

**Supplementary Material for**  
**Improved Simulation of Tropical Cyclone Responses to ENSO in the**  
**Western North Pacific in the High-Resolution GFDL HiFLOR**  
**Coupled Climate Model**

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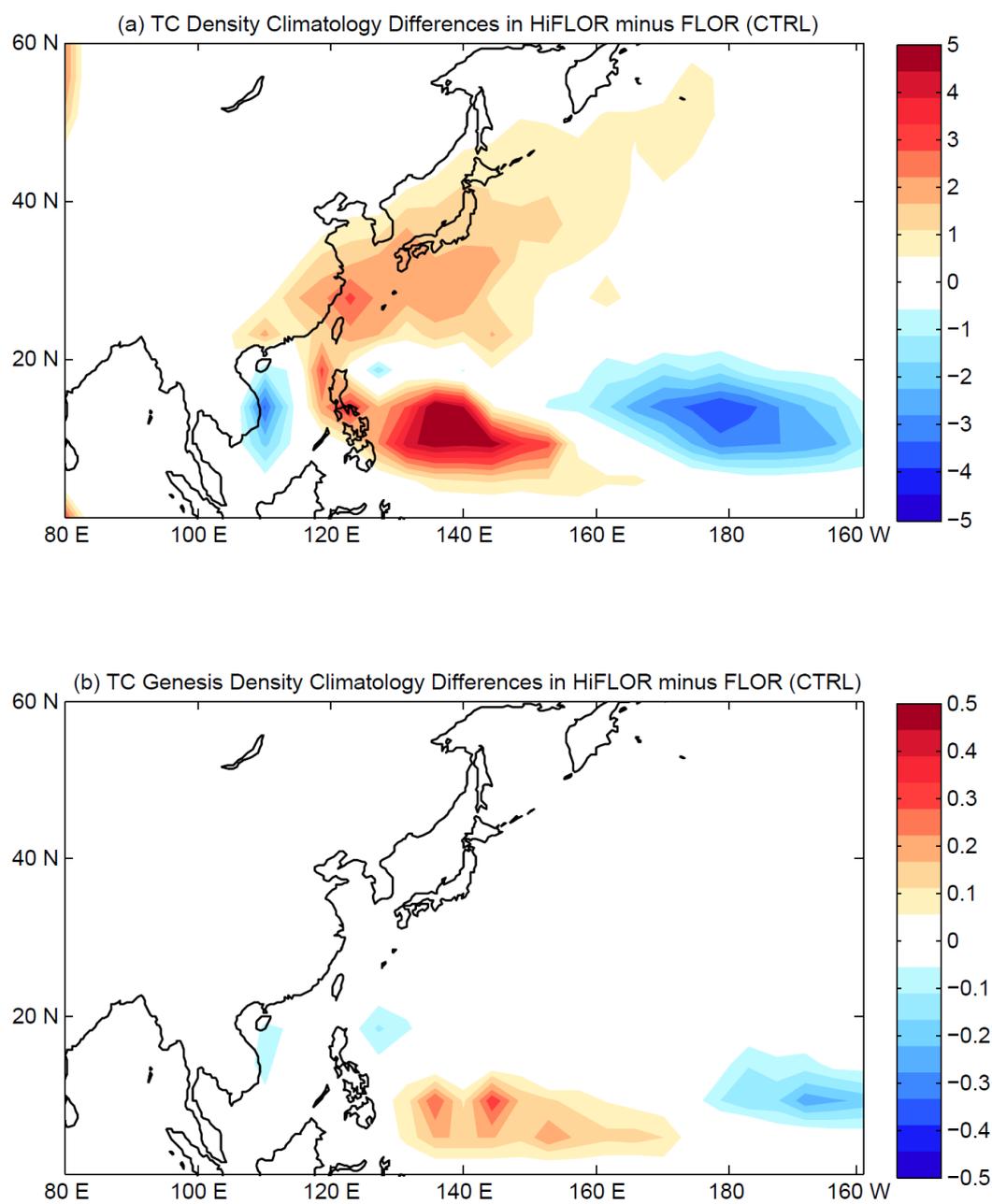


Figure S1. TC (a) density and (b) genesis differences between HiFLOR and FLOR (HiFLOR minus FLOR) in the control experiments.

