

Supplementary Information

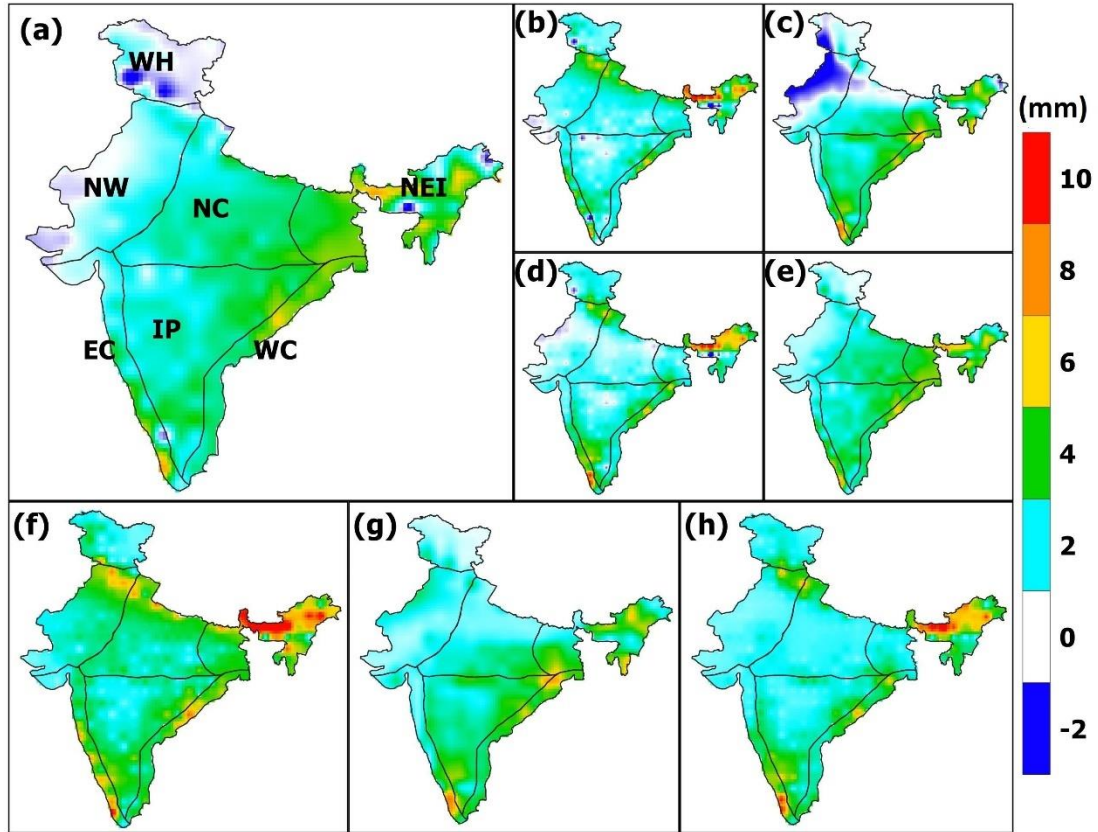


Figure S1: Distribution of Mean Bias Error (MBE) between (a) ERA5 and AIRS (b) ERA5 and MODIS (c) MERRA-2 and AIRS (d) MERRA-2 and MODIS, and Root Mean Square Error (RMSE) of PWV between (e) ERA5 and AIRS (f) ERA5 and MODIS (g) MERRA-2 and AIRS (h) MERRA-2 and MODIS for the period 2003–2020. Different temperature homogeneous regions of India such as WC (West Coast), EC (East Coast), IP (Interior Peninsular), NE (North East), NC (North Central), NW (North West) and WH (Western Himalaya) are also marked.

