Supporting Information for "Response of the low-level jet to precession and its implications for proxies of the Indian monsoon"

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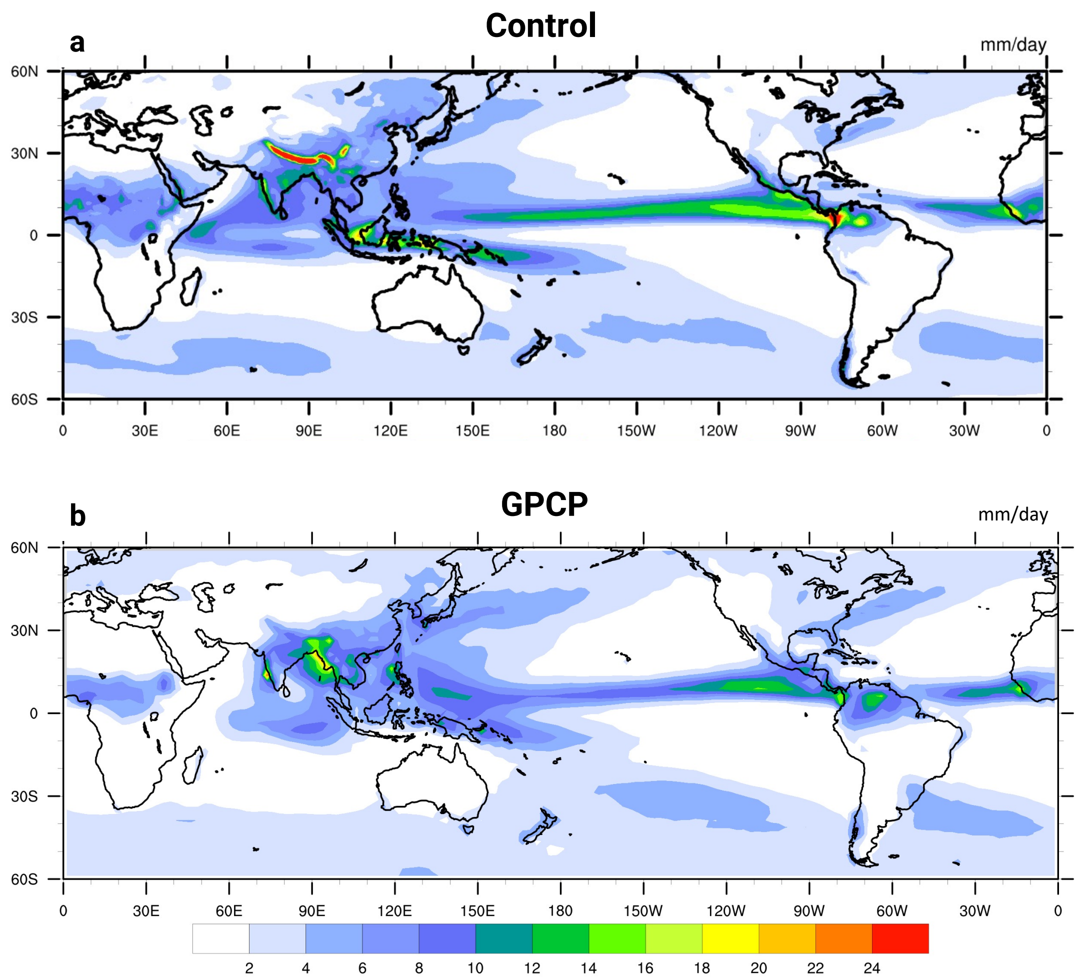

Figure S1. The climatological precipitation rate from the (**a**) pre-industrial control simulation using the fully coupled CESM 1.2.0, and (**b**) GPCP (Global Precipitation Climatology Project) dataset.

