



Supplement of

Multiscale assessment of Indian monsoon rainfall using ICON and CMIP6 model simulations

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1. Figures S1 to S6

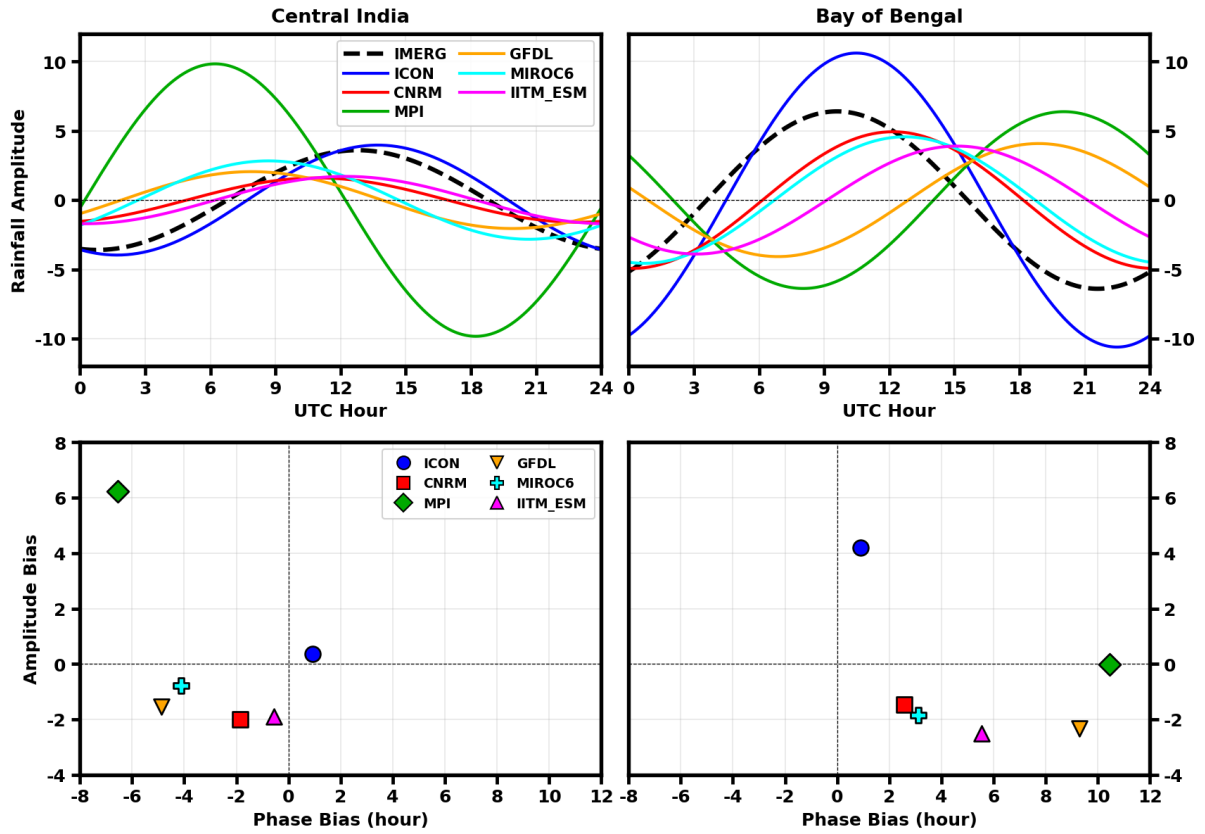


Figure S1. Diurnal cycle of precipitation over central India (CI) and the Bay of Bengal (BoB) from IMERG, ICON, and CMIP6 models. Top panels show the composite diurnal cycle (mm day⁻¹) as a function of UTC hour, and bottom panels show the corresponding phase (hours) and amplitude (mm day⁻¹) biases relative to IMERG. Positive (negative) phase bias indicates delayed (advanced) peak timing, while positive (negative) amplitude bias indicates overestimation (underestimation). CI and BoB regions are as defined in Fig 2f.