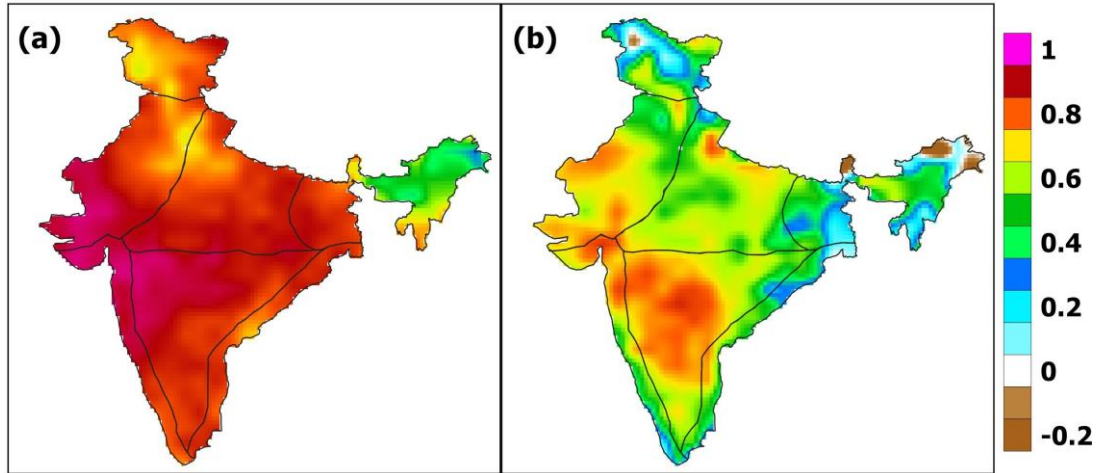


Figure S2: Distribution of Pearson Correlation Coefficient of ERA5 derived PWV with (a) AIRS and (b) MODIS over India for the period 2003–2020.

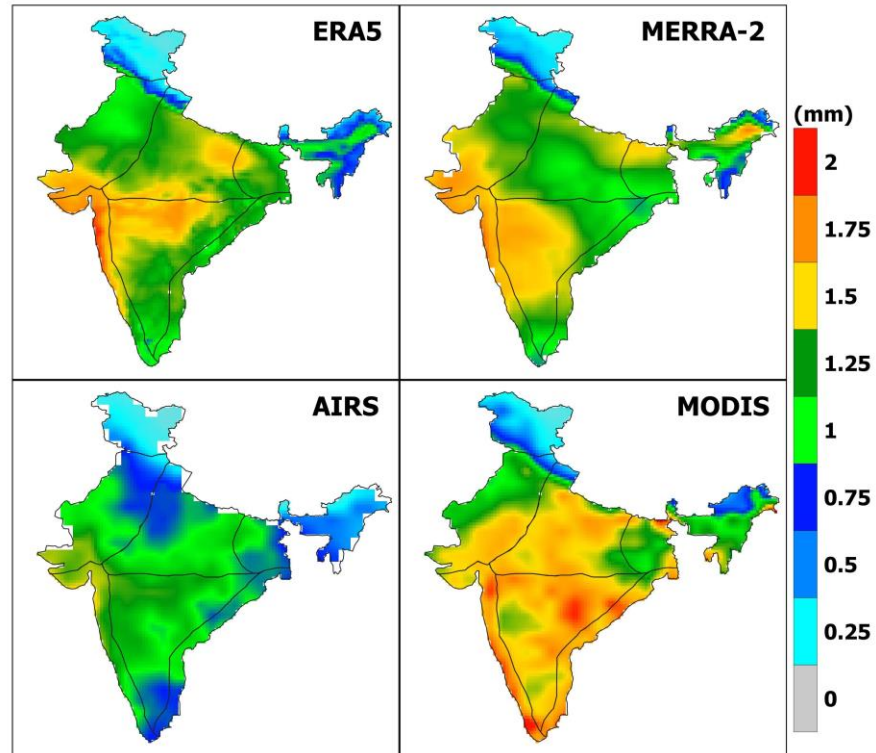


Figure S3: Distribution of annual mean standard deviation of PWV derived from ERA5 (1980–2020), MERRA-2 (1980–2020), AIRS (2003–2020) and MODIS (2001–2020).

