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Supporting Information for

**The tropical Atlantic's asymmetric impact on the El Niño-Southern Oscillation**

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**Contents of this file**

Text S1

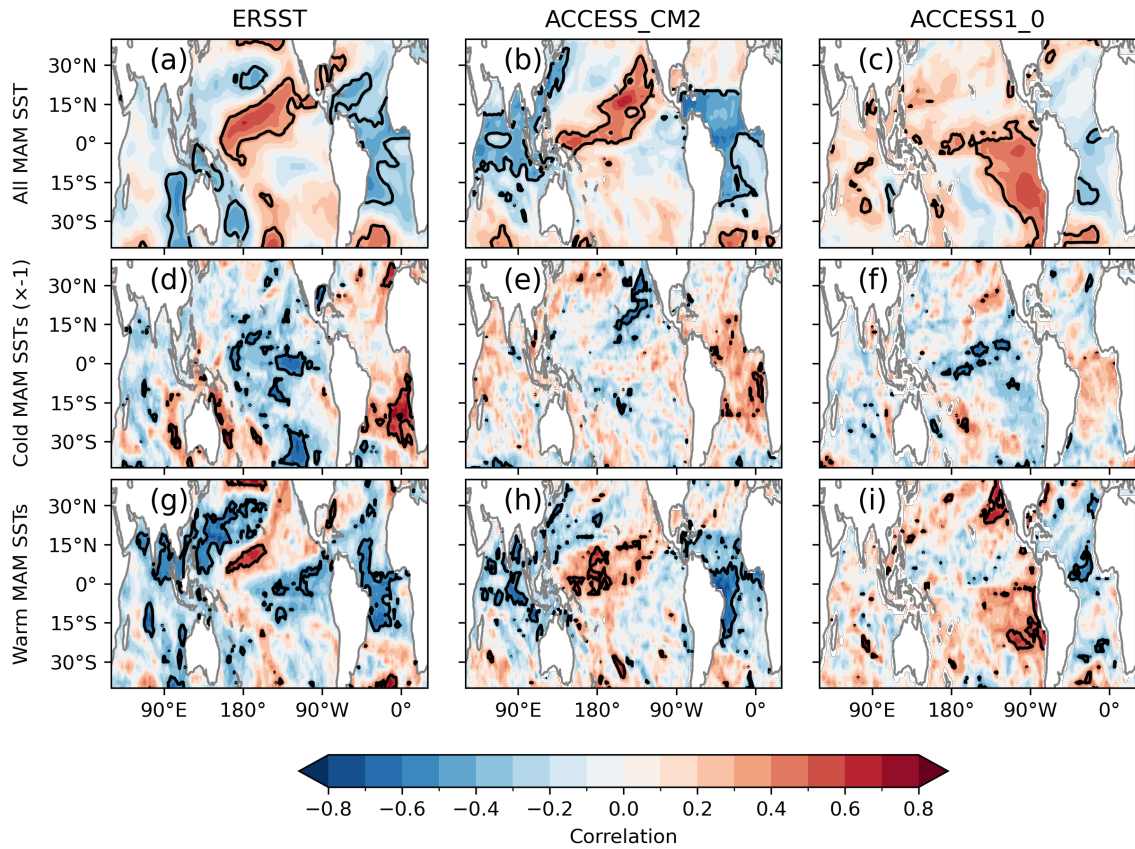
Figures S1 to S4

**Text S1.**

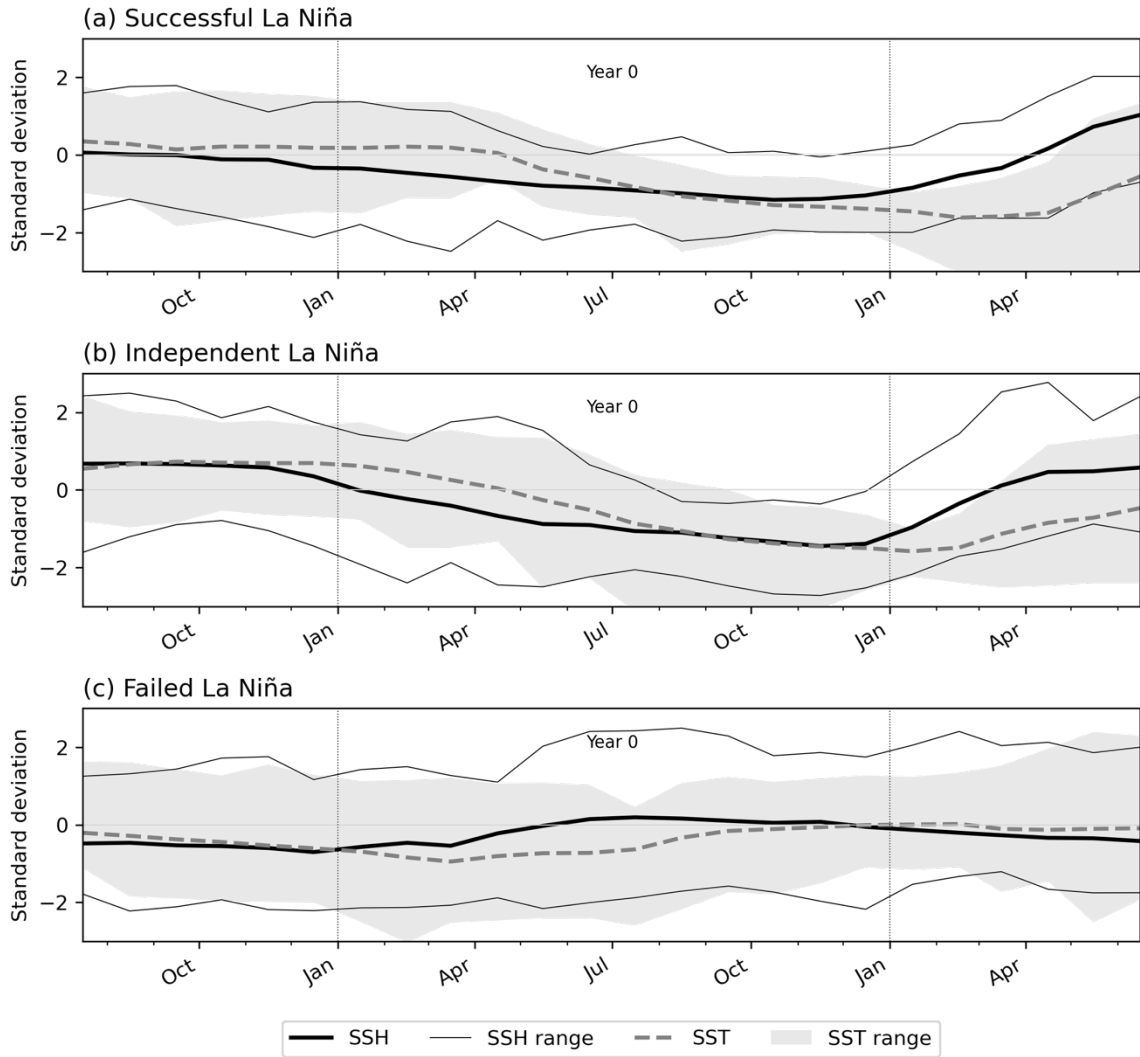
ACCESS CM2 uses the UKMO UM 10.6 atmosphere model coupled to the GFDL MOM5 ocean model, the LANL CICE 5 sea ice model, and the CABLE 2.5 land surface model (Bi et al., 2020).

