

Electronic Supplementary Material to: A Two-plume Convective Model for Precipitation Extremes*

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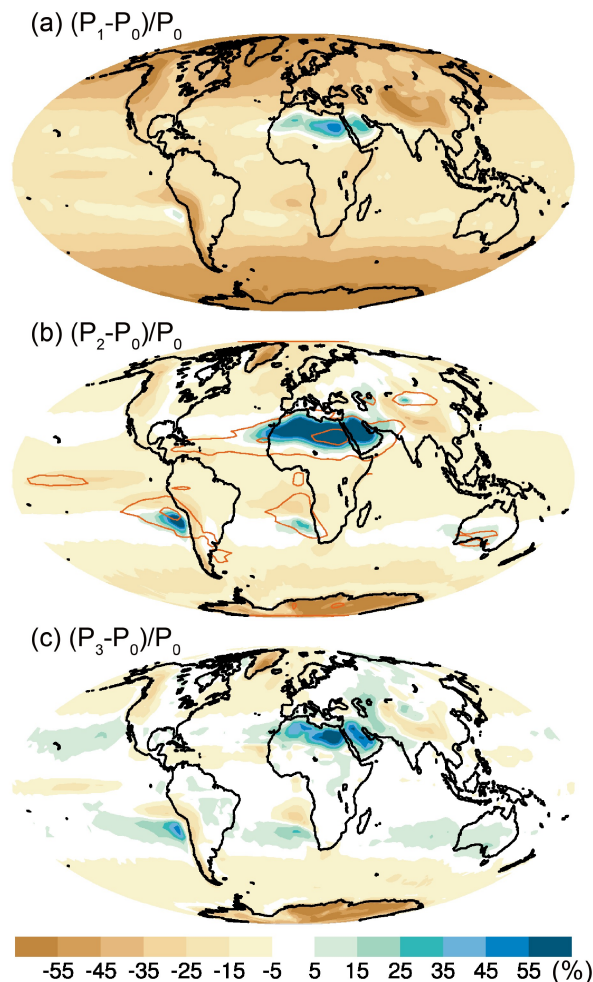


Fig. S1. Geographic maps of the relative errors of (a) model 1, (b) model 2, and (c) model 3 in reproducing precipitation extremes of the CMIP5 historical simulations. In (b), the red contours denote relative humidity (the outer contour is 75% and the inner contour is 55%) conditioned on extreme days on the 0.85 sigma level.

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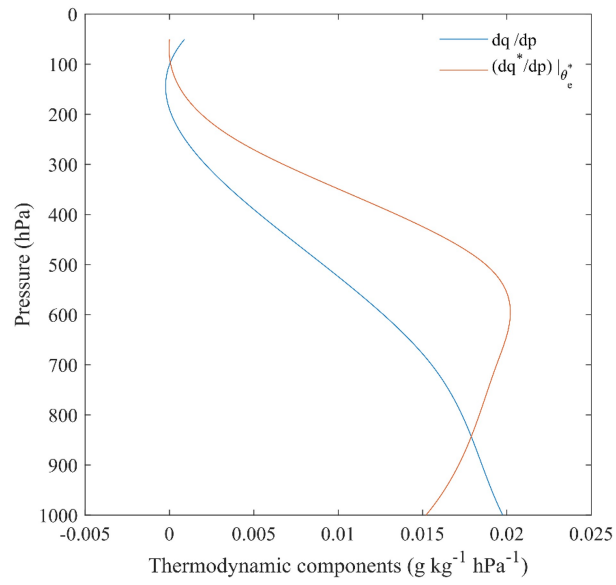


Fig. S2. The globally averaged vertical profiles of $\partial q/\partial p$ and $(dq^*/dp)|_{\theta^*_c}$ during precipitation extremes.