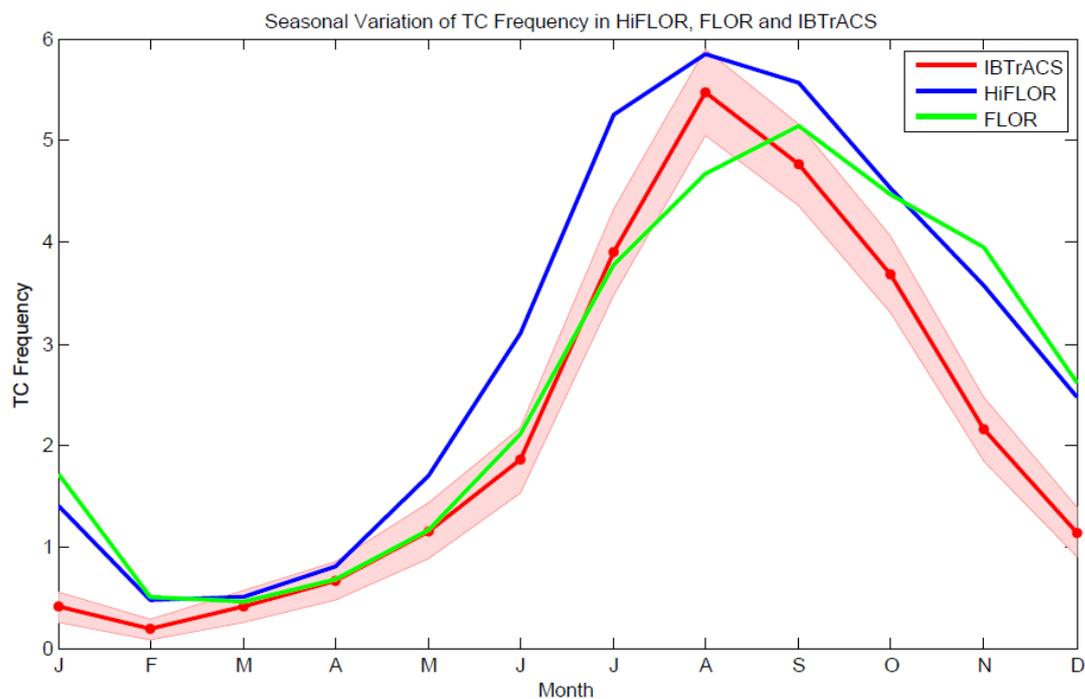


Figure S2. Seasonal variation of TC frequency in the WNP in HiFLOr (blue), FLOR (green), and IBTrACS (red). The shading area indicates the confidence interval at 0.05 level of significance for the observed average monthly TC frequency.

