Supplemental Material

Probabilistic seasonal outlook for the rainy season over India by monitoring the onset dates using GPM IMERG satellite-based precipitation

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Table S1: *Contingency table to generate relative operating characteristic (ROC) curves and quantify prediction (perturbation) uncertainty.*

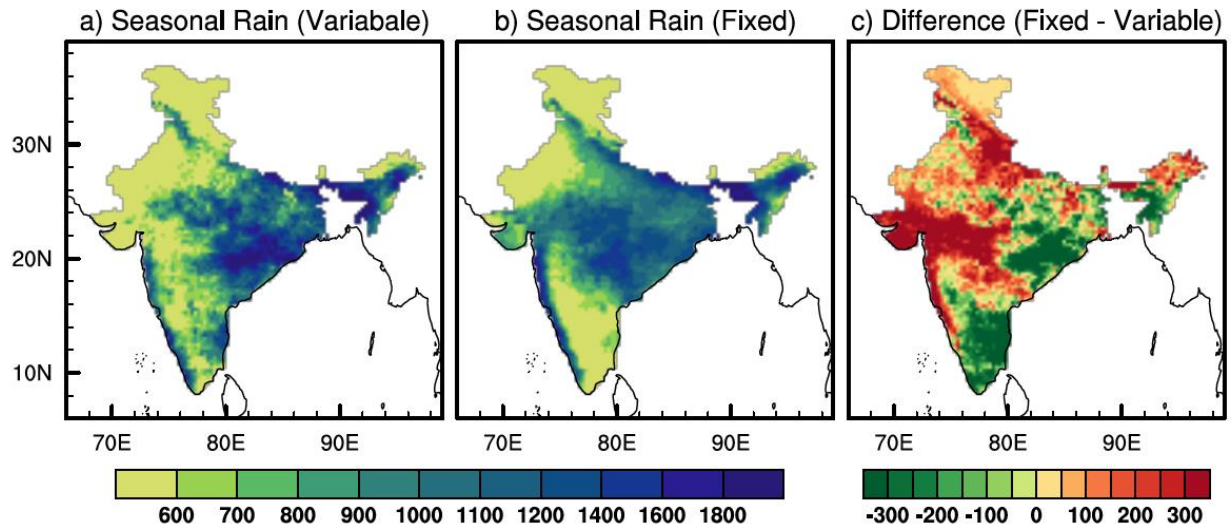| Probability of Occurrence	Exceeds Threshold	Does Not Exceed Threshold
Event Observed (Yes)	Detection	Non-Detection