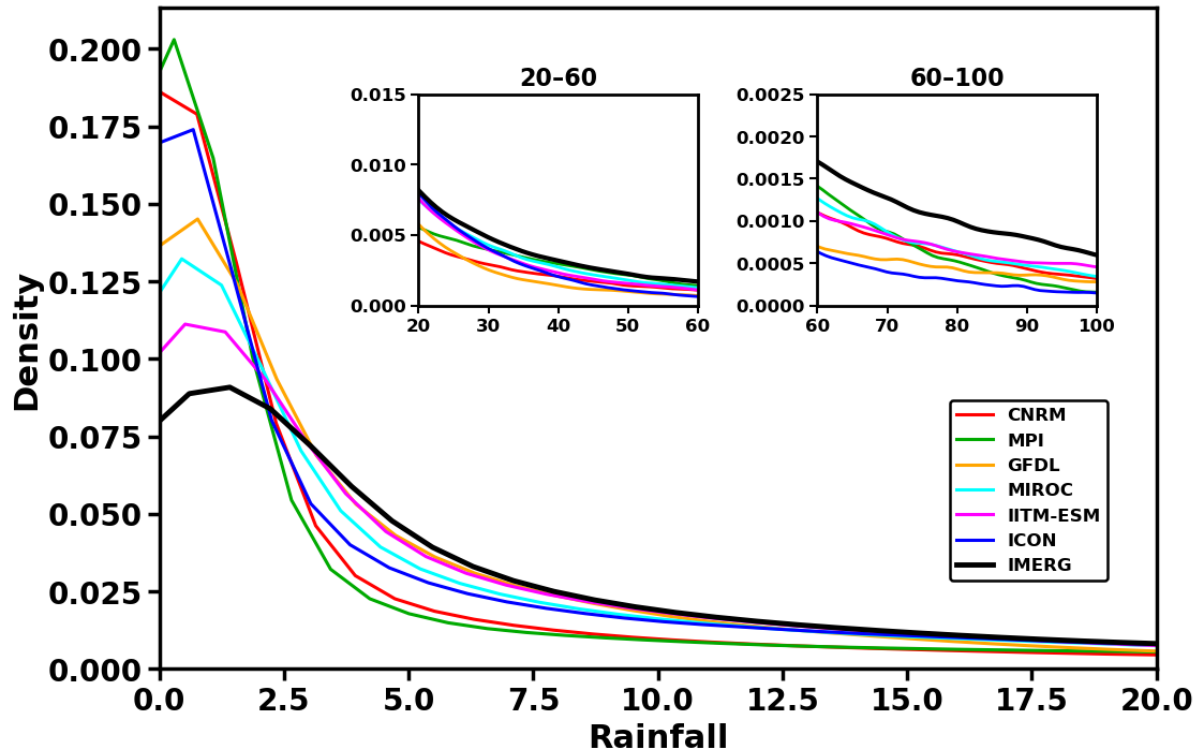


Figure S2. Probability density function (PDF) of JJAS daily rainfall over Central India after regridding IMERG, ICON, and CMIP6 model outputs to a common grid corresponding to the IITM-ESM resolution of approximately 1.9° . The main panel shows $0\text{--}20\text{ mm day}^{-1}$, with inset panels extending to $20\text{--}60\text{ mm day}^{-1}$ and $60\text{--}100\text{ mm day}^{-1}$.

