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## Supplemental Material

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Unforced Interannual-to-Decadal Variability of Global Radiation Imbalance: Role of Low Clouds

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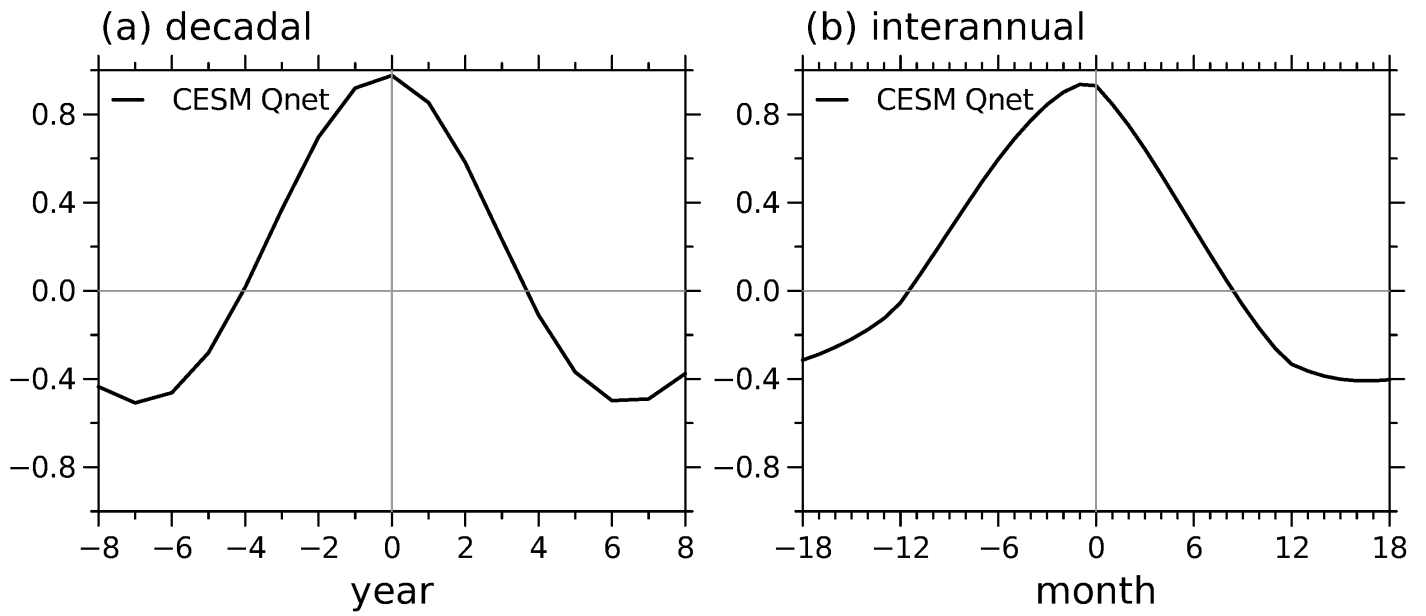


Fig. S1: As in Figs. 2e,j, respectively, but for global net surface heat flux ( $Q_{\text{net}}$ ; positive values for downward flux).