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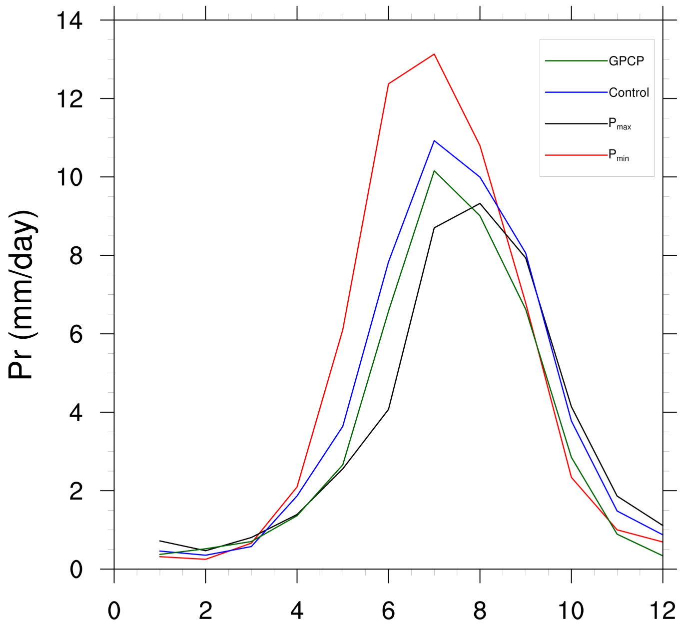

Figure S2. The seasonal cycle of precipitation rate, area–averaged over India (10°N-29°N, 73°E-95°E; land only grids), from the pre-industrial control (in blue), P_{min} (in red), P_{max} (in black), and GPCP (Global Precipitation Climatology Project) data (in green). The control, P_{min} (in red), and P_{max} are the simulations from the fully coupled CESM 1.2.0. GPCP data over the period 1948–2017 is considered for the climatology.

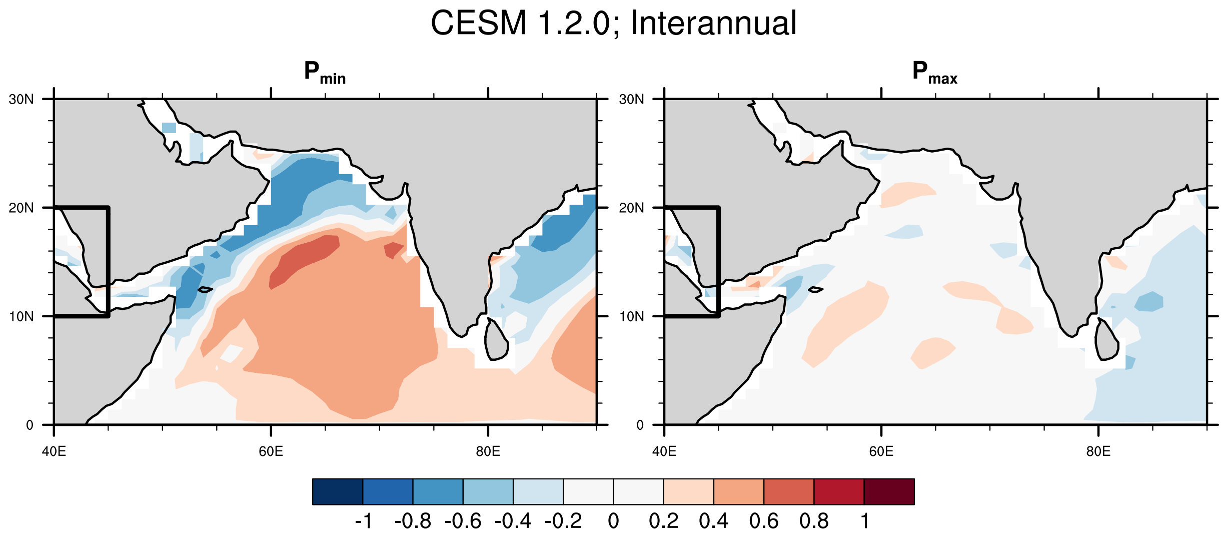

Figure S3. The spatial map of correlation between the Jun-Jul-Aug averaged precipitation over northeastern Africa (10°N-20°N, 35°E-45°E) and Ekman upwelling at all the ocean grid points for (**a**) P_{min} (strong monsoon) and (**b**) P_{max} (weak monsoon). The last 50 years of each simulation are considered to evaluate the correlations. Ekman upwelling is calculated based on the curl of wind stress as discussed in the Data and methods section of the main article.

