SUPPLEMENTARY TABLES AND FIGURES

Table S1. The initial and core thresholds for tracking TCs using OWZP detection scheme.

OWZP detection Scheme threshold values of parameters						
Criterion	**OWZ850**	**OWZ500**	**RH950**	**RH700**	**VWS850-200**	**SH950** *
Initial	$50 \times 10^{-6} s^{-1}$	$40 \times 10^{-6} s^{-1}$	70%	50%	$25 ms^{-1}$	$10\ g\ kg^{-1}$
Core	$60 \times 10^{-6} s^{-1}$	$50 \times 10^{-6} s^{-1}$	85%	70%	$12.5 ms^{-1}$	$14\ g\ kg^{-1}$

* Modified to 0 g kg^{-1} after testing

The equation for the calculation of low deformation vorticity (OWZ) is given below:

$$OWZ = \max\left(OW_{norm,} 0\right) \times \left(\xi + f\right) \times sign\left(f\right)$$

Here OW_{norm} is the normalized Okubo-Weiss parameter, ξ is the relative vorticity, f is the planetary vorticity, $\zeta + f$ is the absolute vorticity, while E and F represent the stretching and shearing deformation respectively:

$$OW_{norm} = \frac{\xi^2 - (E^2 + F^2)}{\xi^2}$$

$$E = \left[\frac{du}{dx}\right] - \left[\frac{dv}{dy}\right] \qquad F = \left[\frac{dv}{dx}\right] + \left[\frac{du}{dy}\right]$$

SH denotes Specific Humidity, RH denotes Relative Humidity, and VWS denotes Vertical Wind Shear.

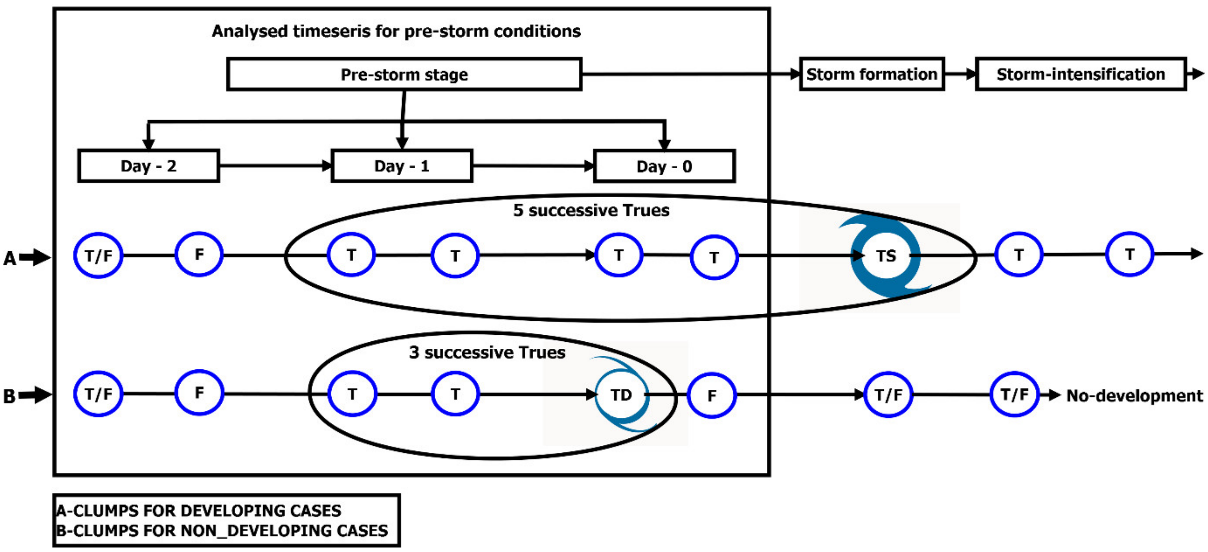

Figure S1. Diagram showing the tracks of developing and non-developing tropical depressions with F(False) indicating that the core thresholds are not satisfied and T(True) where the thresholds are satisfied. The 3rd consecutive true is the TD declaration time for both developing and non-developing TDs. Path A shows that all TSs were once TDs, and path B is a TD that did not develop into TS.

