

Figure S1. Regions showing statistically significant composite anomalies of SIF ($\text{W m}^{-2} \mu\text{m}^{-1} \text{Sr}^{-1}$) across India during the month of July when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) trends. The warmer SST in the oceanic regions lead to positive SIF anomalies, while the colder SST leads to negative SIF anomalies.

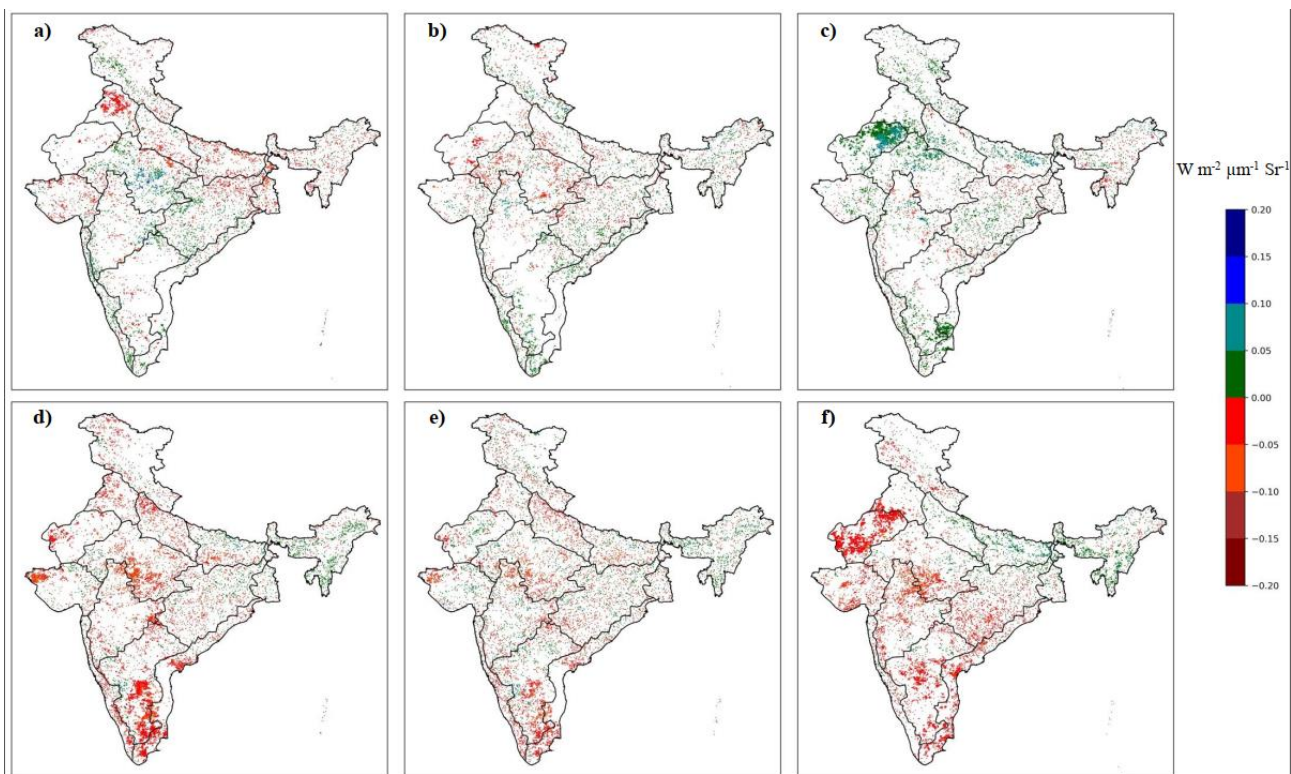


Figure S2. Regions showing statistically significant composite anomalies of SIF ($\text{W m}^{-2} \mu\text{m}^{-1} \text{Sr}^{-1}$) across India during the month of August when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) trends. The warmer SST in the oceanic regions lead to positive SIF anomalies, while the colder SST leads to negative SIF anomalies.

