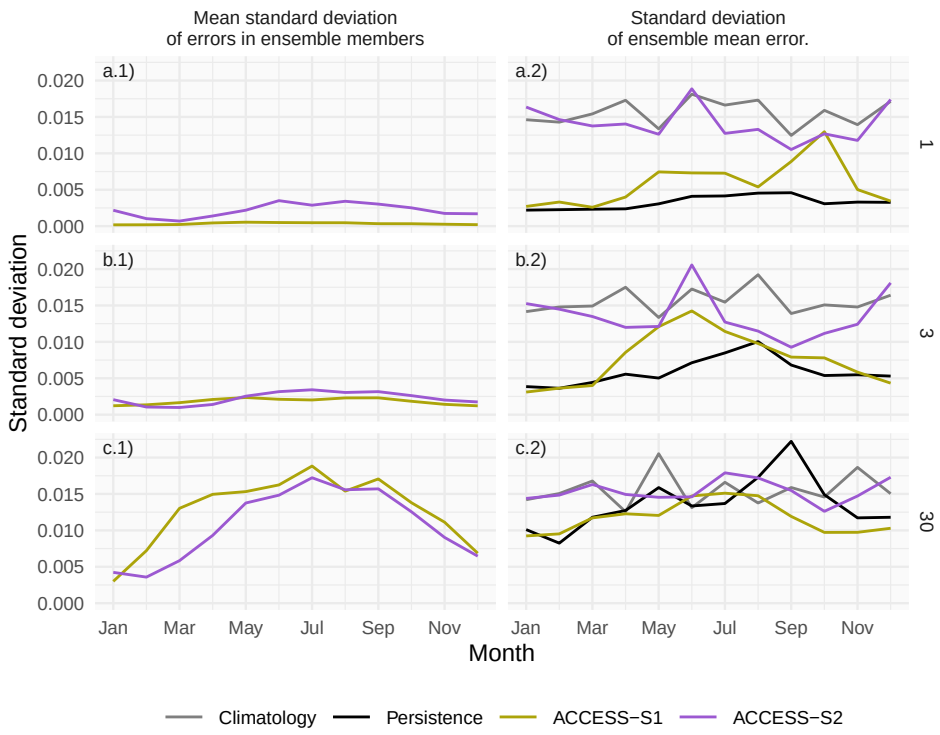

Figure A12: Decomposition of forecast error spread at 1, 5 and 30 days lead time for ACCESS-S1 and ACCESS-S2 hindcasts across initialization months. The left column shows the mean standard deviation of RMSE errors across ensemble members, while the right column shows the standard deviation of the ensemble mean RMSE error and the spread of the persistence and climatology forecasts errors.

References