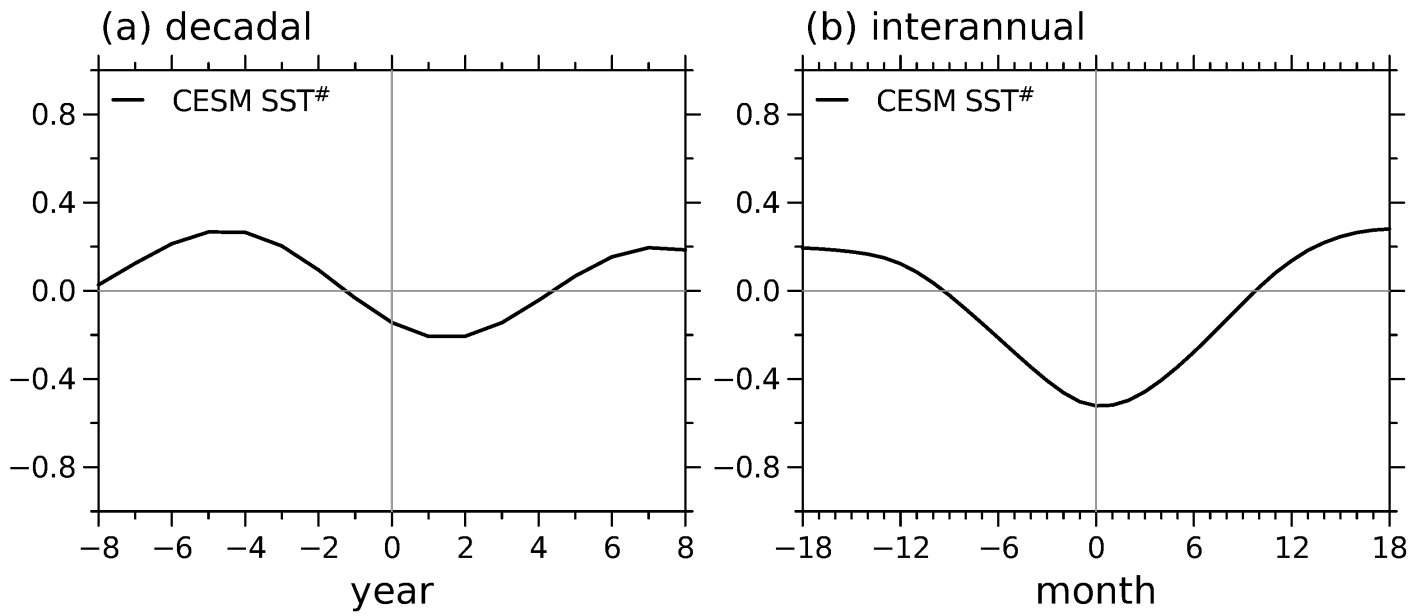


Fig. S2: As in Figs. 2e,j, respectively, but for the SST<sup>#</sup> index. Following Fueglistaler (2019), the SST<sup>#</sup> index is defined as the temperature of the warmest 30% minus the tropical (30°S-30°N) average SST.

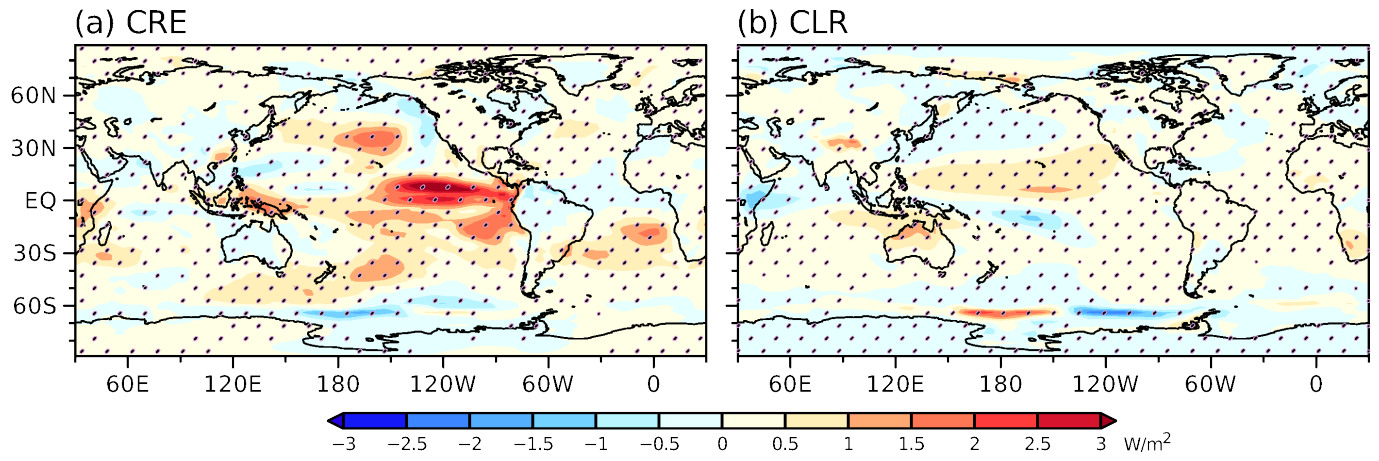


Fig. S3: Regression maps of TOA CRE (a) and clear-sky flux (b) anomalies onto CESM interannual GMTOA at lag 0. Stippling signifies the 90% confidence. Units is  $W m^{-2}$ .