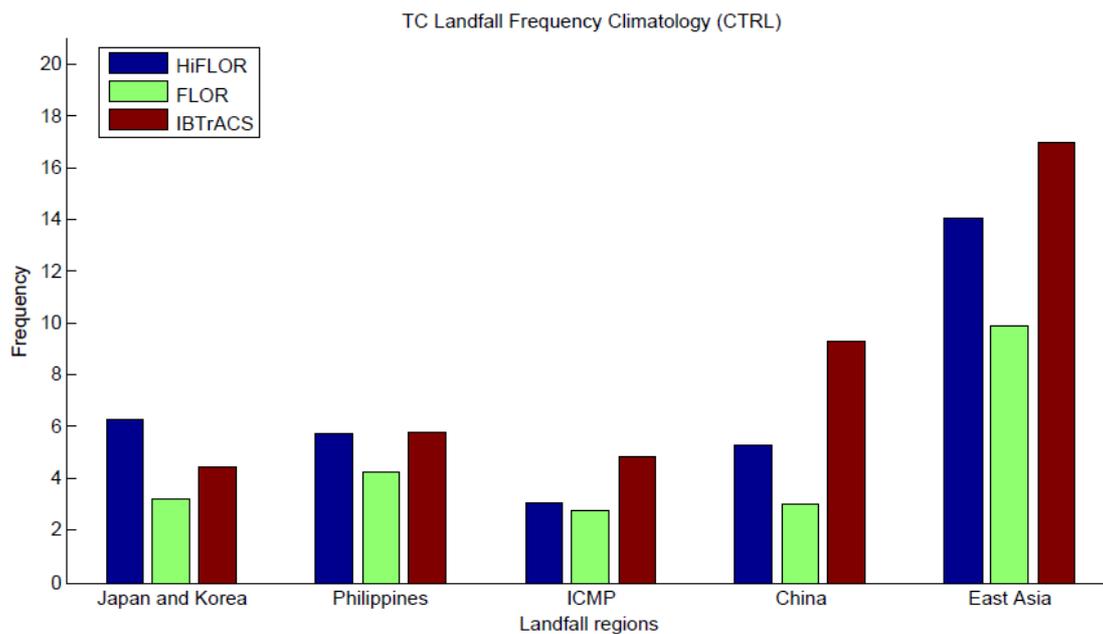


Figure S3. The mean frequency of TC landfall over East Asia and its subregions in the control experiments of HiFLOR and FLOR and observations.

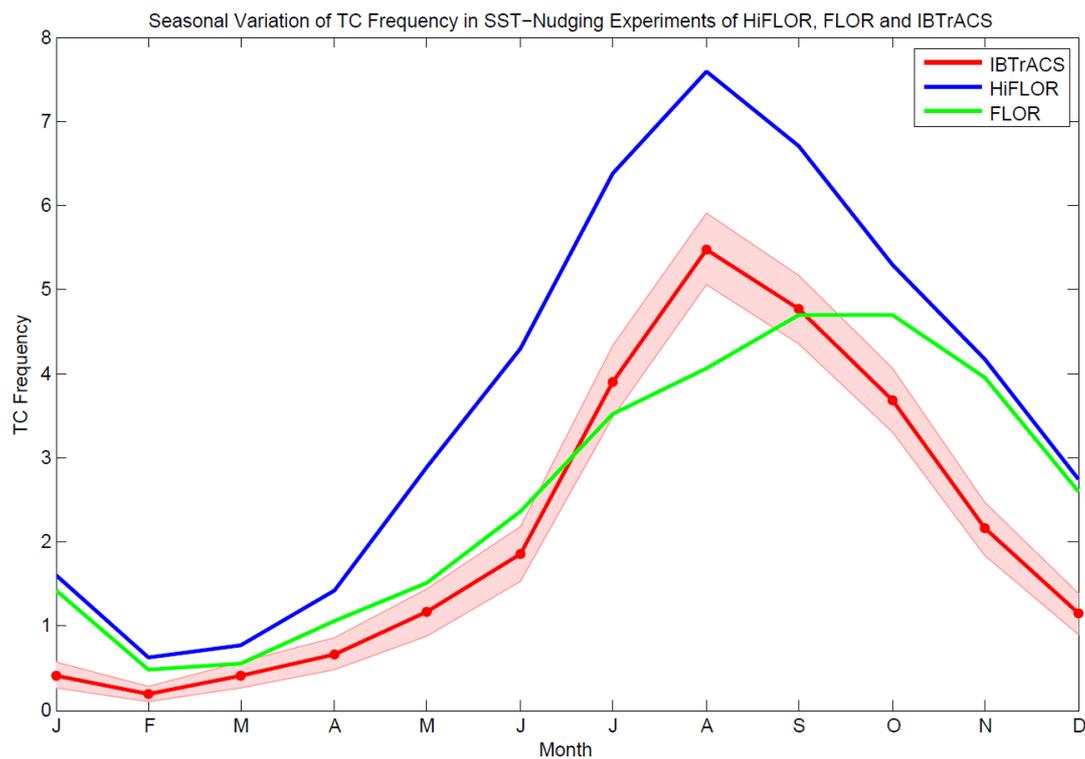


Figure S4. Seasonal variation of TC frequency in the WNP in the SST- and SST-nudging experiments of HiFLOR (blue), FLOR (green), and IBTrACS (red) for the period 1971-2012. The shading area indicates the confidence interval at 0.05 level of significance for the observed average monthly TC frequency.

