Supplementary Materials for


This document contains Supplemental Figures referenced in the main text.
Figure S1. Total dynamical contribution to DJF SAT trends (1963-2011) based on the a) constructed analogue approach used in this study, and b) point-wise partial least-squares regression used in Smoliak et al. (2015). Units are °C yr⁻¹.
Figure S2. Variance of DJF SLP trends [1963-2012; (hPa 50 yrs$^{-1}$)$^2$] across the CESM-LE (a) before and (b) after dynamical adjustment.
Figure S3. Internal dynamical contribution to winter SAT (°C 50 yrs\(^{-1}\)) and SLP (hPa 50 yrs\(^{-1}\)) trends (1963-2012) for each member of the CESM-LE (labeled 1-30), the CESM-LE ensemble-mean (labeled “EM”), and observations (MLOST and 20CR; labeled “OBS”). For SLP, the contour interval is 1 hPa 50 yrs\(^{-1}\), negative values are dashed and the zero contour is thickened.
Figure S4. Standard deviation of DJF SAT trends (1963-2012) across the CESM-LE (a) before and (b) after dynamical adjustment (°C 50 yrs⁻¹). The proportion of total trend standard deviation (%) accounted for by dynamical adjustment is shown in panel c.
**Figure S5.** Timeseries decomposition of DJF SAT anomalies (°C) averaged over North America for observations (MLOST) into internal, forced, dynamical and thermodynamic components. The top panel shows the raw (black) and dynamically-adjusted (magenta; internal dynamics removed) components. The second panel from the top shows the free (blue) and forced (red) components. The second panel from the bottom shows the forced thermodynamics (brown) and forced dynamics (orange) components. The bottom panel shows the free thermodynamics (green) and free dynamics (cyan) components. Note the different vertical scales for each set of curves. See text for explanation.
Figure S6. Trends (1963-2012) in winter SAT (color shading; °C 50 yrs⁻¹) and SLP (contours; contour interval is 1 hPa 50 yrs⁻¹, negative values are dashed and the zero contour is thickened) from each of the 38 CMIP5 models (labeled 1-38), the CMIP5 ensemble-mean (labeled “EM”), and observations (MLOST; labeled “OBS”).
Figure S7. Standard deviation of DJF SAT (shading; °C) and SLP (contours; contour interval = 1 hPa) anomalies in the CESM-LE and observations (OBS) based on (a, b) unfiltered and (c, d) 8-year low-pass filtered data. Observational datasets are MLOST for SAT and 20CR for SLP.