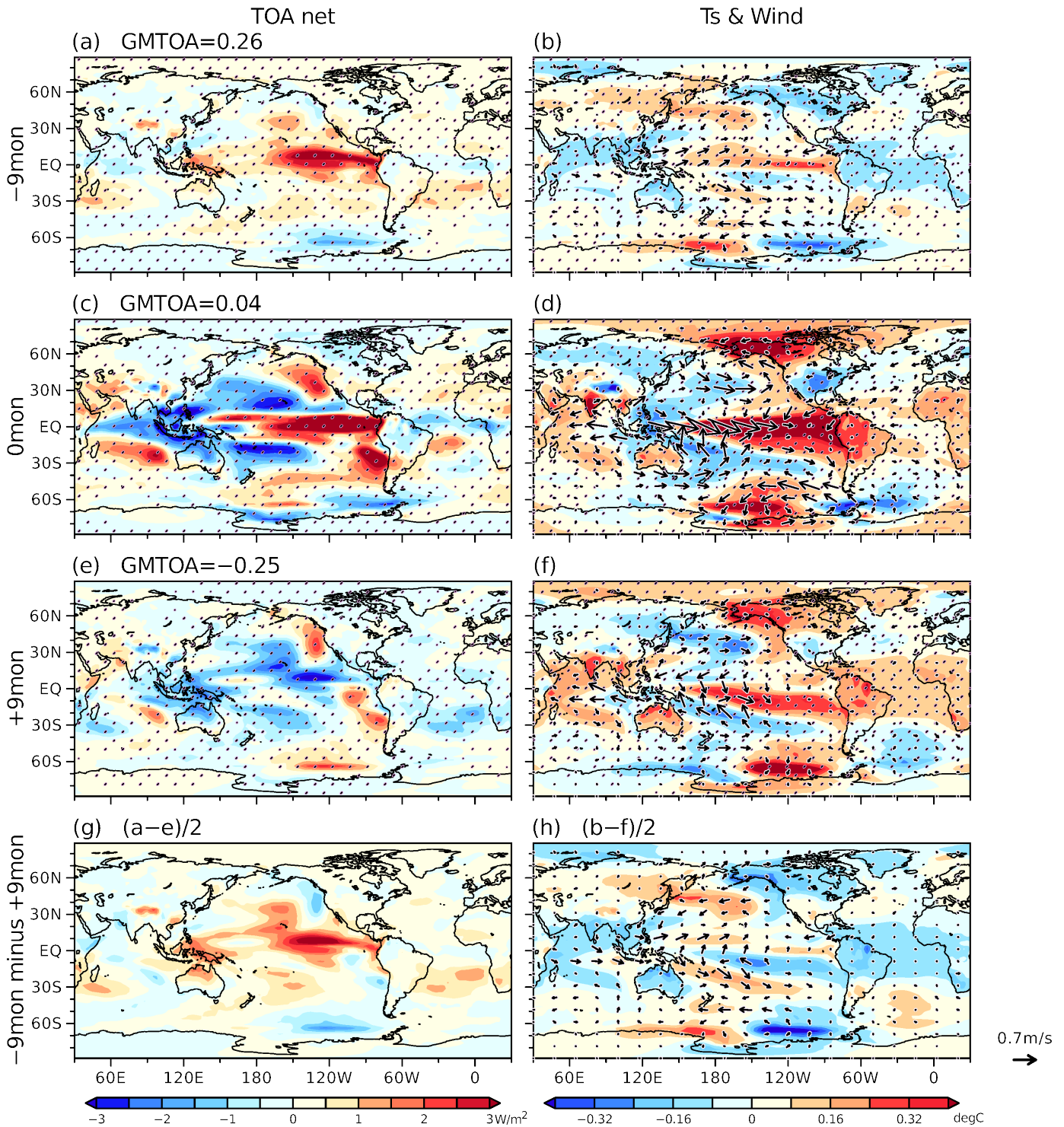


Fig. S4: ENSO-related anomalies. Lagged regression maps of (a,c,e) TOA radiation ( $\text{W m}^{-2}$ ; GMTOA are shown in the title), (b,d,f) surface temperature (shading;  $^{\circ}\text{C}$ ) and wind (arrows;  $\text{m s}^{-1}$ ; only points with the 90% confidence are drawn) onto interannual Nino3.4 SST anomalies at lags (a,b)  $-9$ , (c,d)  $0$ , and (e,f)  $+9$  months. Corresponding GMTOA anomalies are shown. Stippling indicates the 90% confidence. (g,h) the bulk ENSO-related anomalies as the half of the difference between lag  $-9$  and  $+9$  months, following Ceppi and Fueglistaler (2021). Results are insensitive among lags  $\pm 8,9,10$  months near the peak correlation with GMTOA.