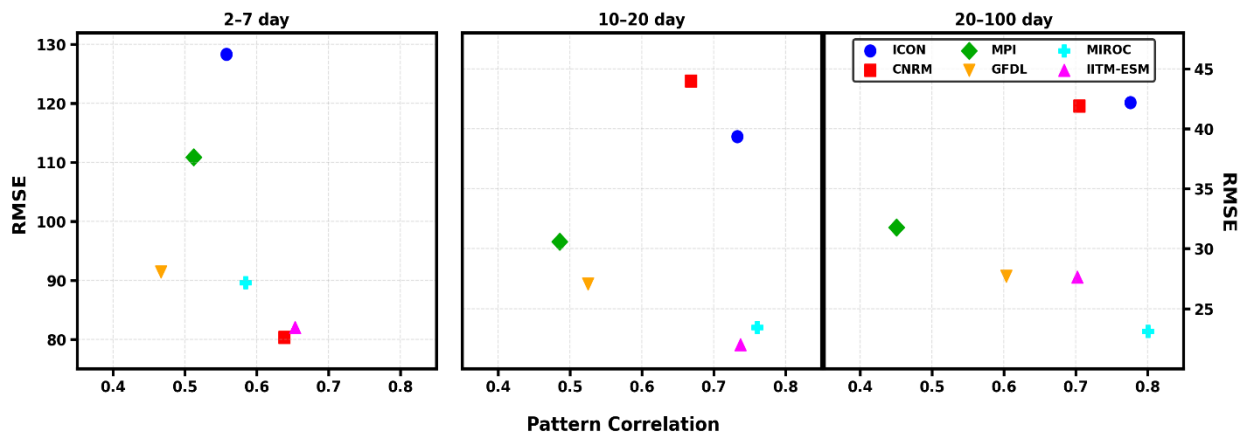


Figure S3. Pattern correlation and RMSE of rainfall variance in the synoptic (2–7 days), higher ISO (10–20 days), and lower ISO (20–100 days) bands, computed from filtered daily rainfall anomalies ($\text{mm}^2\text{ d}^{-2}$) of ICON and CMIP6 models (CNRM, MPI, GFDL, MIROC, IITM-ESM) relative to IMERG observations.