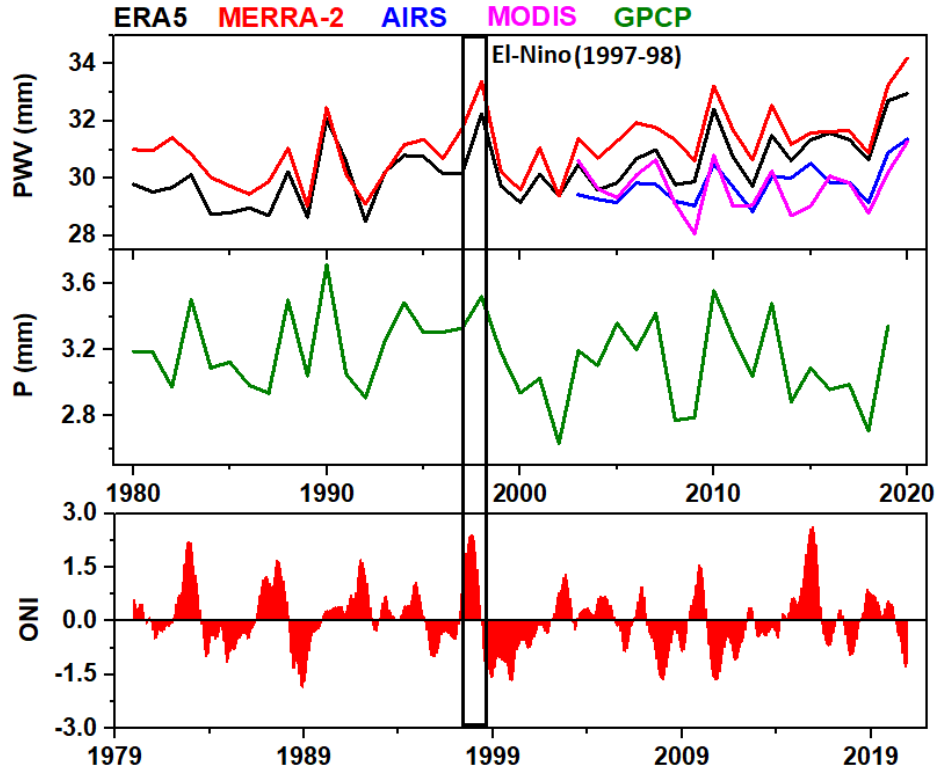


Figure S4: Temporal evolution of PWV averaged over India derived from ERA5 (1980–2020), MERRA–2 (1980–2020), AIRS (2003–2020) and MODIS (2001–2020) (top panel). Middle panel shows the temporal growth of precipitation in India derived from GPCP (1980–2020) and bottom panel shows the ONI distribution.

