Supplementary data

Figure S1. *Spatial correlation of δ¹⁸O with (a, d, e, f, g, h, i) air temperature, (b) SST, and (c) SIC from the ERA5 reanalysis data for different seasons over the 1957–2013 CE period. The scale bars indicate Pearson's correlation coefficient (r) at p < 0.05. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.*
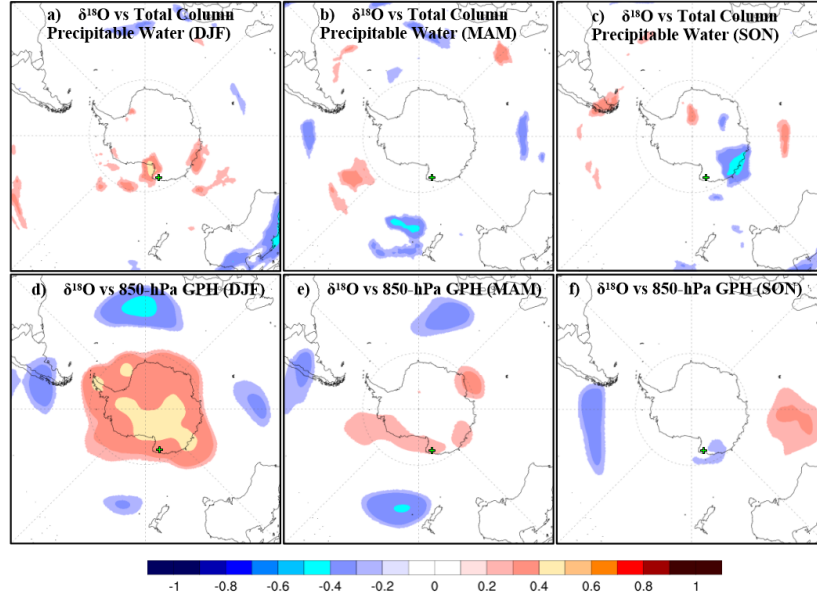
Figure S2. Spatial correlation of $\delta^{18}O$ with the (a–c) total column precipitable water and (d–f) 850-hPa GPH from the ERA5 reanalysis data for different seasons over the 1957–2013 CE period. The scale bars indicate Pearson's correlation coefficient (r) at $p < 0.05$. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.