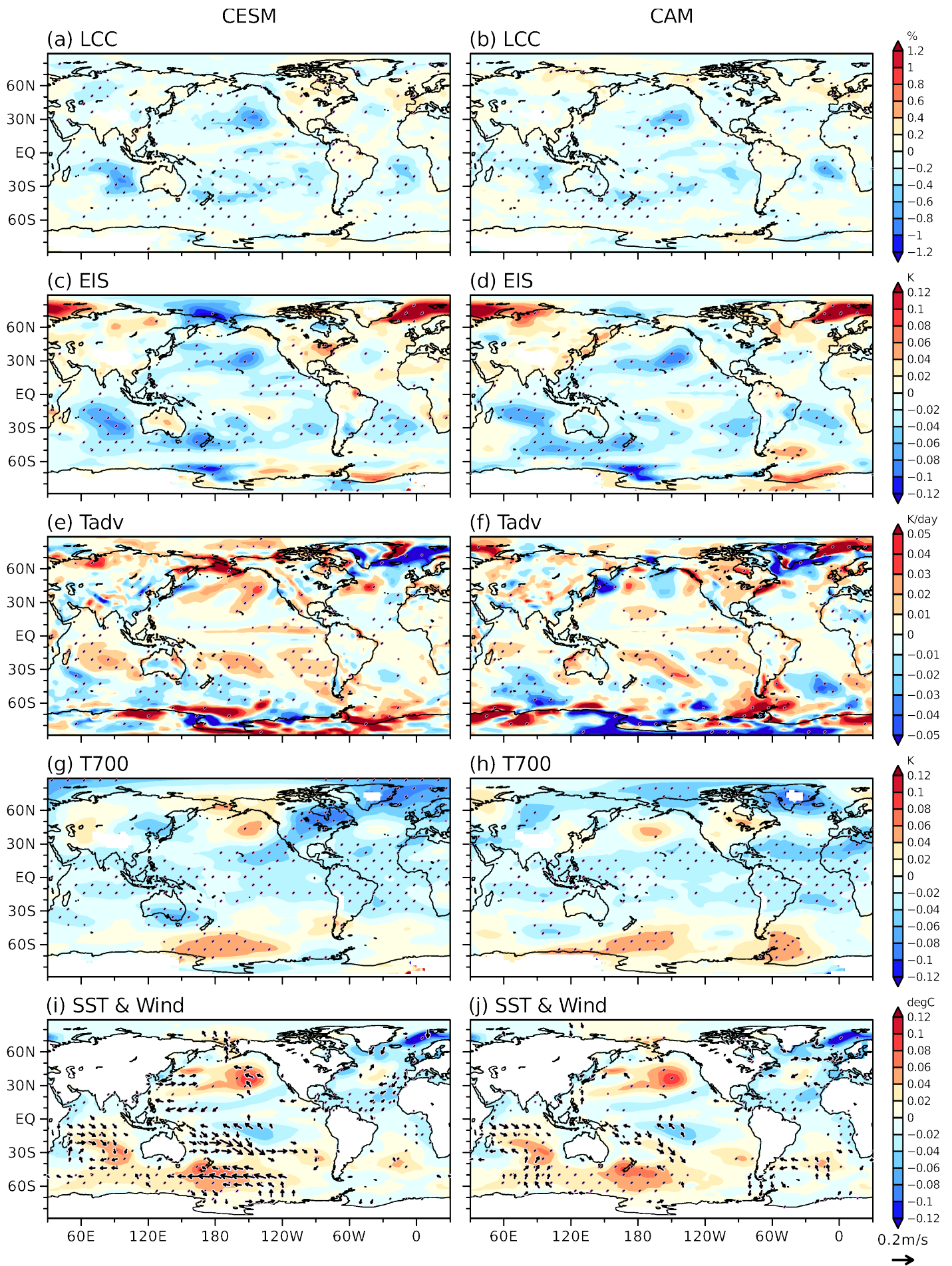


Fig. S5: As in Fig. 7, but for lag 0.