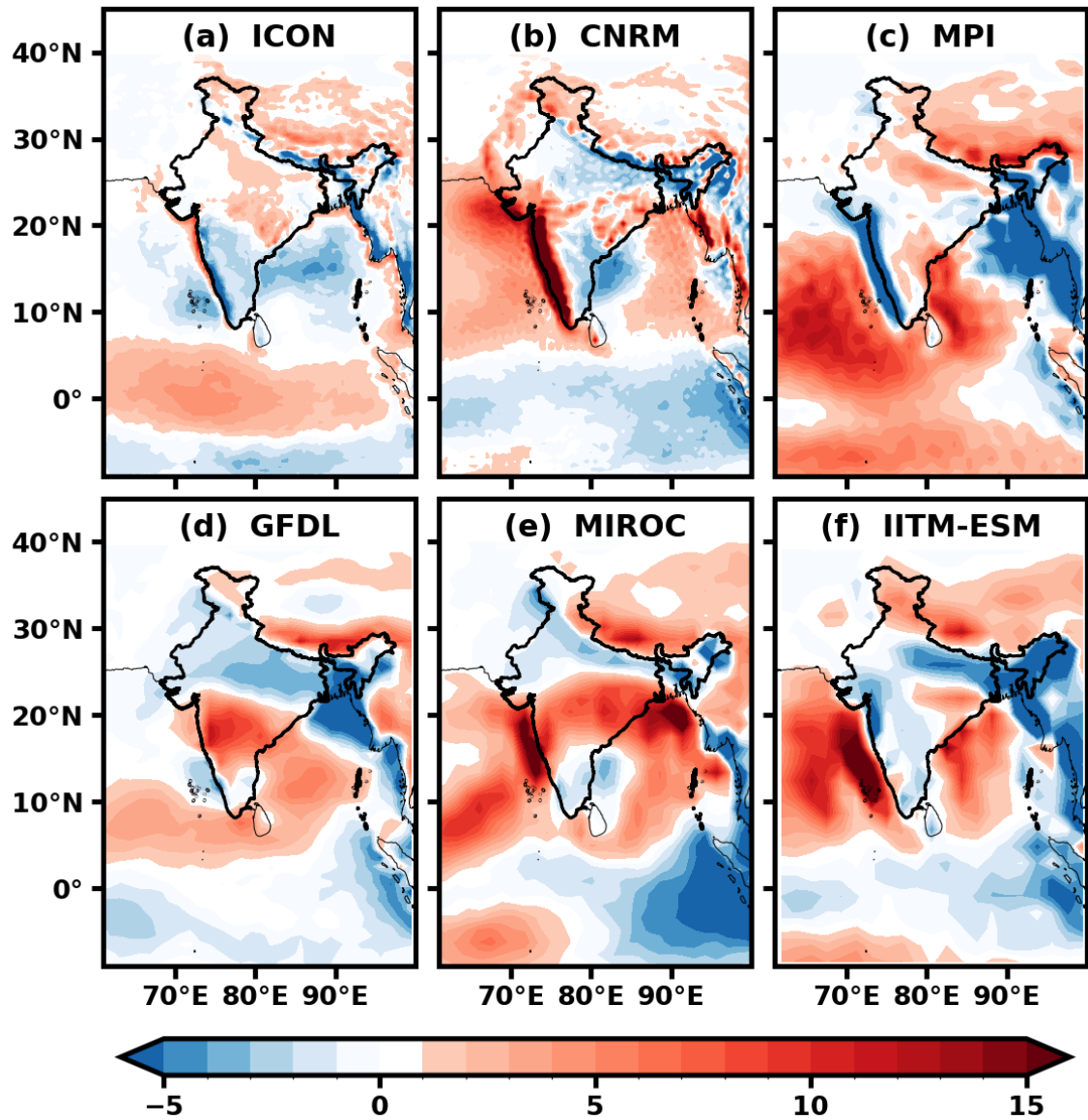


Figure S4. Seasonal bias of precipitation relative to IMERG from (a-f) ICON, CNRM, MPI, GFDL, MIROC, and IITM-ESM model simulations. Units are in mm day⁻¹.