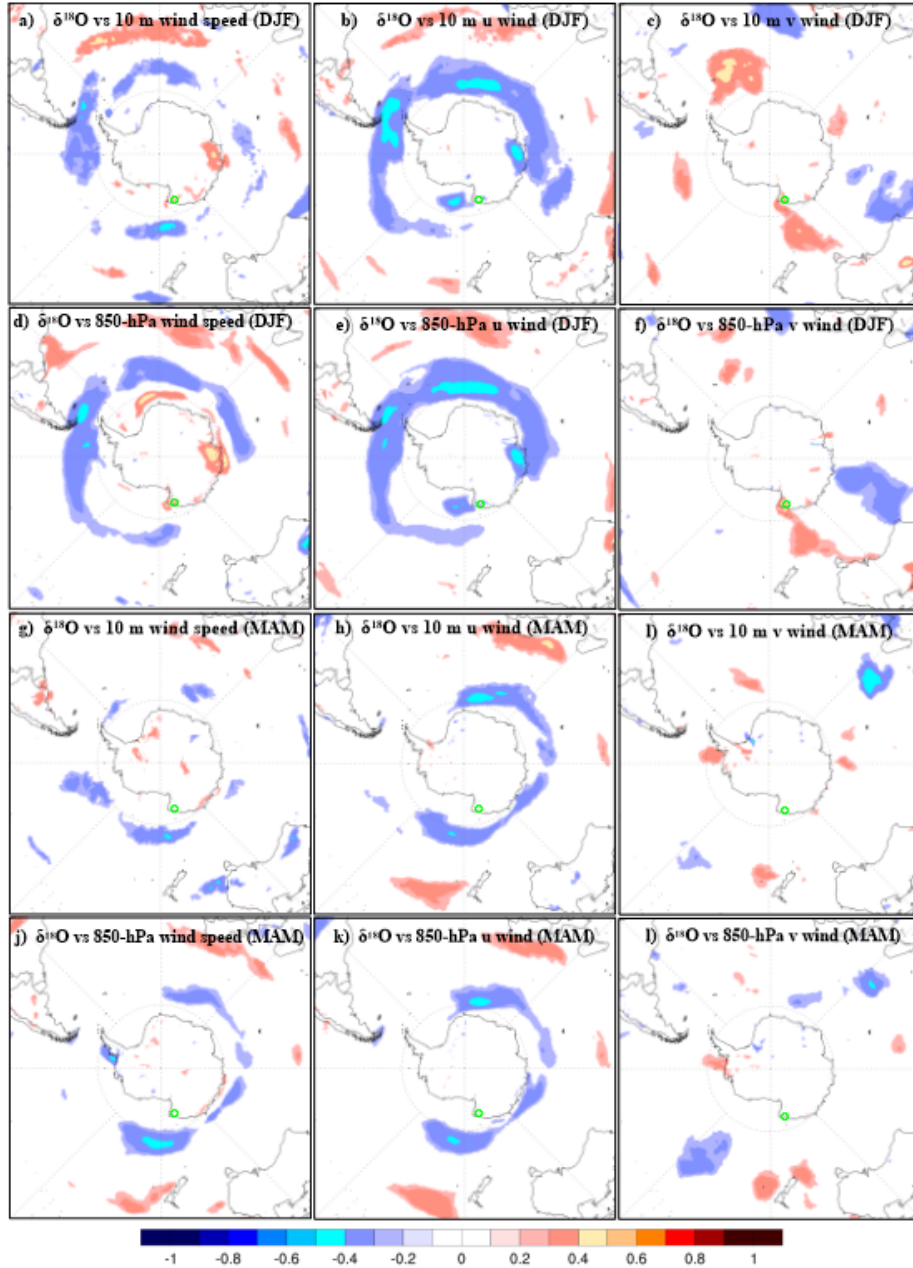
Figure S3. *Spatial correlations of δ¹⁸O with wind speed (a, d, g, j), u-wind components (b, e, h, k), and v-wind components (c, f, i, l) from ERA5 reanalysis data for different seasons over the 1957–2013 CE period. The scale bars indicate Pearson's correlation coefficient (r) at p < 0.05. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.*
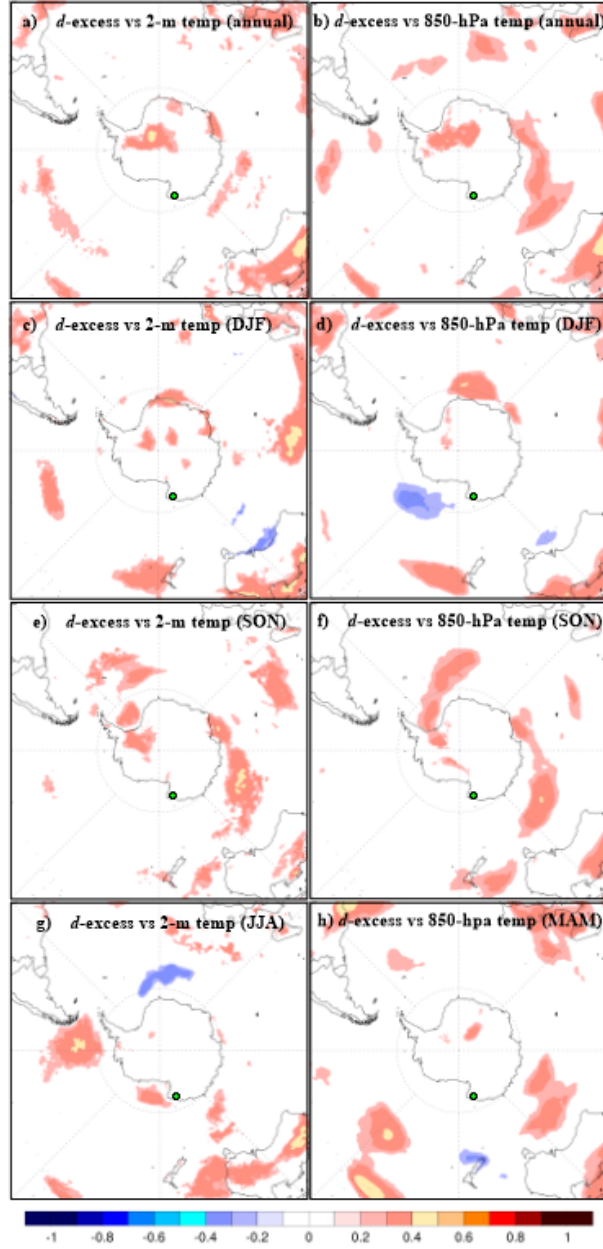
Figure S4. *Spatial correlation of d-excess with the (a, c, e, g) 2-m and (b, d, f, h) 850-hPa temperature from ERA5 reanalysis