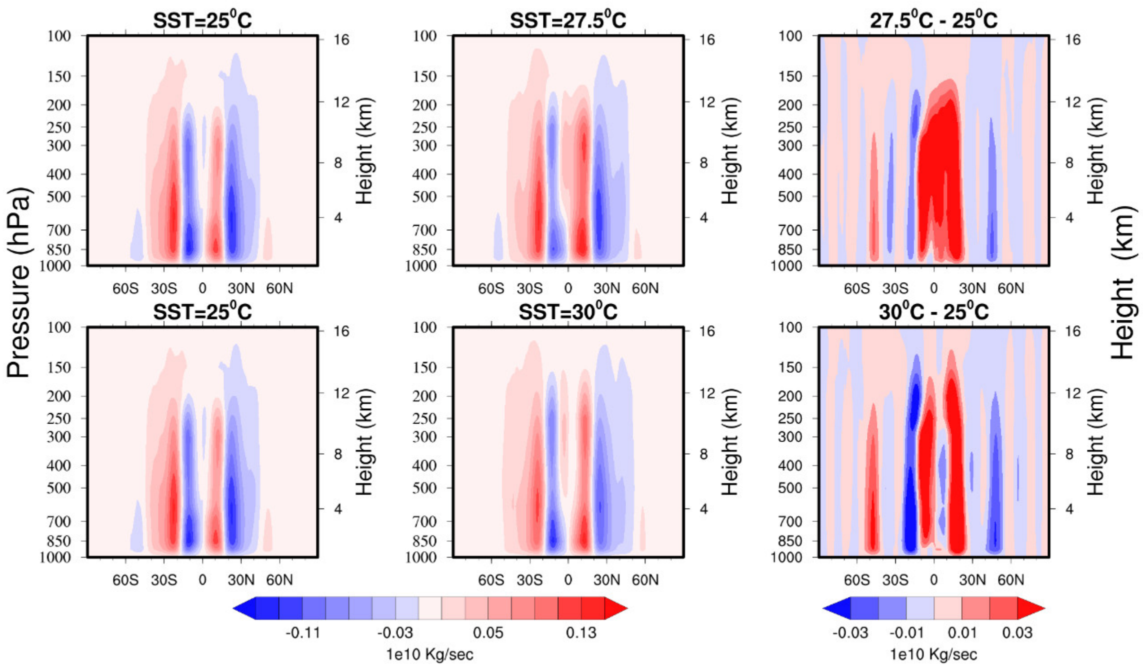

Figure S2. Annual mean mass streamfunction (kg s^{-1}) for all experiments, along with differences in values.