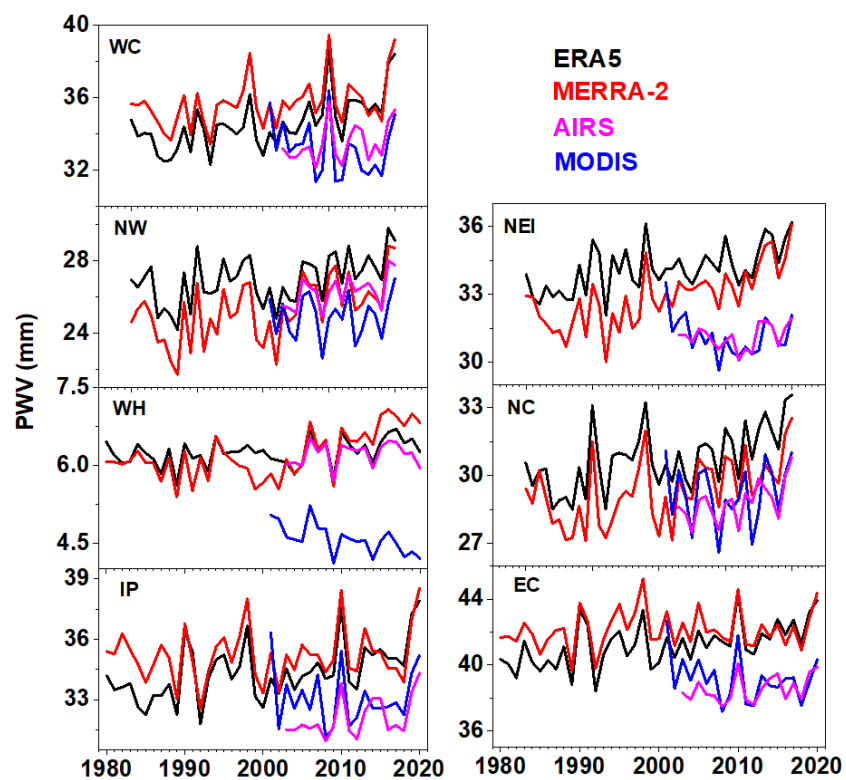


Figure S5: Temporal evolution of PWV over different Indian regions estimated from the ERA5 (1980–2020), MERRA–2 (1980–2020), AIRS (2003–2020) and MODIS (2001–2020) data.

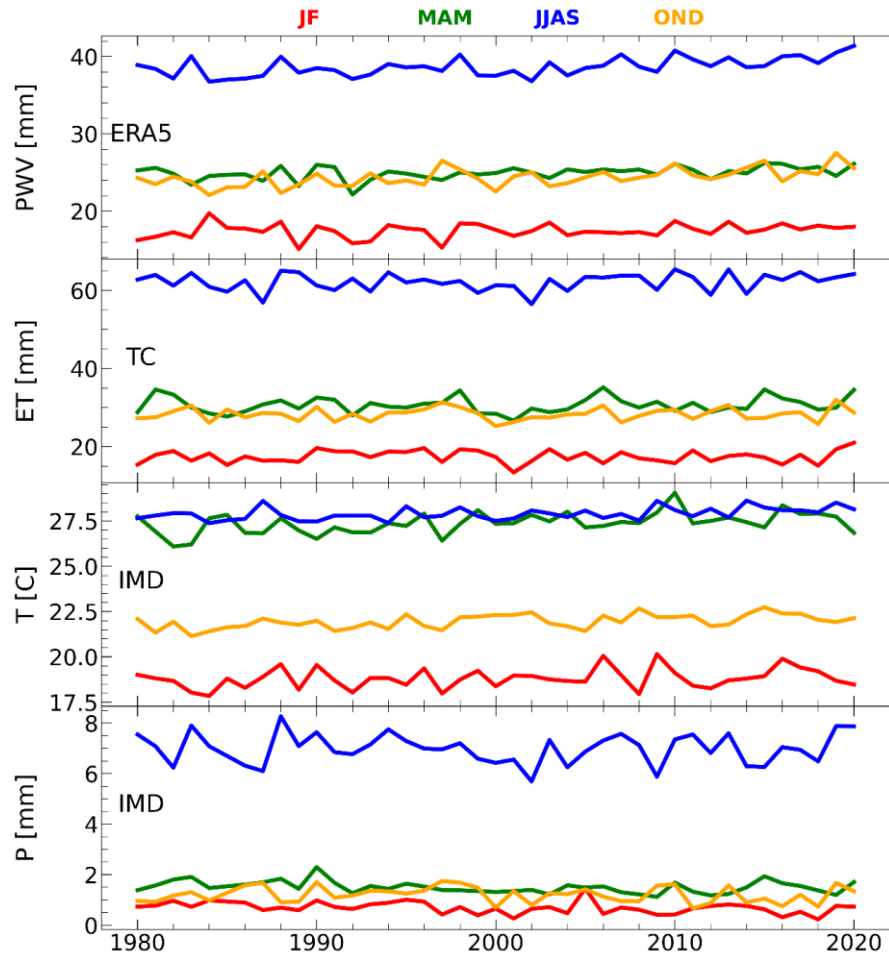


Figure S6: Temporal evolution of PWV from ERA5, Evapotranspiration (ET) from TERRACLIMATE and surface temperature (T) and total precipitation (P in mm) from IMD data over India for the period 1980–2020.