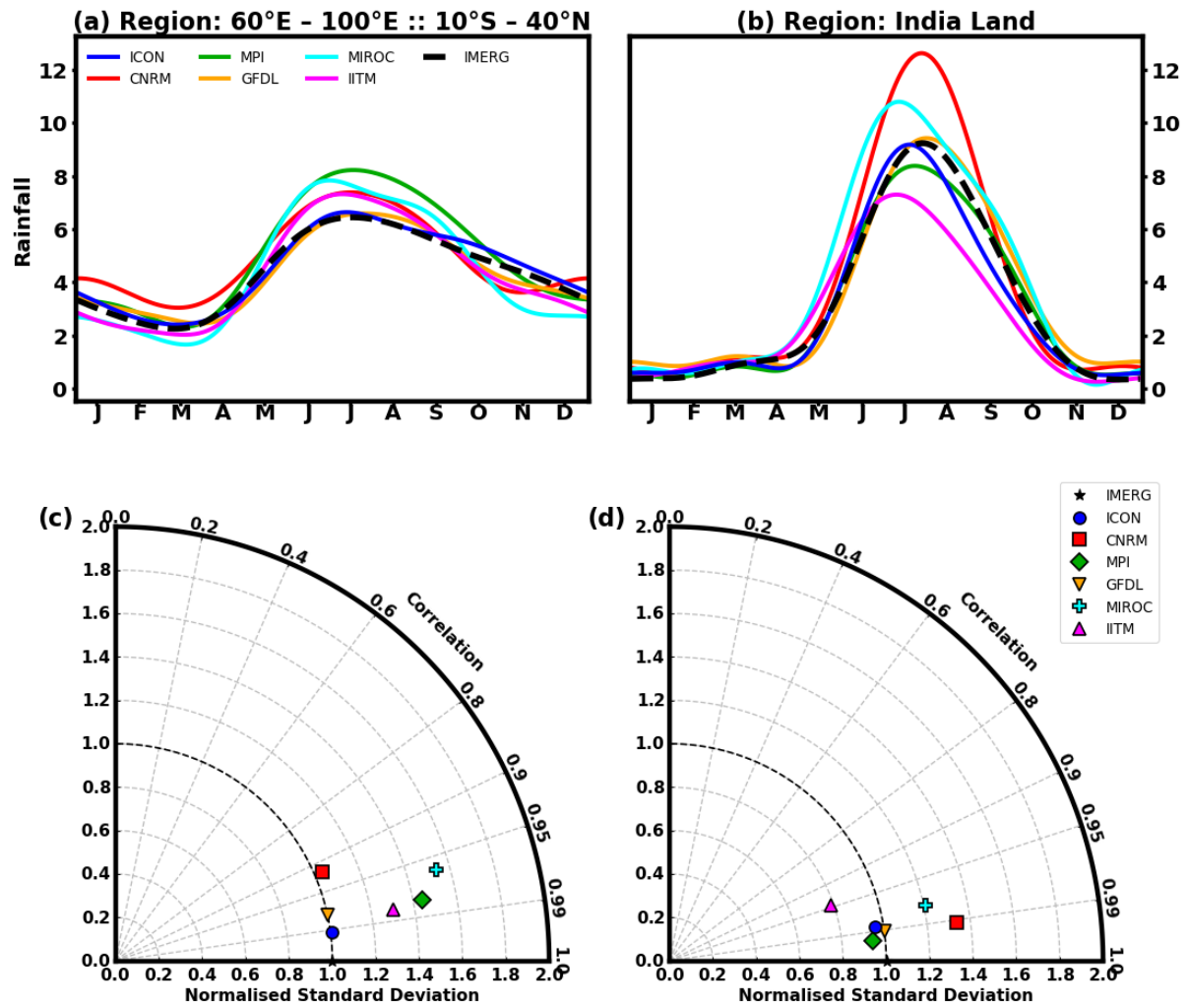


Figure S5. Annual cycle of daily rainfall (mm day⁻¹) for ICON, CNRM, MPI, GFDL, MIROC, IITM, and IMERG (reference) over (a) the region 60°E–100°E, 10°S–40°N, and (b) the Indian landmass. Panels (c) and (d) represent Taylor diagrams showing model correlation and normalized standard deviation relative to IMERG for regions (a) and (b), respectively.

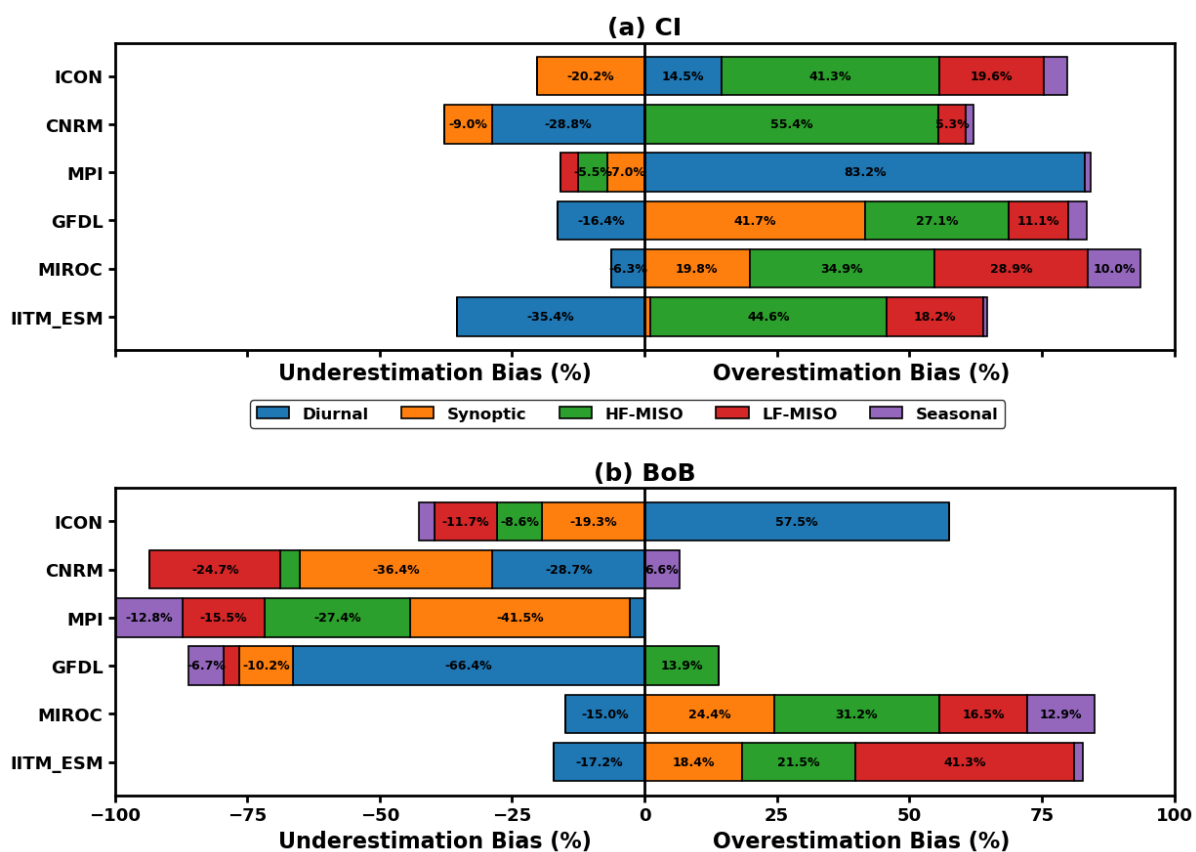


Figure S6. Percentage contribution of individual timescale variance biases relative to each model's total variance bias over (a) land (Central India) and (b) ocean (Bay of Bengal) domains.