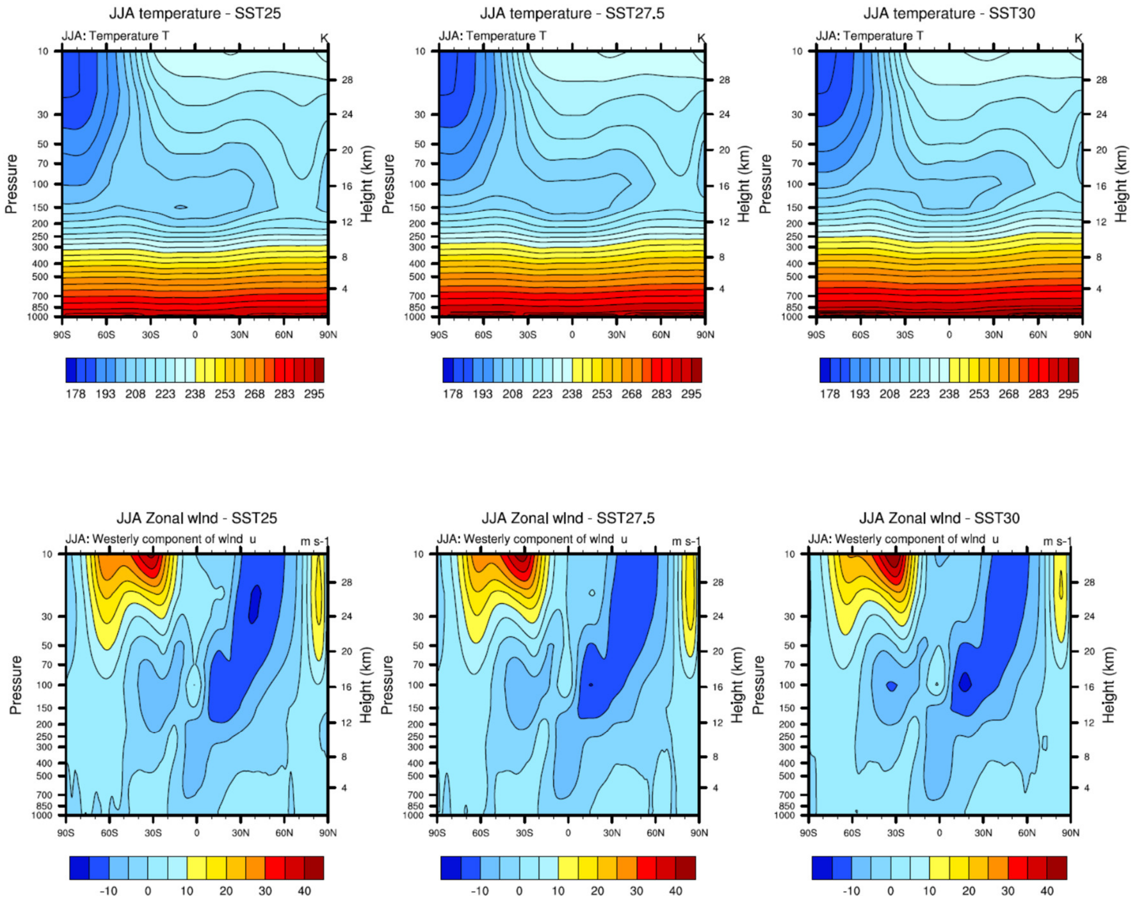

Figure S3. Mean temperature and zonal wind variation with height, June to August average, for all three experiments.