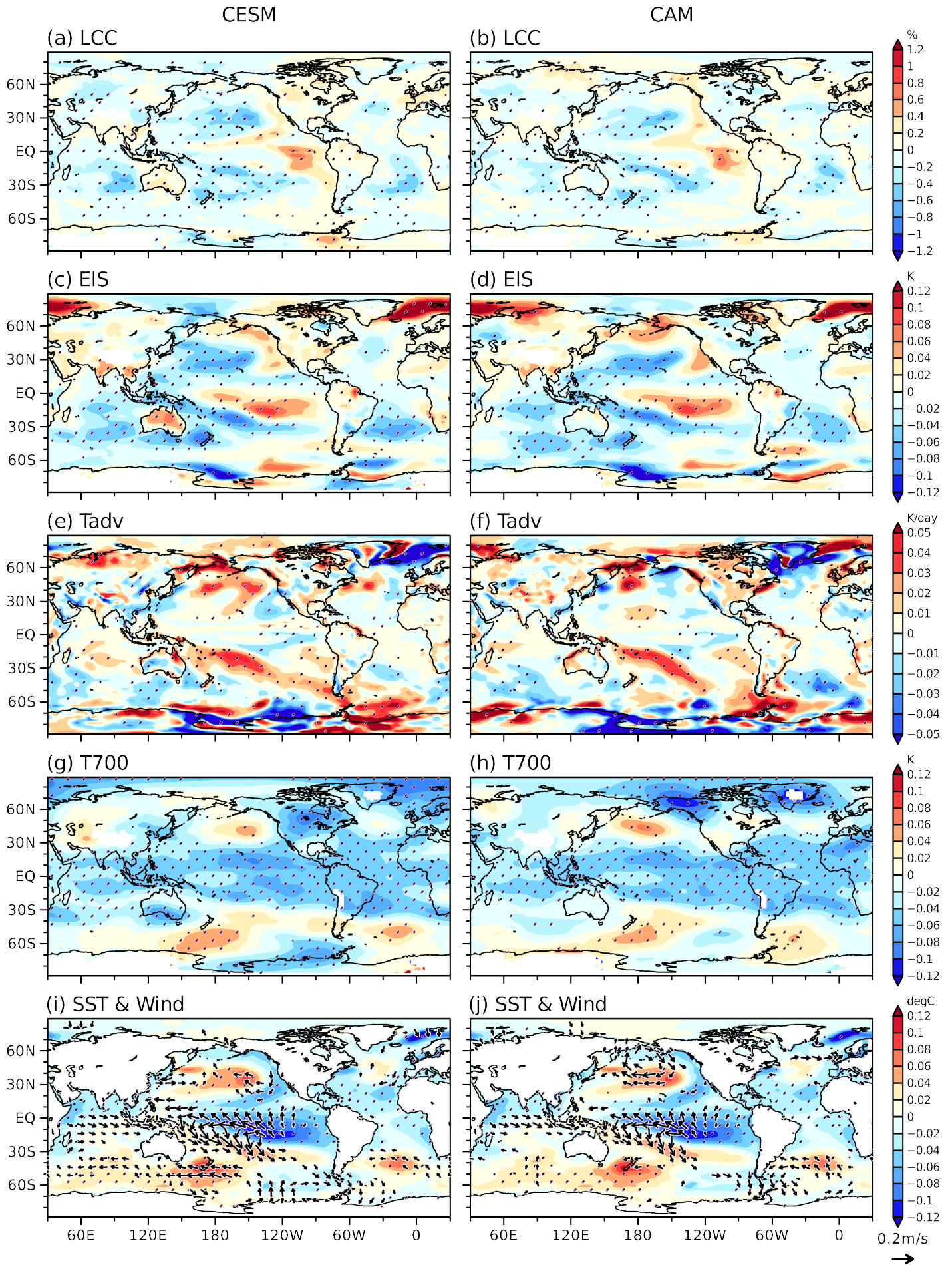


Fig. S6: As in Fig. 7, but for lag -1 year.

