

# Supporting Information for “Assessing Biases and Climate Implications of the Diurnal Precipitation Cycle in Climate Models”

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**Table S1** Correlation coefficient between spatial mean of diurnal precipitation phase over oceans against (a) ECS and (b) TCR for 26 CMIP6 models. Correlations are broken down by season (row) and hemisphere (column). Grid cells for which  $0 \text{ mm day}^{-1}$  lies within 3 standard deviations of the diurnal amplitude are masked out.

a

**CMIP6 Oceanic Phase–ECS Correlations**

Season	Northern Hemisphere	Southern Hemisphere
DJF	0.63	0.49
MAM	0.46	0.55
JJA	0.41	0.62
SON	0.45	0.47

b

**CMIP6 Oceanic Phase–TCR Correlations**

Season	Northern Hemisphere	Southern Hemisphere
DJF	0.32	0.25
MAM	0.25	0.25
JJA	0.23	0.34
SON	0.24	0.27

**Table S2** Correlation coefficient between spatial mean of diurnal precipitation phase over oceans and ECS in low-precipitation areas ( $< 1.5 \text{ mm day}^{-1}$ , top row) and high-precipitation areas ( $> 5 \text{ mm day}^{-1}$ , bottom row) for 26 CMIP6 models and 21 CMIP5 models. Precipitation masks are calculated and applied separately for each model.

**CMIP Oceanic Phase–ECS Correlations**

Precipitation Regime	CMIP5	CMIP6
Low	-0.15	0.52
High	-0.31	0.47

**Figure S1.** Annual-mean diurnal precipitation amplitude (deviation from daily mean in  $\text{mm day}^{-1}$ , right column) and phase (local solar time in hours of the maximum, left column) in IMERG observations (top row, for 6/2000 – 5/2015 mean) and averaged across 26 CMIP6 models (middle row, for 1985–2014 mean) and 21 CMIP5 models (bottom row, for 1976–2005 mean). The amplitude and phase are estimated using the diurnal component of a sinusoidal fit with diurnal (24 hour) and semi-diurnal (12 hour) modes. Grid cells for which  $0 \text{ mm day}^{-1}$  lies within 2 standard deviations of the diurnal amplitude are masked out.