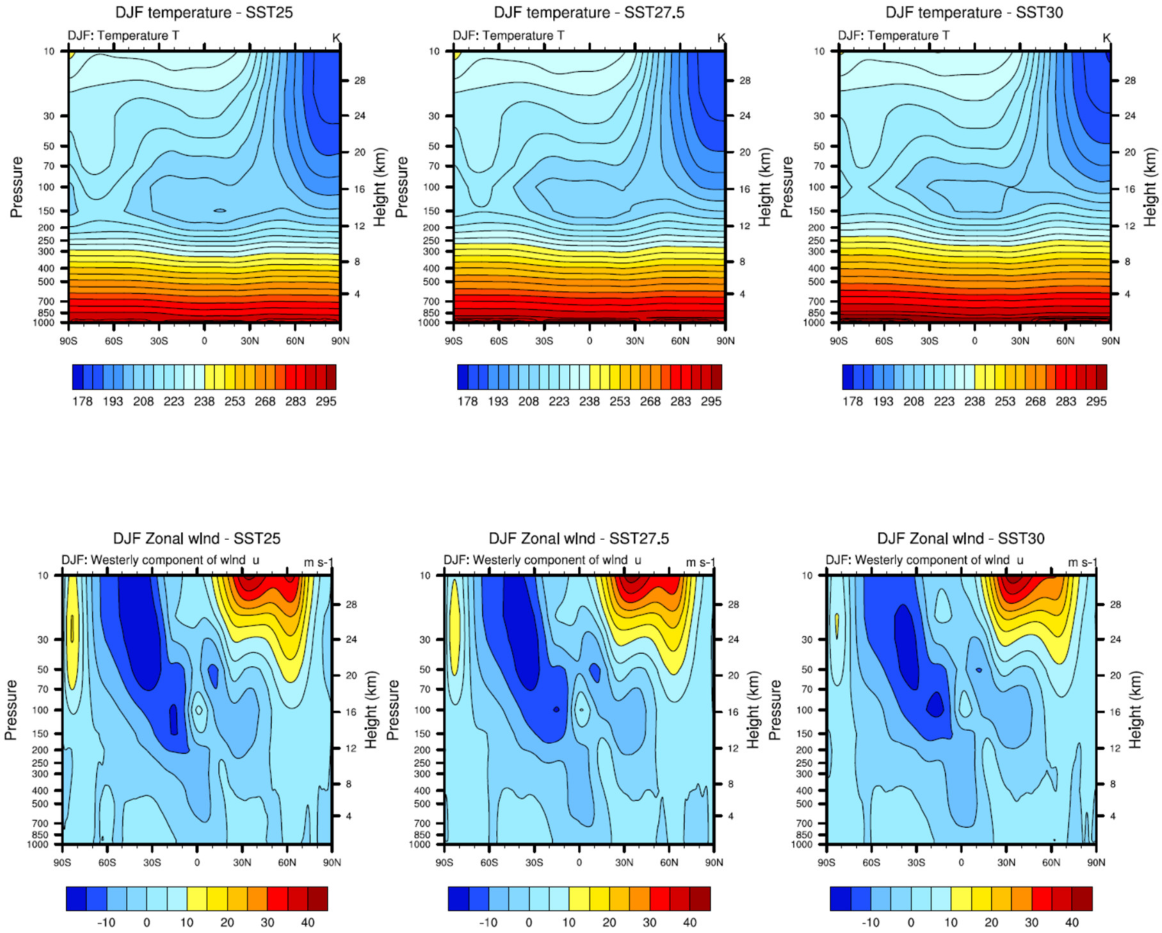

Figure S4. The same as Fig. S3 but for December to February.

The mean state of the simulations

Figure S2 shows the simulated annual mean mass stream function. As mentioned in the paper at line 367, this indicates a clear three-cell circulation, similar to the terrestrial climate but considerably weaker (see, for instance, Peixoto and Oort, 1992 [1]; their Fig. 7.19). The temperature pattern aloft, along with the corresponding zonal wind pattern, is quite non-terrestrial. Figures S3 and S4 show that at the 200 hPa level, a level typical of the height of the subtropical jet, easterlies predominate in the simulated summer subtropics and mid-latitudes, whereas in the terrestrial climate, westerlies dominate poleward of about 25-30 degrees (see Peixoto and Oort, 1992 [1]; their Fig. 7.15). In the simulated climate, weak westerlies only appear poleward of about 60 degrees in the summer hemisphere and 50 degrees in the winter hemisphere. The cause is likely the meridional temperature gradient, through the thermal wind relationship. In the terrestrial climate, 200 hPa temperature is a maximum in the equatorial region, and the negative poleward temperature in the subtropics and mid-latitudes dictates westerly winds. In contrast, in the simulations upper tropospheric temperatures are a minimum in the equatorial regions, given a weak positive poleward temperature gradient in the subtropics, resulting in weak easterlies.