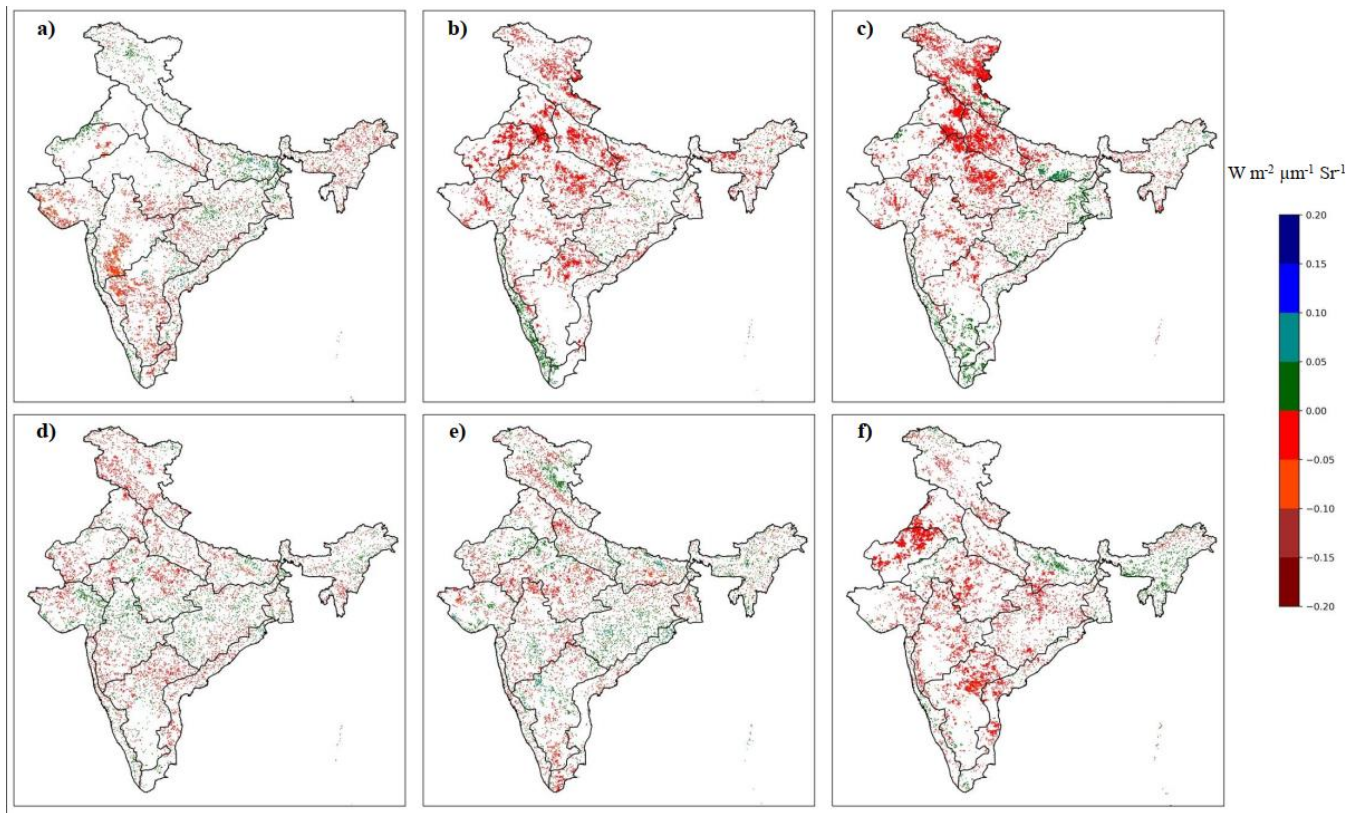
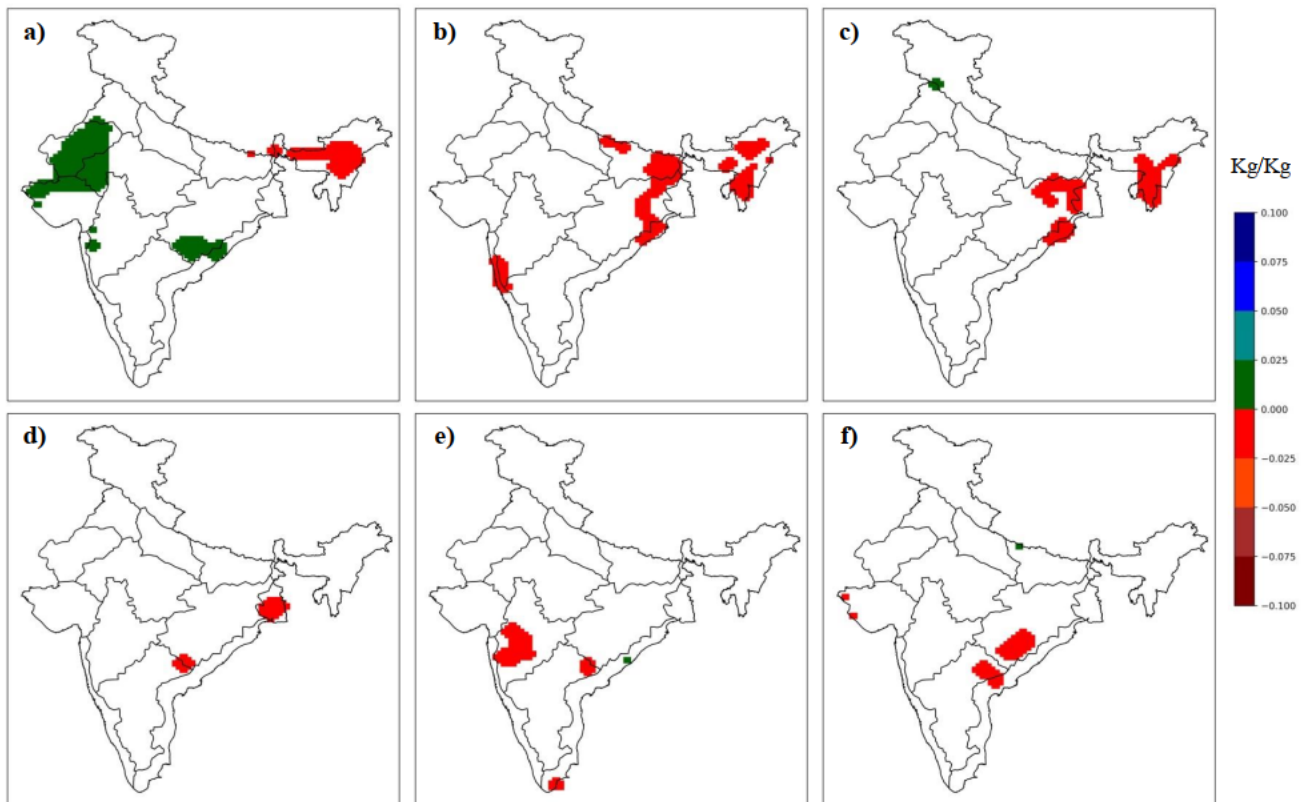
