Evolution and forcing mechanisms of ENSO over the last 300,000 years in CCSM3

Supplementary materials

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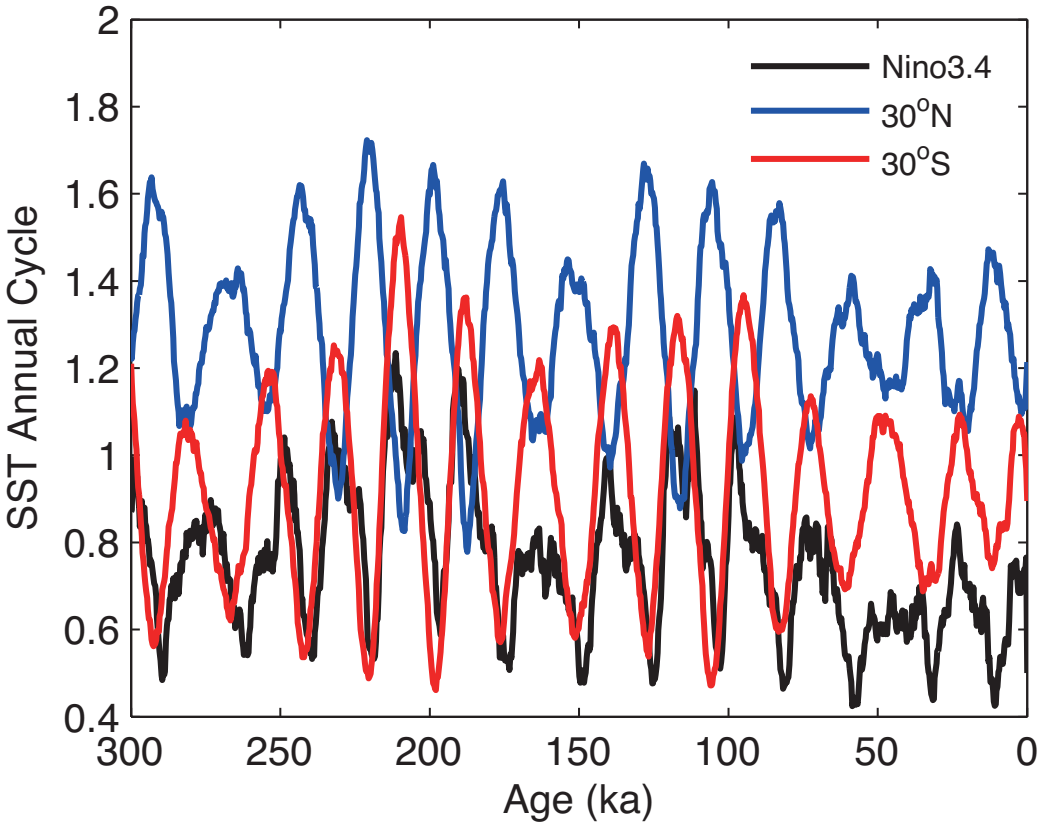
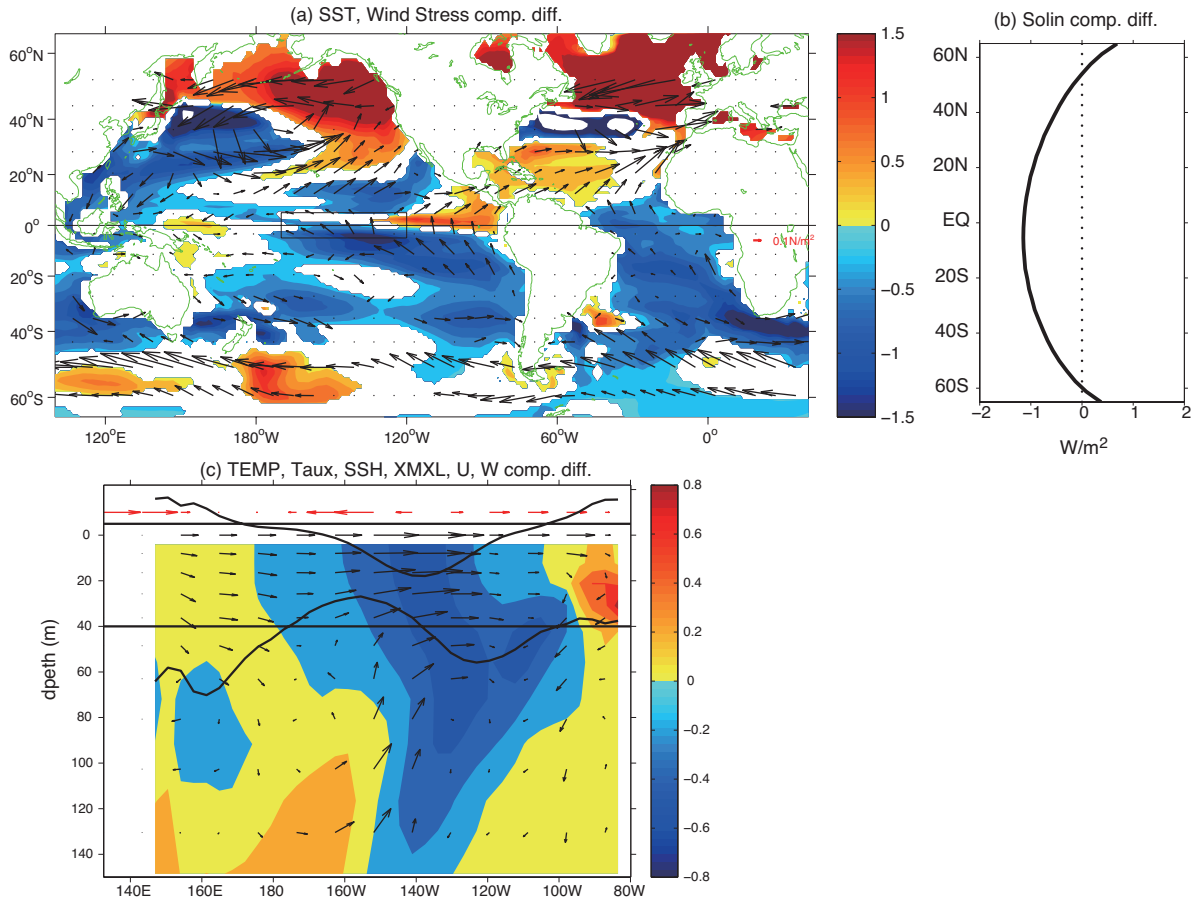