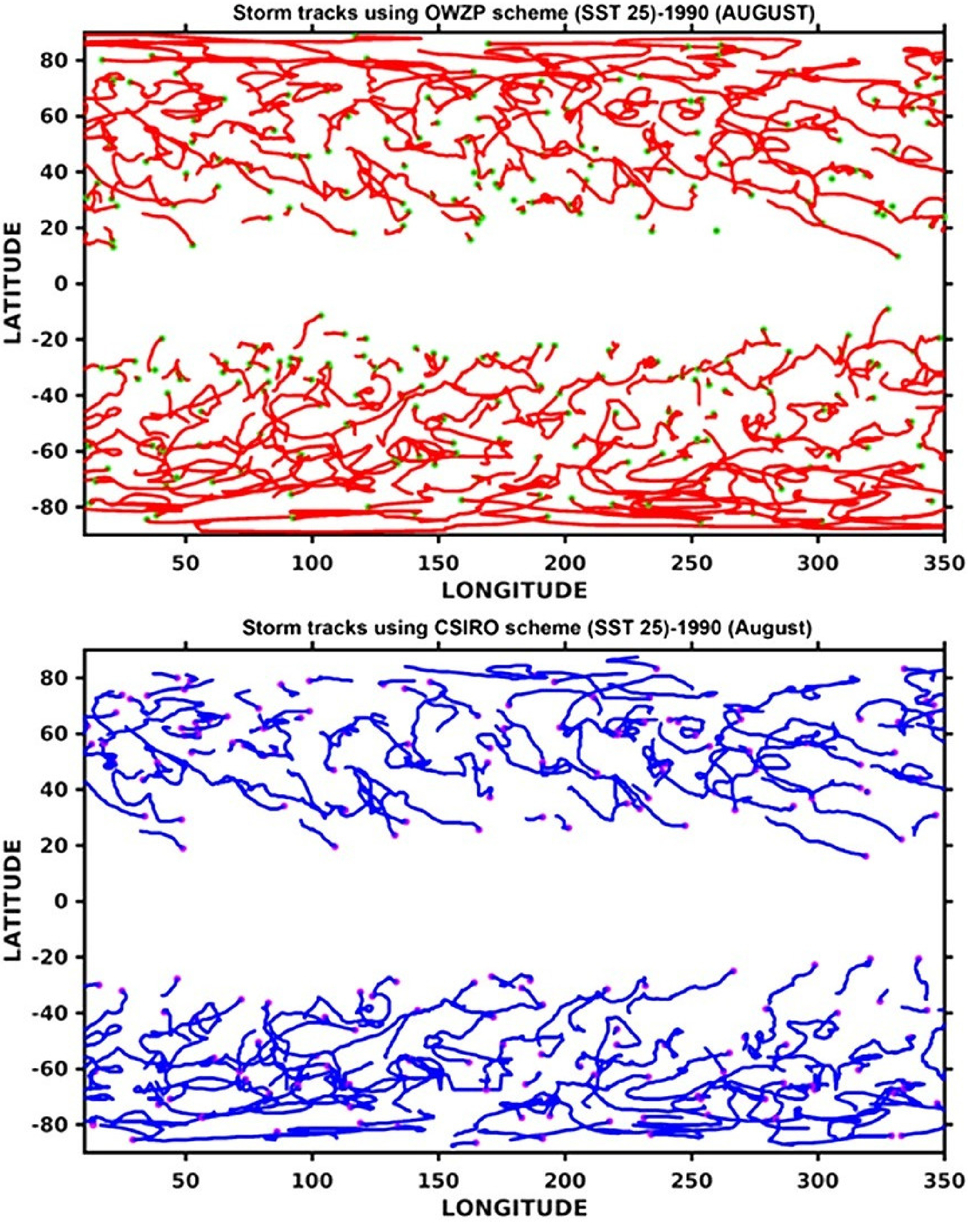

Figure S5. Tracks of the 280 storms detected using the OWZP scheme (red lines; genesis locations at the green dots) and 214 storms detected by the CSIRO scheme (blue lines; genesis locations given by magenta dots), for August 1990 of the SST25 experiment.

Reference

1. Peixoto, J.P.; Oort, A.H. *Physics of Climate*; American Institute of Physics: College Park, MD, USA, 1992; 520p.