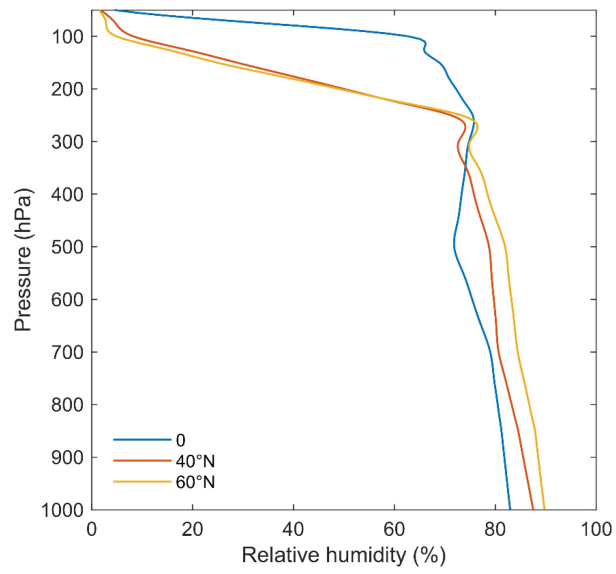


Fig. S3. Composites of relative humidity profiles during precipitation extremes at three representative latitudes.

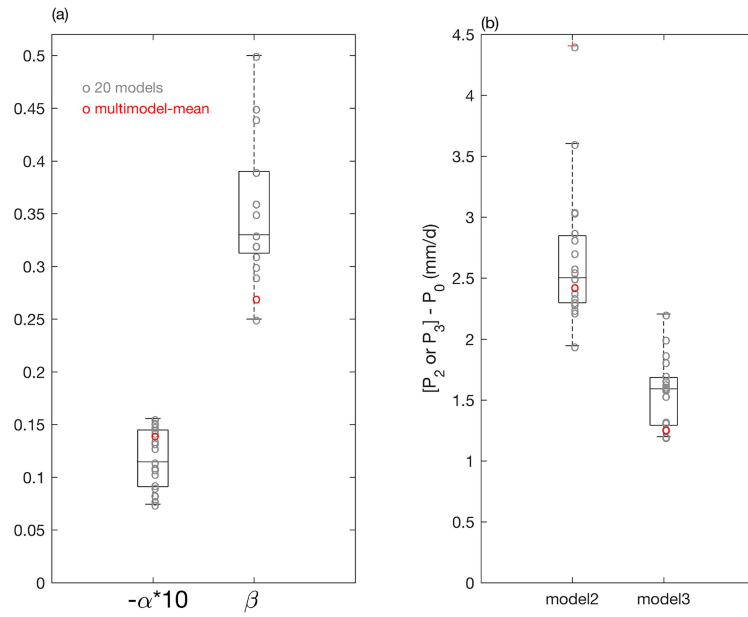


Fig. S4. (a) The coefficients (α in Eq. (4) and β in Eq. (5) and (b) the global-mean errors of model 2 and model 3 for individual GCM outputs and for the multi-model means. In the box plot, the central mark indicates the median and the bottom and top edges of the box indicate the 25th and 75th percentiles, respectively.

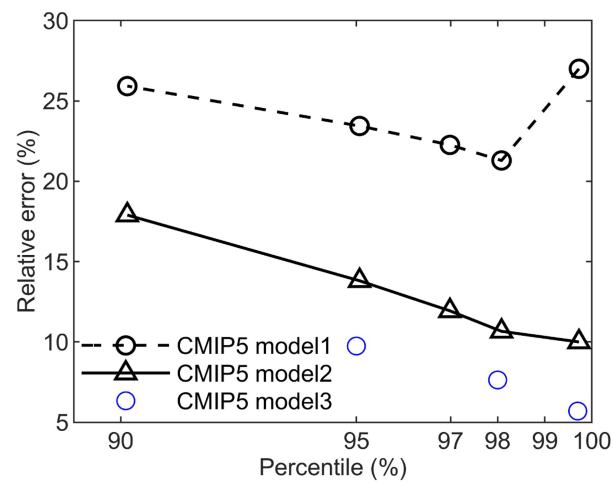


Fig. S5. The global-mean relative errors of the three simple models for the CMIP5 extreme precipitation of different intensities (95th percentile, 98th percentile, and 99.7th percentile). In the main text, we mainly introduce the results of RX1day, which corresponds to the 99.7th percentile.