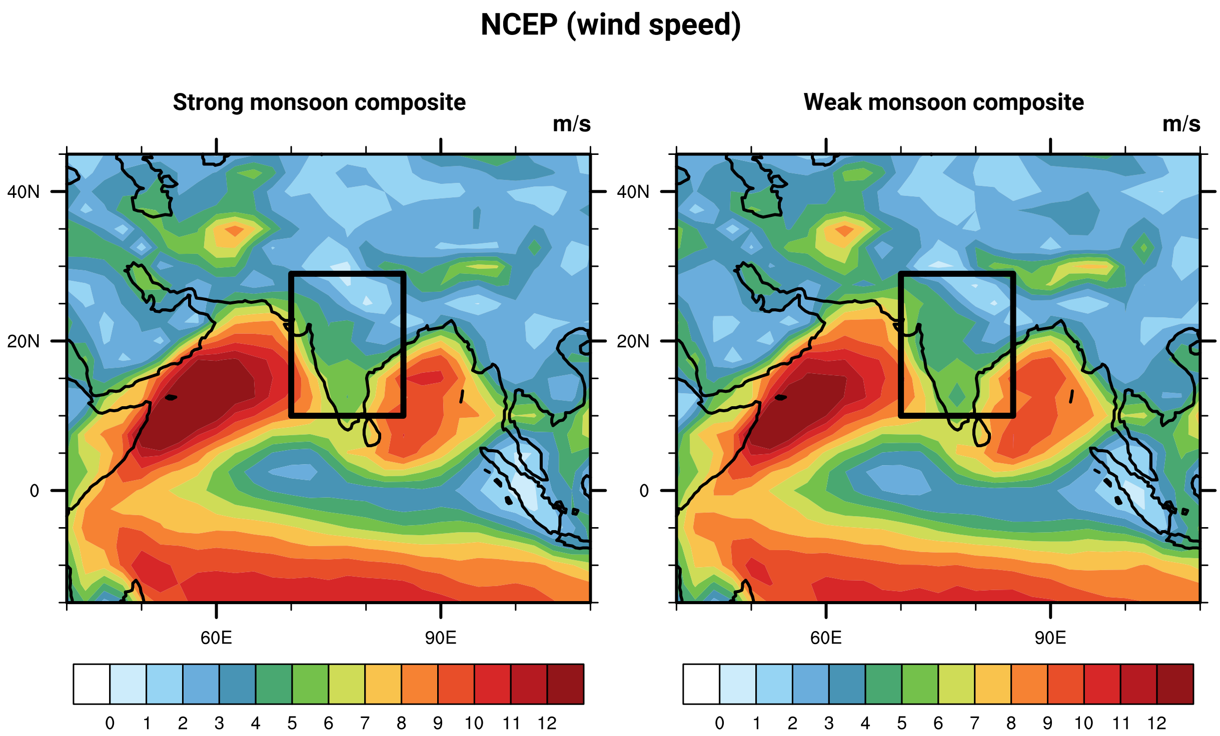

Figure S4. The composite of surface wind speed for all the, (**a**) strong and (**b**) weak monsoon years from the NCEP reanalysis dataset. Years are classified as strong and weak monsoon years based on the threshold of one standard deviation in all India rainfall about the climatological mean. All India rainfall is the area–averaged precipitation over India (10°N-29°N, 73°E-85°E; land only grids). Precipitation data is taken from GPCP (Global Precipitation Climatology Project). The period 1948–2017 is considered for this analysis.