ACCESS 1.0 uses the UKMO UM 7.3 atmosphere model coupled to the GFDL MOM4p1 ocean model, LANL CICE 4.1 ice model, and the UKMO MOSES 2 land surface model (Bi et al., 2013).

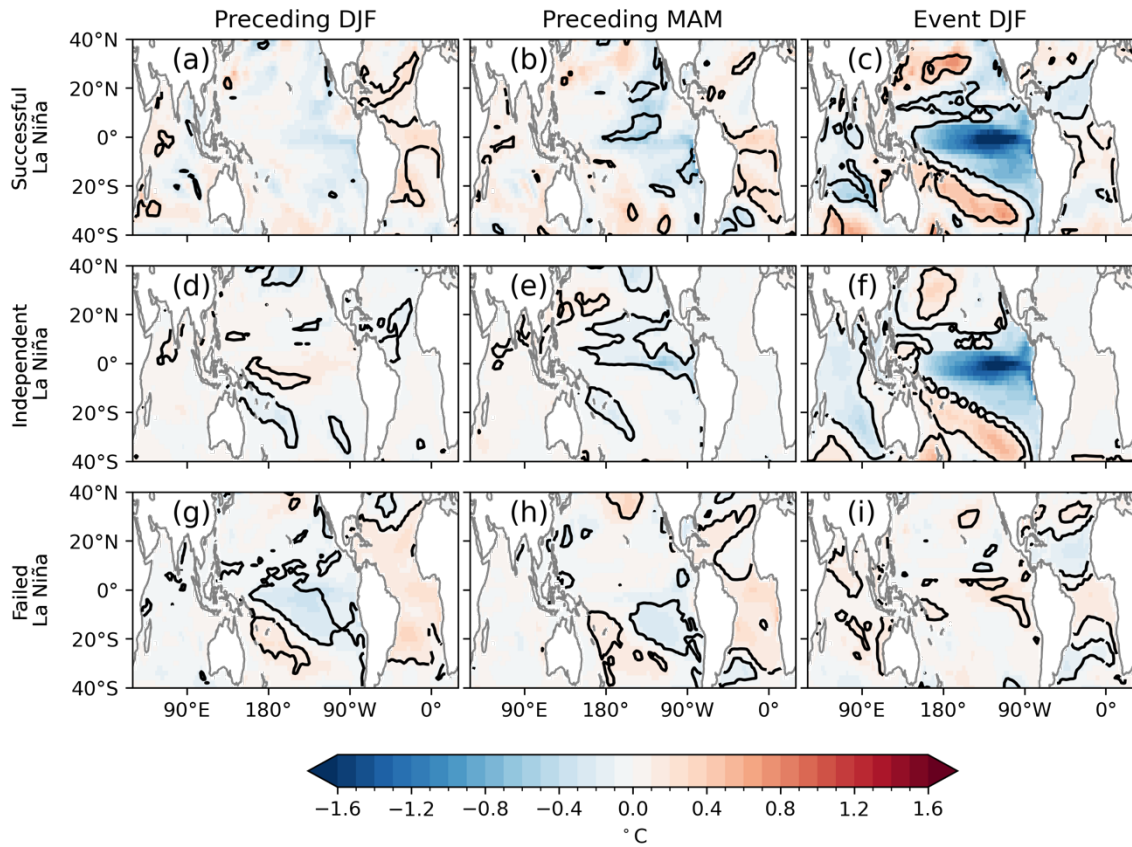
The two models have the same horizontal resolution for the atmosphere (1.25° latitude and 1.875° longitude) and ocean (varying from 1/3° around the equator to 1°), but ACCESS CM2 has a higher atmospheric vertical resolution of 85 levels compared to 38 levels in ACCESS 1.0.