data for different seasons over the 1957–2013 CE period. The scale bars indicate Pearson's correlation coefficient (r) at p < 0.05. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.*
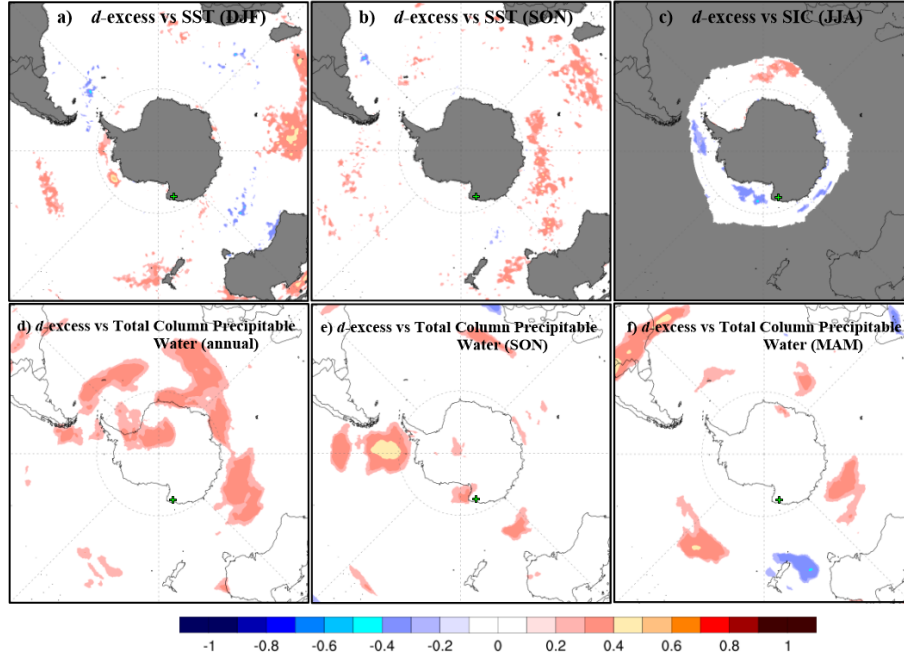
Figure S5. *Spatial correlation of d-excess with (a, b) SST, (c) SIC, and (d–f) total column precipitable water from ERA5 reanalysis data for different seasons over the 1957–2013 CE period. The scale bars indicate Pearson's correlation coefficient (r) at p < 0.05. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.*
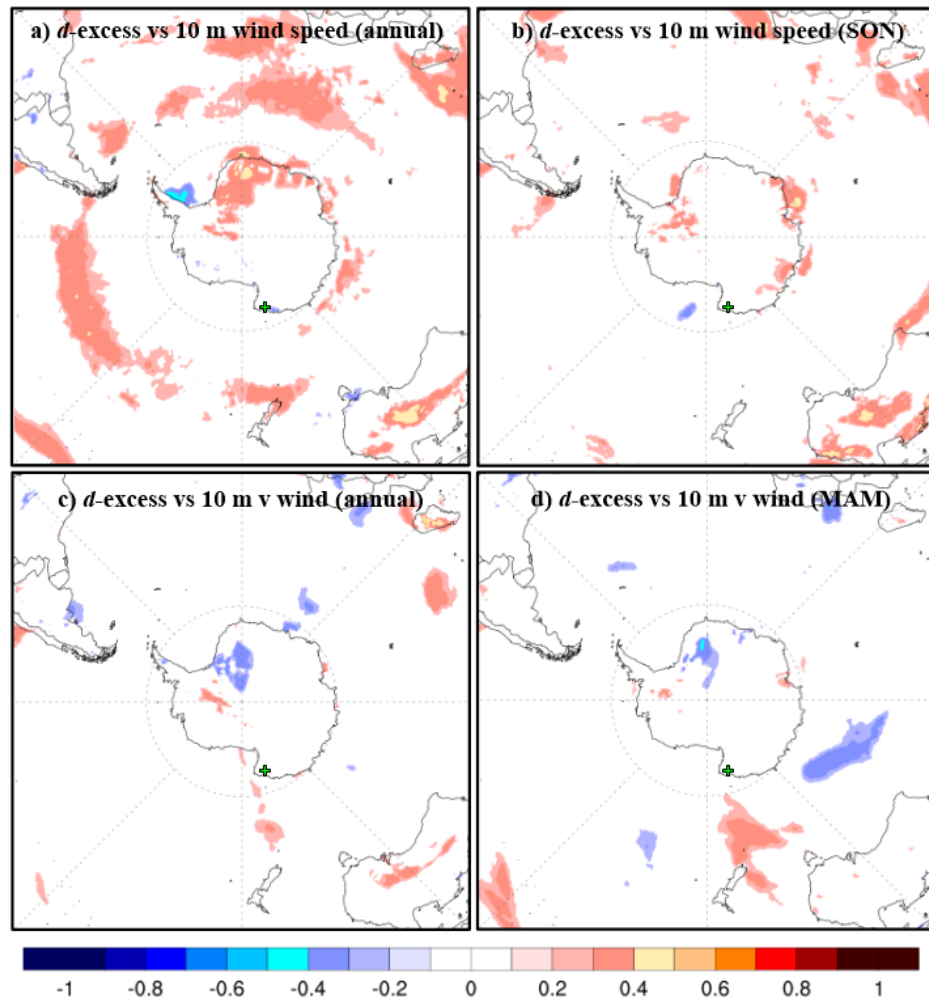