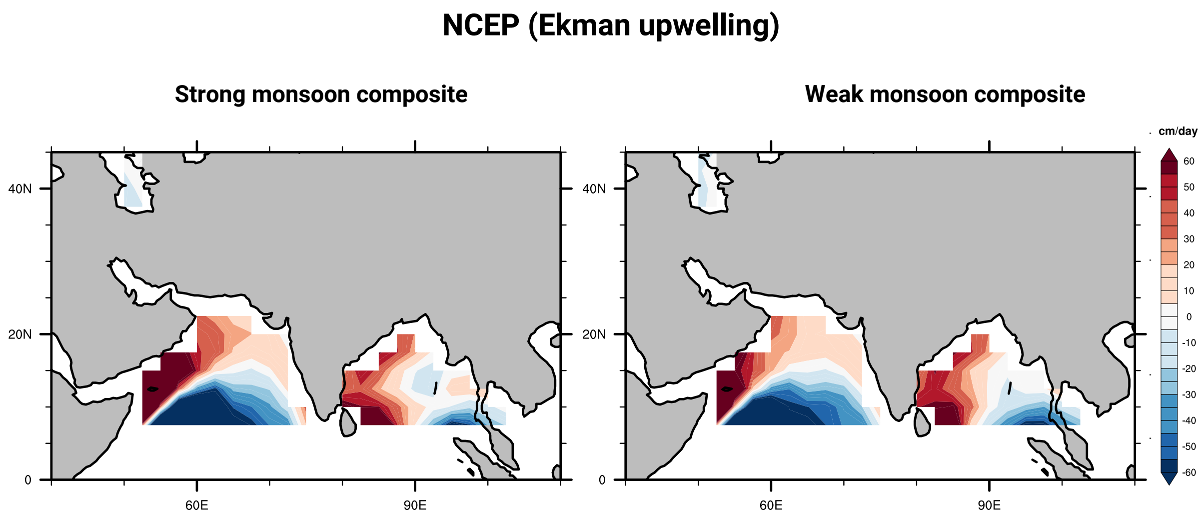

Figure S5. The composite of Ekman upwelling for all the, (**a**) strong and (**b**) weak monsoon years from the NCEP reanalysis dataset. Years are classified as strong and weak monsoon years based on the threshold of standard deviation in all India rainfall about the climatological mean. All India rainfall is the area–averaged precipitation over India (10°N-29°N, 73°E-85°E; land only grids). Precipitation data is taken from GPCP (Global Precipitation Climatology Project), and Ekman upwelling is evaluated from the surface wind data of NCEP reanalysis as the curl of wind stress. The period 1948–2017 is considered for this analysis.

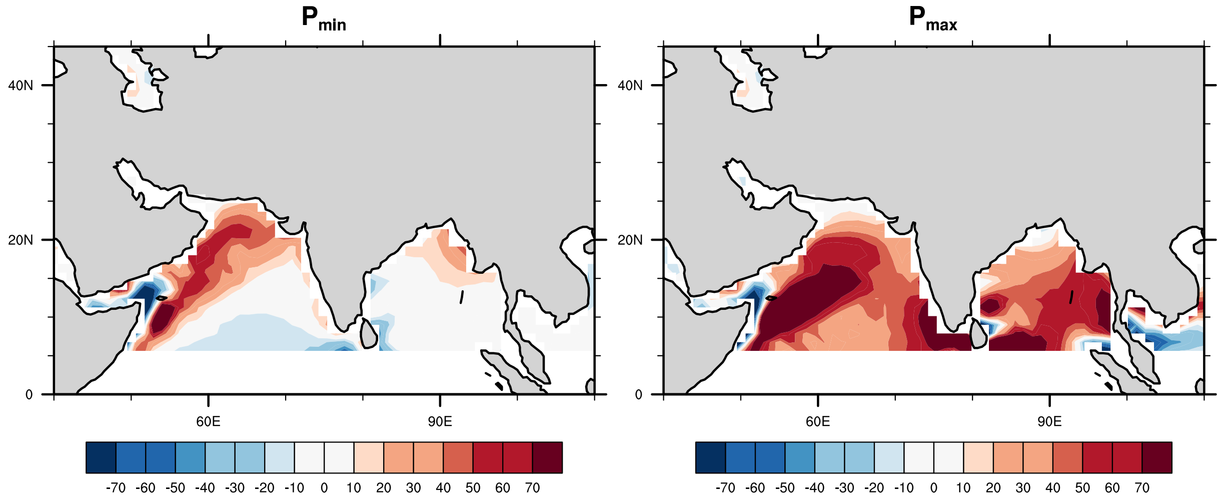

Figure S6. The climatological Jun-Jul-Aug averaged Ekman upwelling for (**a**) P_{min} and (**b**) P_{max}. The fully coupled model EC-Earth is used for this analysis (?, ?). Ekman upwelling is calculated based on the curl of wind stress.