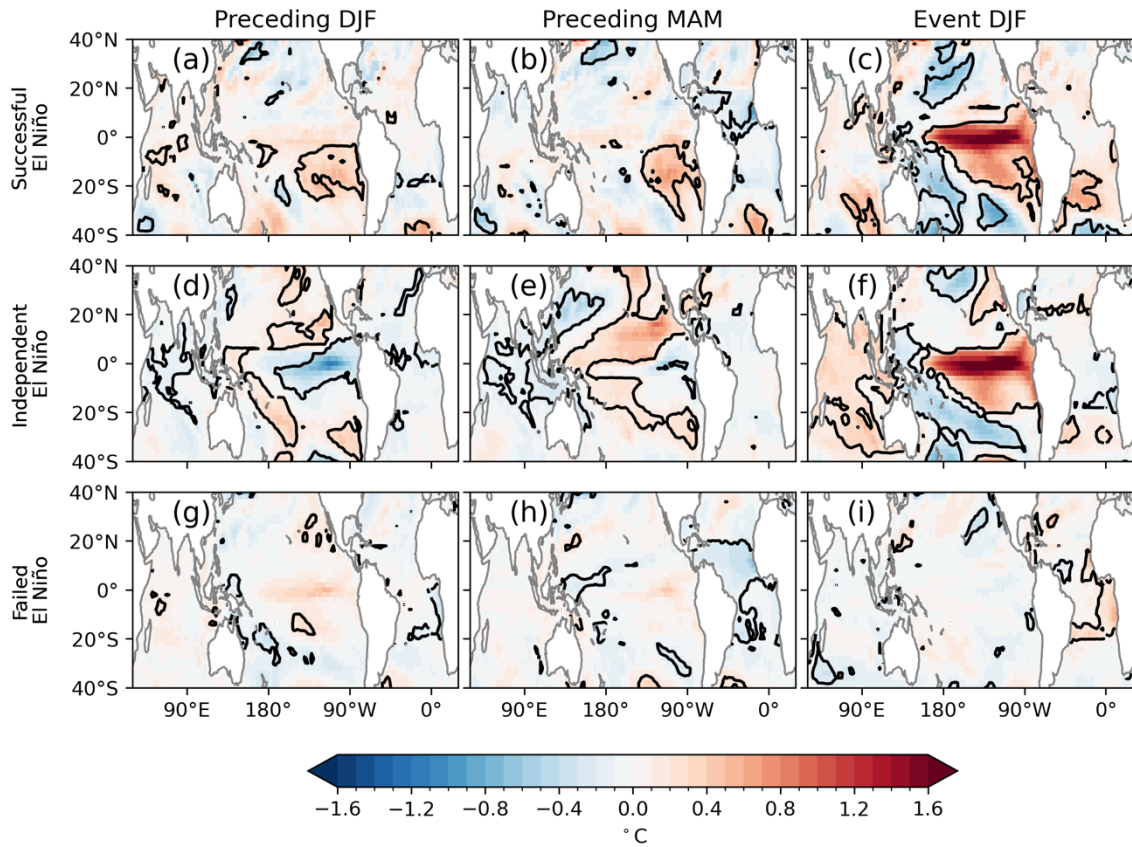
**Figure S1.** (left column, top to bottom) as for Fig. 1b, 1c, 1d, but using ERSST data. (centre and right columns) as for left column, but using ensemble mean ACCESS CM2 Atlantic pacemaker and ACCCES1.0 Atlantic pacemaker experiments, respectively. Note: as in Fig. 1c, cold MAM SSTAs is multiplied by -1.



**Figure S2.** ACCESS CM2 ensemble mean evolution of detrended equatorial Pacific sea surface height (SSH, 5°N-5°S, 130°E-80°W) and detrended Niño3.4 SST for (a) independent, (b) successful and (c) failed La Niña groups defined in Fig. 2b. The range of SSH and SST are marked by thin lines and grey shading, respectively.



**Figure S3.** As Fig. 3, but for the ACCESS 1.0 pacemaker.



**Figure S4.** As Fig. 3 but for the El Niño cases defined in Fig. 2b.