Event Not Observed (No)	False Alert	Correct Rejection

Figure S1: *The 23-year climatological seasonal accumulated rainfall (mm) of the a) rainy season b) southwest monsoon (June-September)from IMERG and c) difference between the fixed length southwest monsoon and variable length rainy season.*
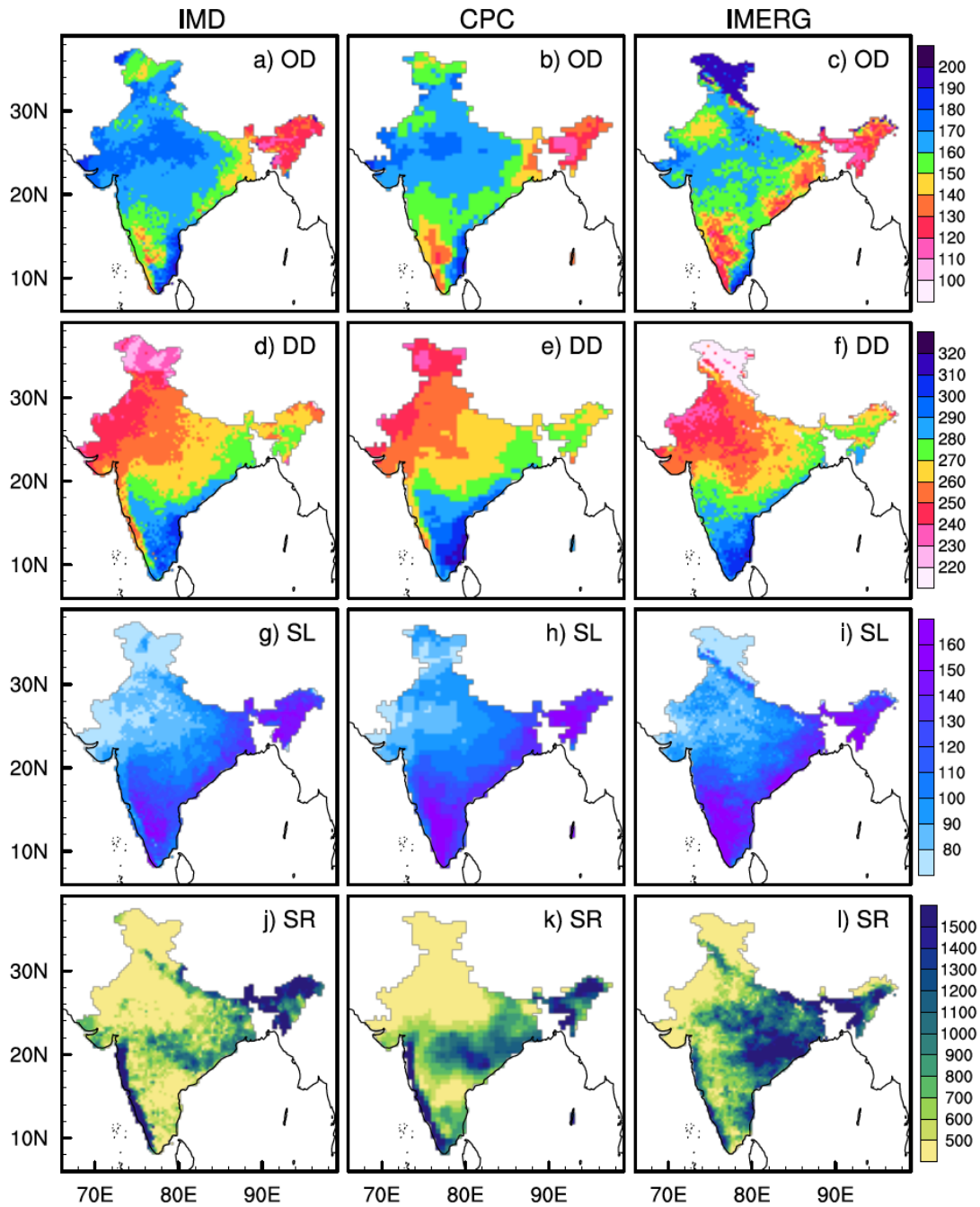
Figure S2: *The climatological mean a, b, c) onset date (Julian day), d, e, f) demise date (Julian day), g, h, i) seasonal length, and j, k, l) seasonal accumulated rainfall (mm) of the rainy season from a, d, g, j) IMD, b, e, h, k) CPC and c, f, i, l) IMERG.*