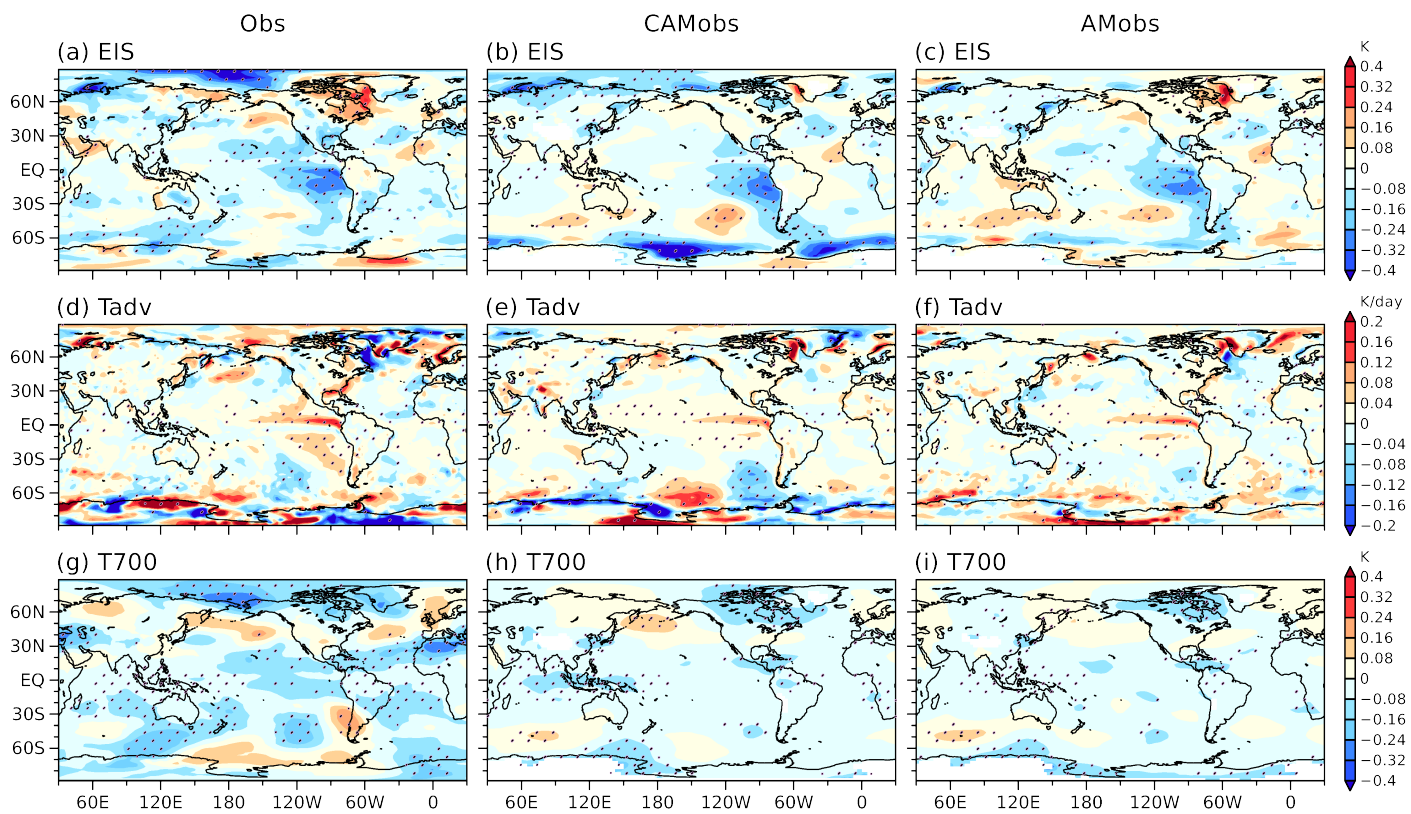


Fig. S7: As in Fig. 9, but (a,b,c) EIS (K), (d,e,f) surface temperature advection ( $\text{K day}^{-1}$ ), and (g,h,i) 700-hPa temperature (K).