Fig. S1 Nino3.4 (black), 30°N (with longitude extent as Nino 3.4, blue) and 30°S (with longitude extent as Nino 3.4, red) SST annual cycle amplitude in 30-year sliding windows (5-year forward steps, with 100-year running-mean smoothing).



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18 **Fig. S2** Composite mean state difference (low precession minus high precession). (Upper
19 panel) SST (shading), surface tau (vectors) and zonal mean insolation; (lower panel) cross
20 section of sea temperature (shading), ocean current (black vectors), surface taux (red vectors),
21 SSH (upper black curve) and mixed layer depth (lower black curve, using model output
22 XMXL).

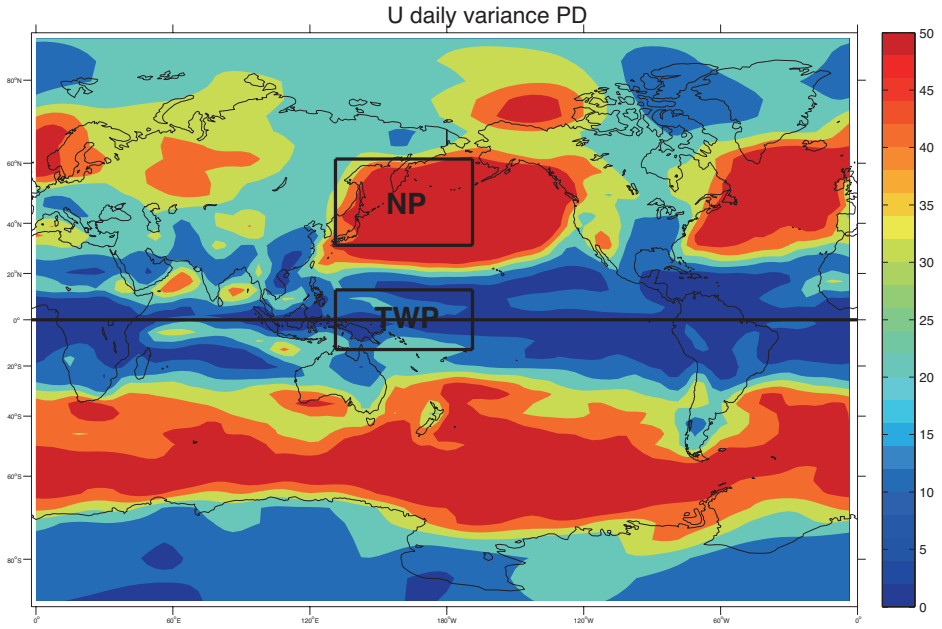

Fig. S3 Distribution of monthly mean variance of daily surface U wind (derived from monthly U and UU) in ORB (present day), and the black boxes depict the tropical western Pacific (15S–15N, 120–190E) and North Pacific region (30N-60N, 130E-190E) when plotting Fig. 7.