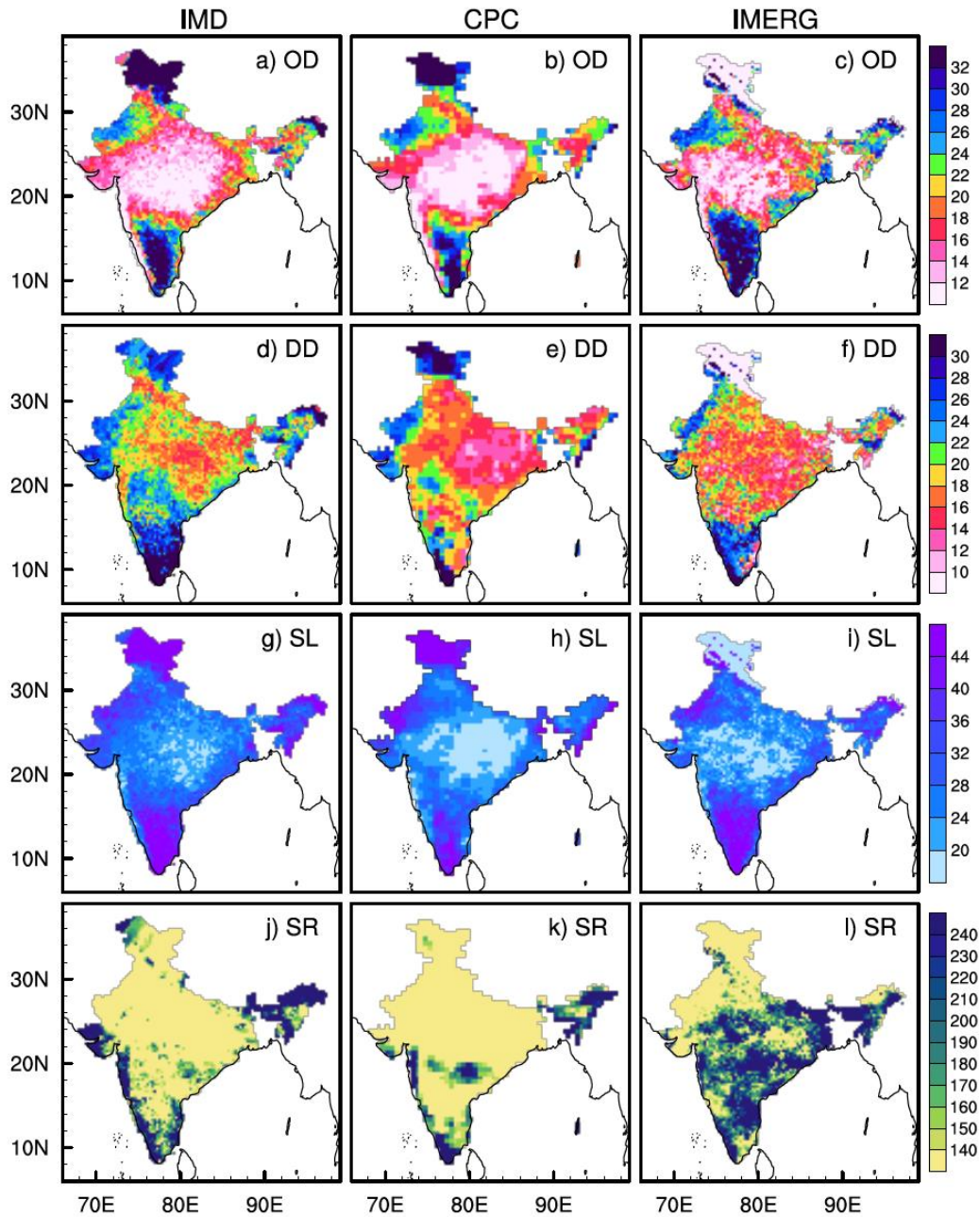
Figure S3: *The 23-year standard deviation of a, b, c) onset date (Julian day), d, e, f) demise date (Julian day), g, h, i) seasonal length, and j, k, l) seasonal accumulated rainfall (mm) of the rainy season from a, d, g, j) IMD, b, e, h, k) CPC and c, f, i, l) IMERG.*
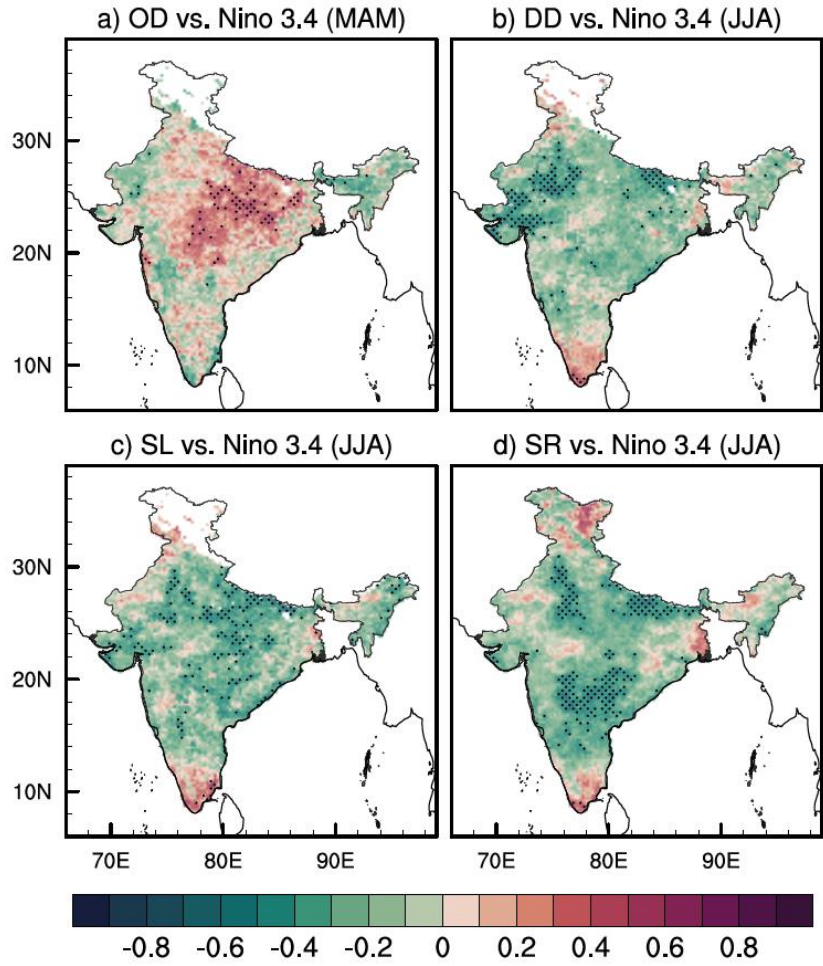
Figure S4: *The correlation coefficients of MAM Niño3.4 indices with anomalies of (a) onset date, and JJA Niño3.4 SST index with anomalies