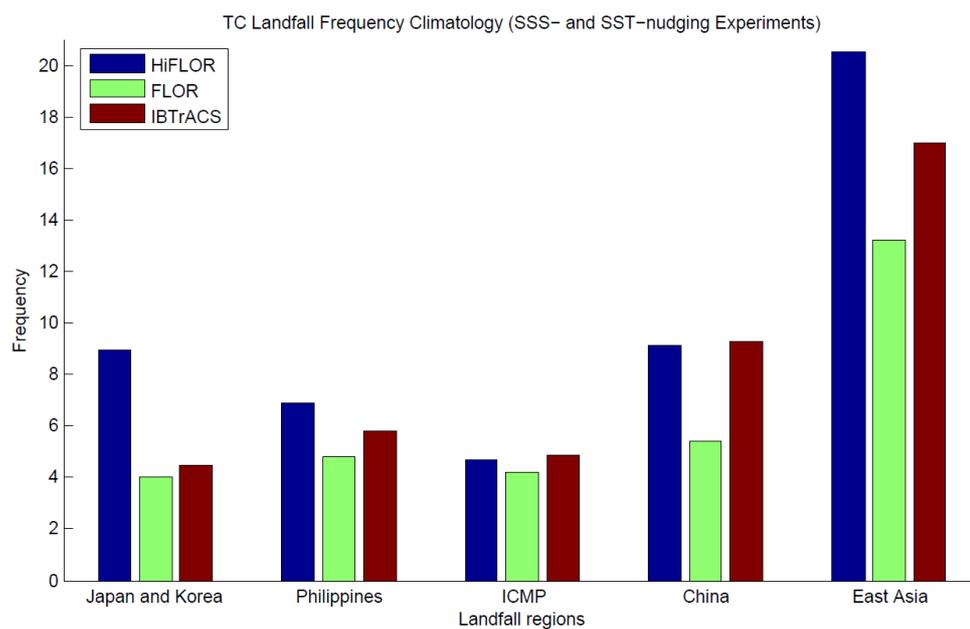


Figure S5. The mean frequency of TC landfall over East Asia and its subregions in the SSS- and SST-nudging experiments of HiFLOr and FLOR and observations.

Table S1. TC lifespan in the control experiments and SST-nudging experiments of HiFLOR, FLOR and observations.

<b>TC lifespan(<math>\times 6h</math>)</b>	<b>HiFLOR</b>	<b>FLOR</b>	<b>Observations</b>
CTRL	51.6	50.4	37.6
SST-nudging	47.8	47.6	38.3

Previous studies have shown that biases in climatology, directly and indirectly by impacting the character of ENSO, impact the ENSO-TC connection in FLOR (Vecchi et al., 2014; Krishnamurthy et al., 2015). A flux-adjusted version of FLOR (FLOR-FA) outperforms FLOR in simulating ENSO-TC teleconnections in the WNP (Vecchi et al., 2014). During the El Niño phase, the eastward shift in TC density with FLOR is not observed in FLOR-FA and the TC track density anomalies in the eastern part of the WNP are more consistent with observations in FLOR-FA (Figure S6). However, FLOR-FA still produces positive anomalies of TC density around Taiwan in contrast to observations (Figures S6). During the La Niña phase, FLOR-FA displays TC density anomalies similar to observations. However, the TC track density is weaker along the East Asian coast in contrast to observations, suggesting reduced TC landfalls (Figure S6). This indicates that an improved simulation of ENSO SST in FLOR-FA is important to improve the simulated TC activity in the eastern portion of the WNP. It is useful to assess whether HiFLOR outperforms FLOR-FA in TC simulation. The simulated TC density in HiFLOR appears to be more realistic than that in FLOR-FA during both El Niño and La Niña phases (Figure S6S). The positive TC density biases around Taiwan and south China in FLOR-FA are not simulated in HiFLOR during El Niño phases; the negative TC density biases along the East Asia coast during La Niña years in FLOR-FA are dramatically improved in HiFLOR. Therefore, HiFLOR performs better than FLOR-FA in simulating the responses of TC density to ENSO.