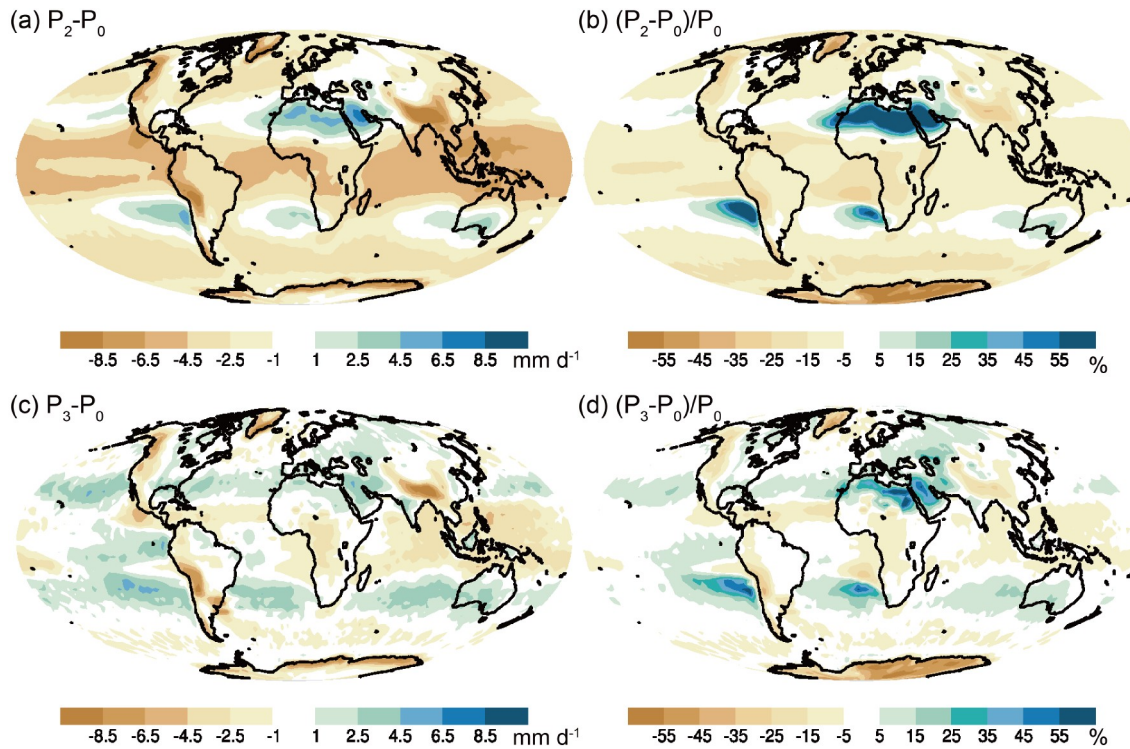


Fig. S6. The errors (the left column) and relative errors (the right column) of model 2 (the top row) and model 3 (the bottom row) for the warmer climate under the CMIP5 RCP8.5 simulations.

Table S1. The 20 CMIP5 GCMs used in the study. The first ensemble run of each model is used.

Model name	Institution	Reference
CNRM-CM5	CNRM and CERFACS	Voldoire et al., 2013
CMCC-CMS	CMCC	Scoccimarro, et al., 2011
CMCC-CM		Hurrell, et al., 2013
CMCC-CESM		
MPI-ESM-MR	Max Plank Institution for Meteorology	Raddatz, et al., 2007
MPI-ESM-LR		Marsland, et al., 2003
ACCESS1-0	CSIR and BOM	Dix, et al., 2013
ACCESS1-3		
GFDL-ESM2M	NOAA GFDL	Li and Conil, 2003
GFDL-ESM2G		Dunne, et al., 2012
GFDL-CM3		Dunne, et al., 2013
MRI-ESM1	MRI	Yukimoto, et al., 2012
MRI-CGCM3		
IPSL-CM5A-MR	IPSL	Dufresne, et al., 2013
IPSL-CM5B-LR		Hourdin, et al., 2013
IPSL-CM5A-LR		Hourdin, et al., 2013
CanESM2	CCCma	Christian, et al., 2010
MIROC5	MIROC	Arora and BOER, 2010
NorESM1-M	Norwegian Climate Center	Watanabe, et al., 2010
MIROC-ESM-CHEM	JAMSTEC and AORI	Bentsen, et al., 2013
		Watanabe, et al., 2011

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