of (b) demise date, (c) length, and (d) seasonal rain of the wet season. The stippling indicates statistical significance at a 5% significance level according to the t-statistic.*
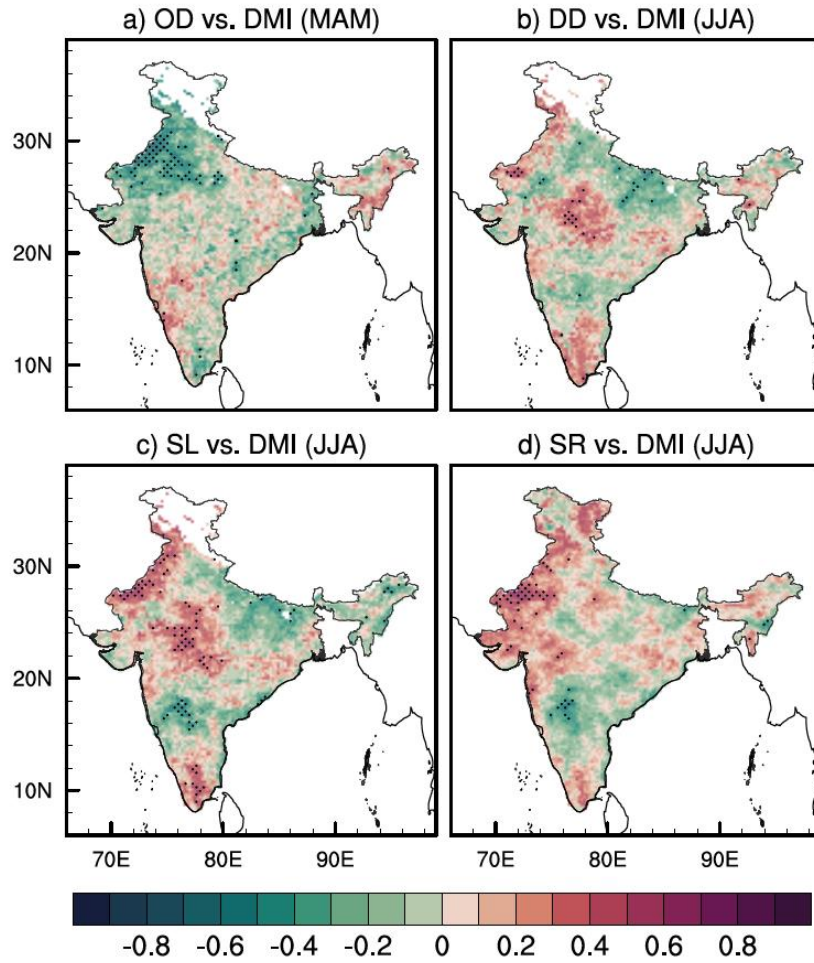
Figure S5: *The correlation coefficients of MAM dipole model index (DMI) with anomalies of (a) onset date, and JJA DMI with anomalies of (b) demise date, (c) length, and (d) seasonal rain of the wet season. The shading indicates statistical significance at a 5% significance level according to the t-statistic.*