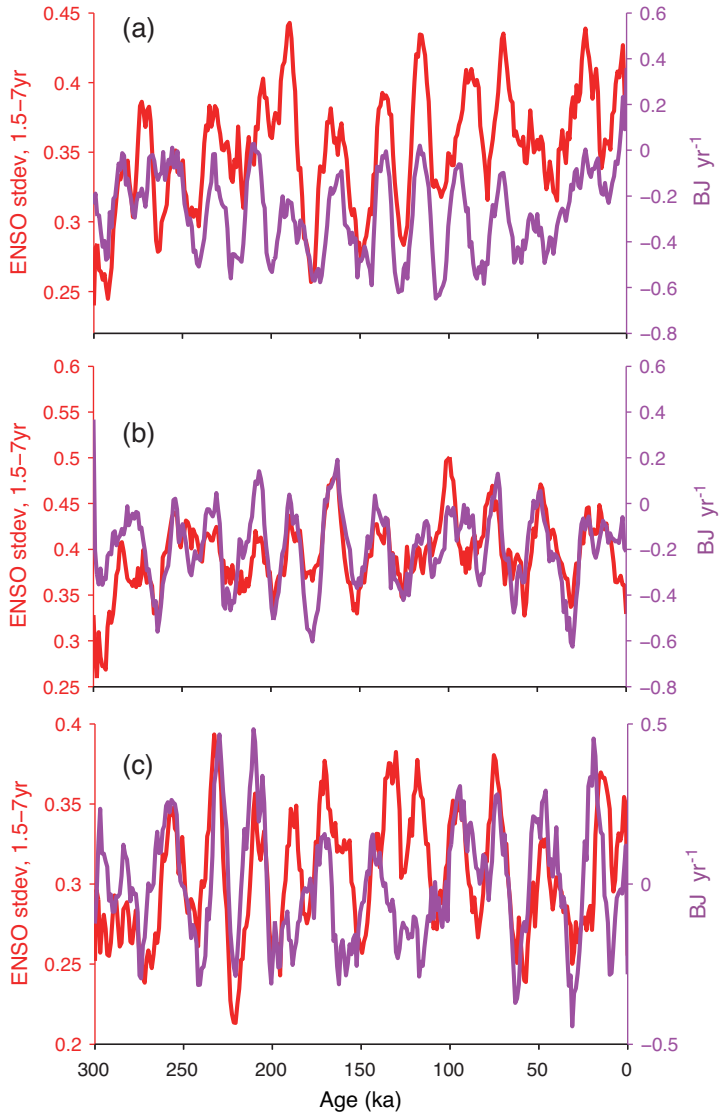

Fig. S4 Temporal evolution of ENSO (red) variability and BJ index (purple) (in 30-year windows and with 300-year running mean smoothing) for (a) ORB simulation; (b) ORB+GHG simulation and (c) ORB+GHG+ICE simulation.