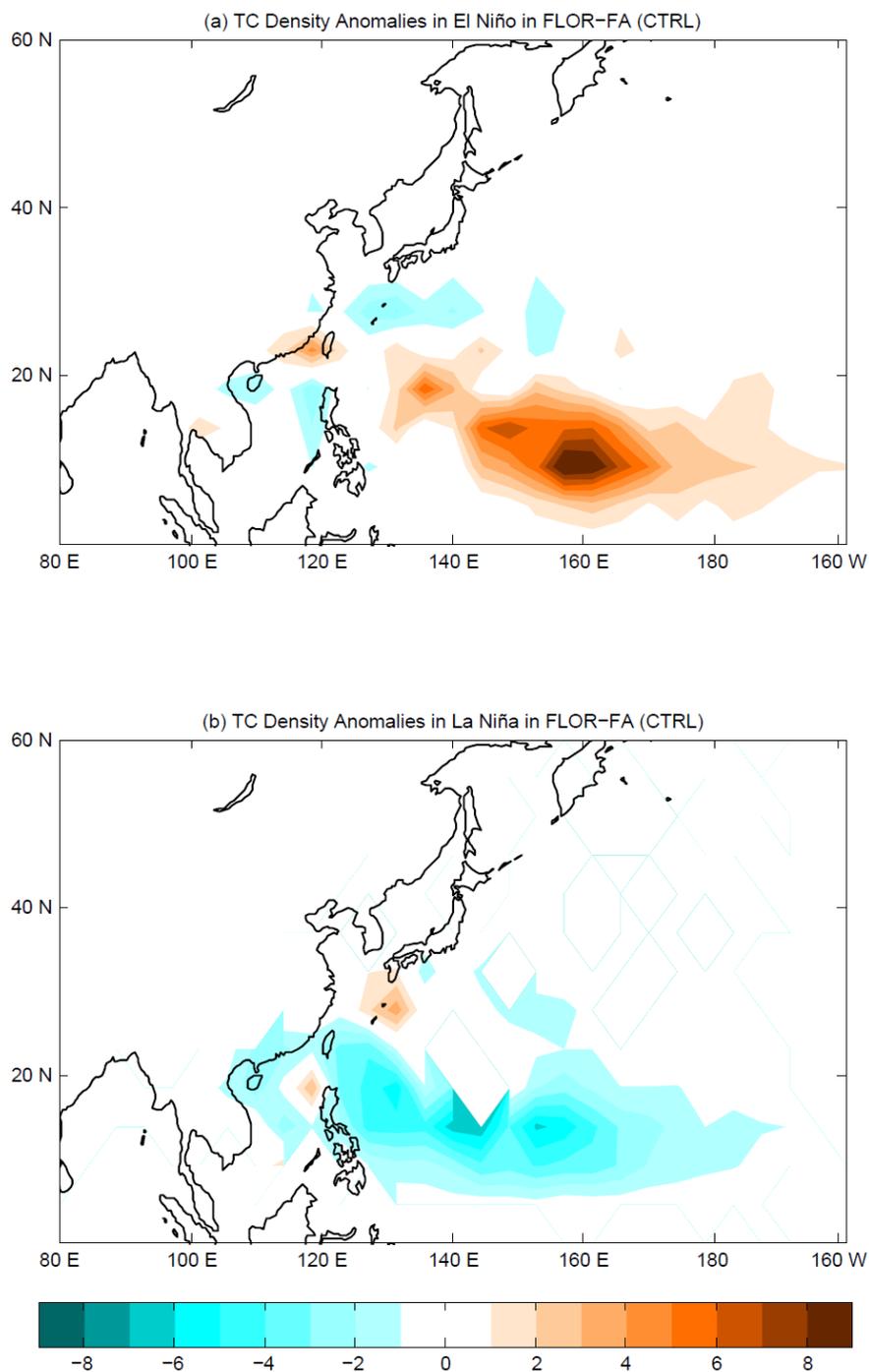


Figure S6. TC track density anomalies (units: times/year; binned into  $5^\circ \times 5^\circ$  grid box) in El Niño and La Niña phases based on the control experiments of FLOR-FA .