Figure S6. *Spatial correlation of d-excess with the (a, b) 10 m wind speed and (c, d) v-wind component from ERA5 reanalysis data for different seasons over the 1957–2013 CE period. The scale bars indicate Pearson's correlation coefficient (r) at p < 0.05. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.*
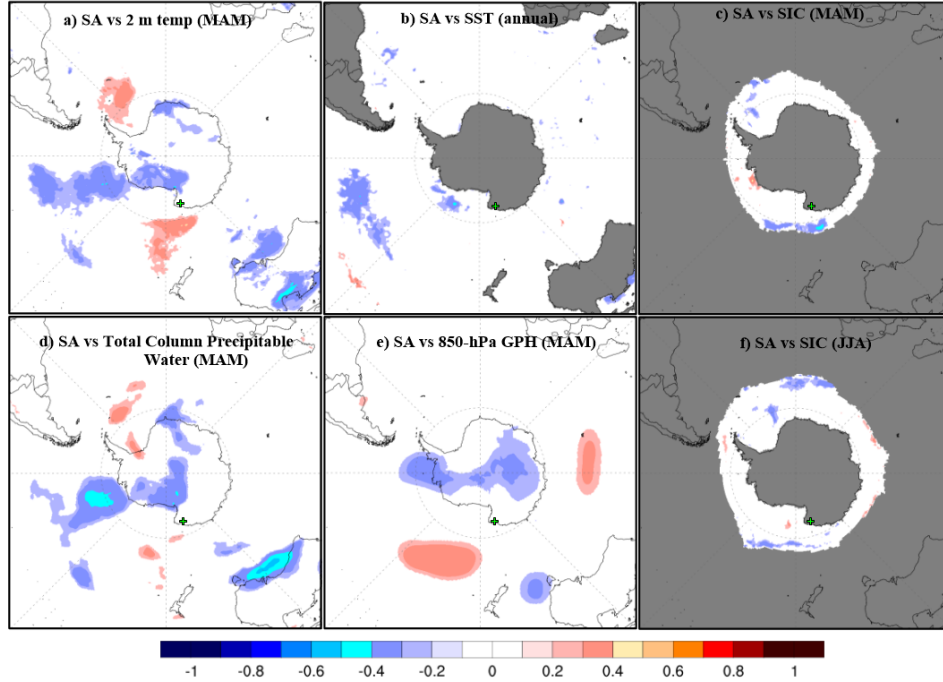
Figure S7. Spatial correlation of SA with (a) air temperature, (b) SST, (c, f), SIC, (d) total column precipitable water, and (e) 850-hPa GPH from ERA5 reanalysis data over the 1957–2013 CE period. The scale bars indicate Pearson's correlation coefficient (r) at p < 0.05. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.