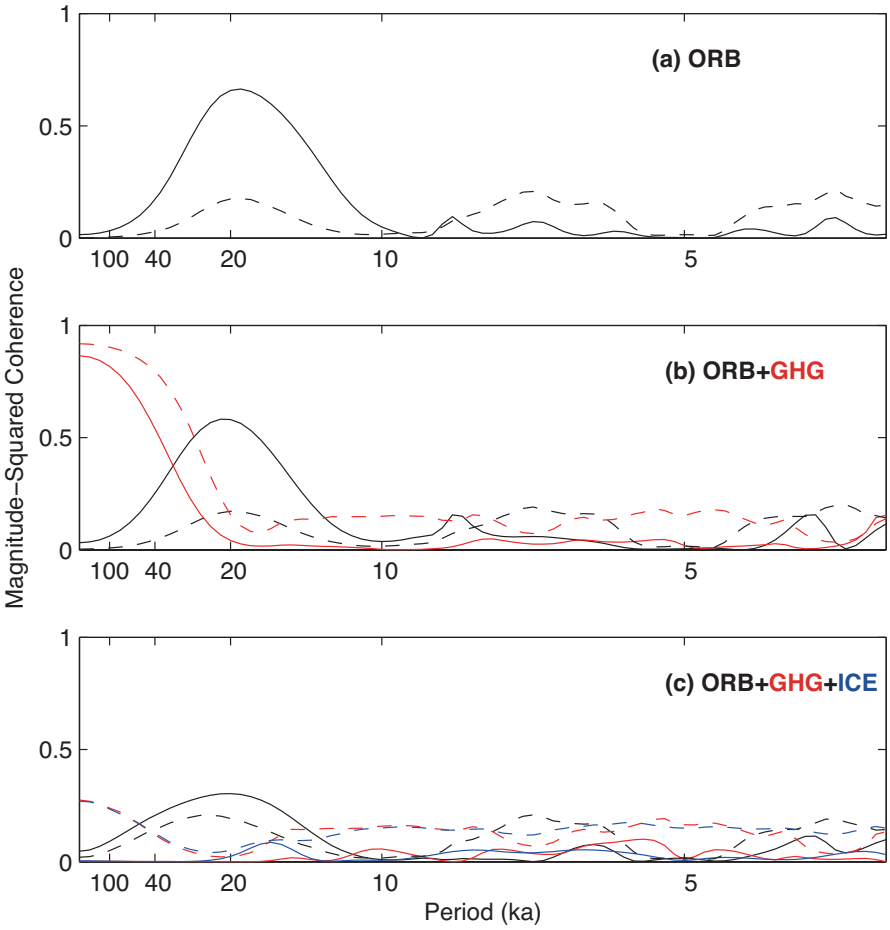

Fig. S5 Coherence of BJ index and external forcing. The solid curves are coherence of BJ and precessional forcing (black), GHGs forcing (red) and ice-sheet forcing (blue), respectively. The dashed curves are 95% significant level (derived by resampling of one time series without replacement 1000 times and calculate coherence distribution for the uncorrelated series), with the corresponding color to each forcing. (a) ORB simulation; (b) ORB+GHG simulation and (c) ORB+GHG+ICE simulation.

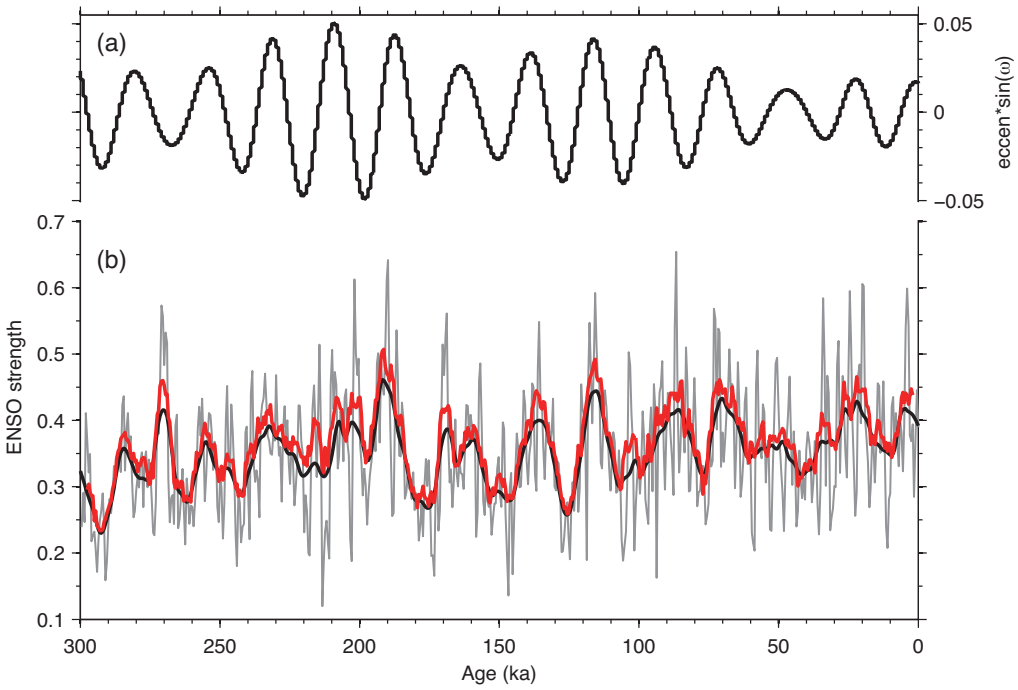

Fig. S6 Test the robustness of orbital scale trend in ENSO variability. (a) the precession index; (b) Nino3.4 SST 1.5-7 year band interannual variability in 10-year sliding windows and 5-year forward step (grey curve) with additional 100-year running-mean smoothing (black curve), and in 50-year sliding windows and 5-year forward step (red curve). Note that the aforementioned 'year' is model year.