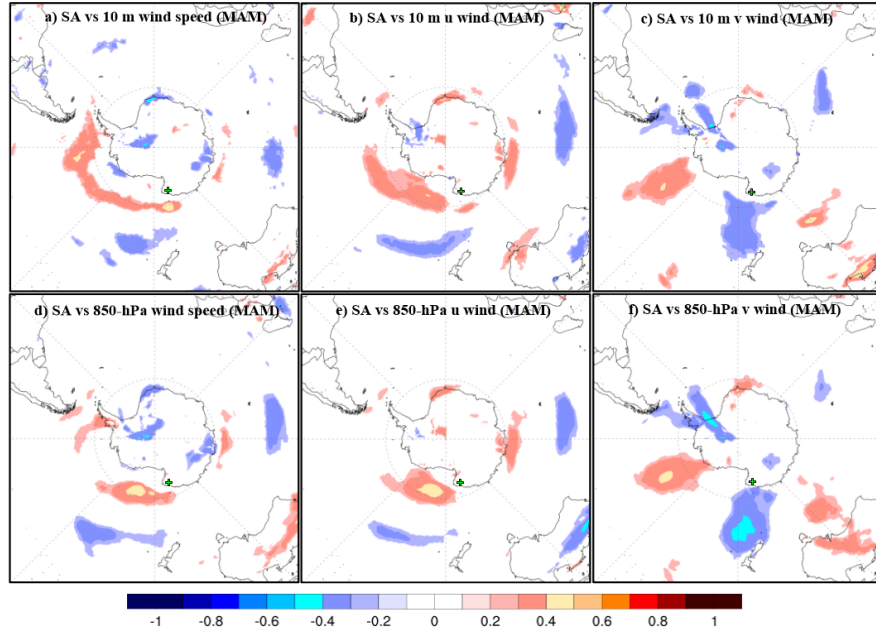
Figure S8. *Spatial correlation of SA with (a, d) wind speed, (b, e) u-wind components, and (c, f) v-wind components from ERA5 reanalysis data during the MAM season over the 1957–2013 CE period. The scale bars indicate Pearson's correlation coefficient (r) at p < 0.05. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.*
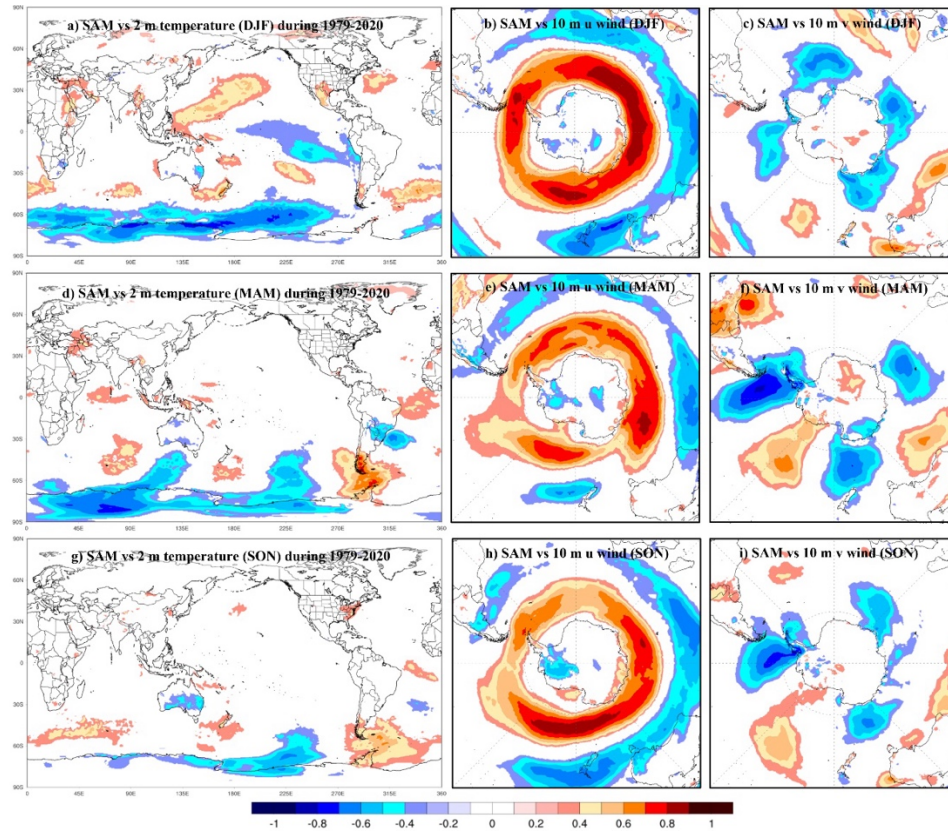
Figure S9. Spatial correlation of the SAM index with (a, d, f) temperature, (b, e, h) u-wind components, and (c, f, i) v-wind components from ERA5 reanalysis data for different seasons over the 1979–2020 CE period. The scale bars indicate Pearson's correlation coefficient (r) at p < 0.05. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.
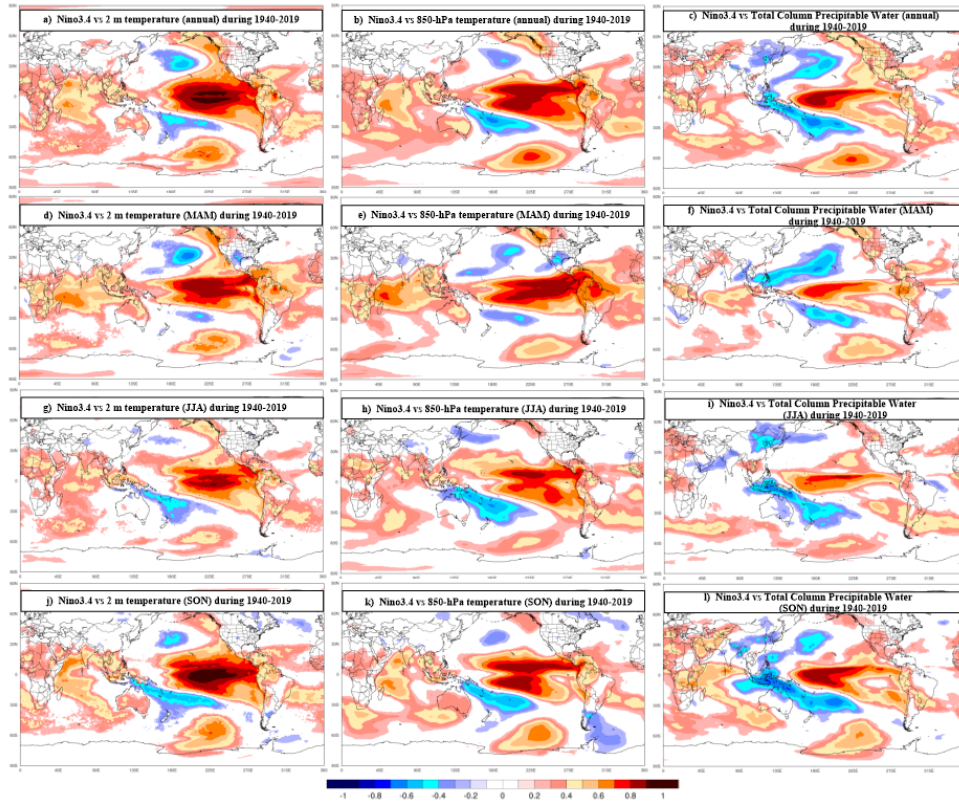
Figure S10. Spatial correlation of the Nino3.4 index with ERA5 reanalysis data for different seasons over the 1940–2019 CE period. The scale bars indicate Pearson's correlation coefficient (r) at p < 0.05. This figure was generated using Climate Reanalyzer (https://climatereanalyzer.org/) from the Climate Change Institute, University of Maine, USA.