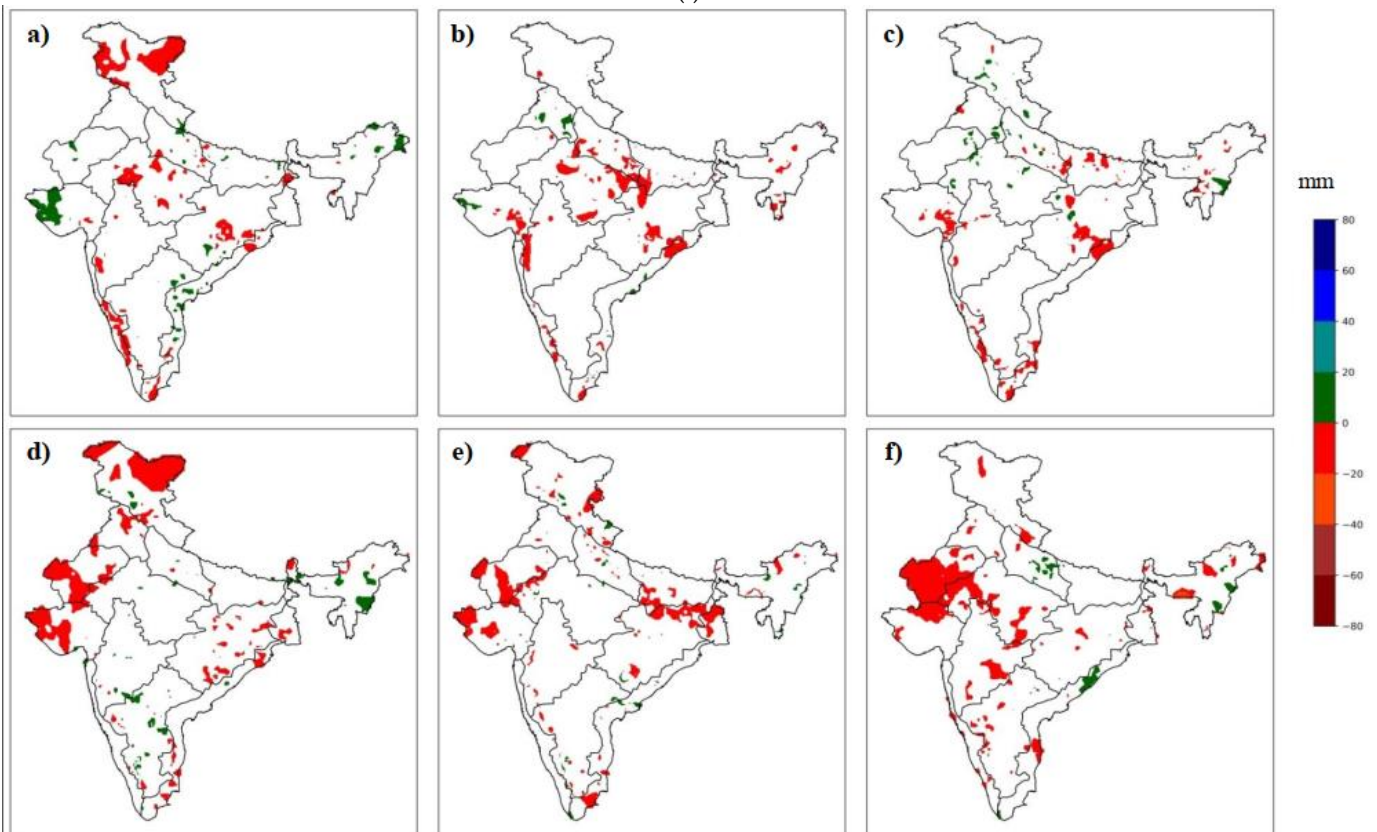


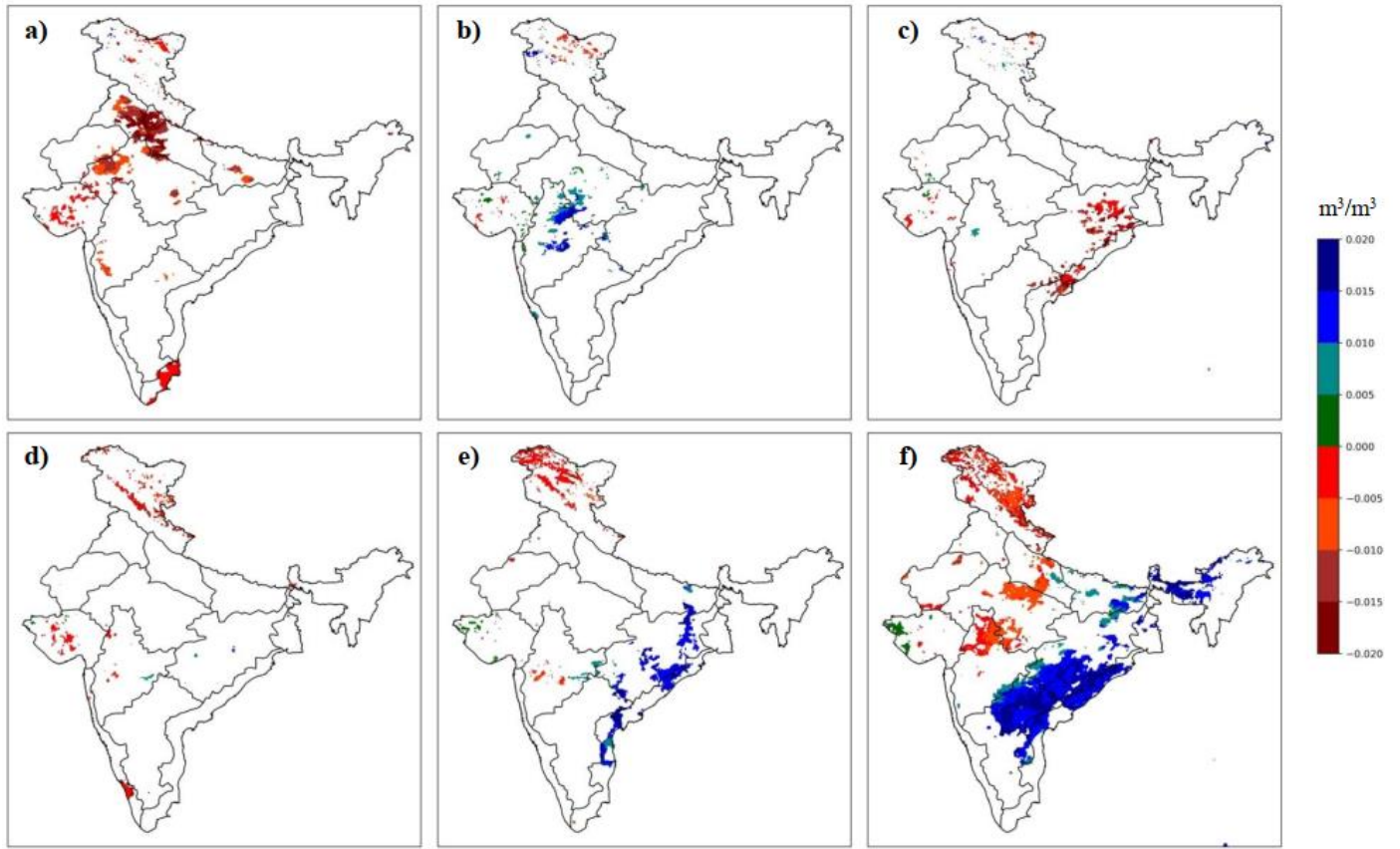
Figure S3. Regions showing statistically significant composite anomalies of SIF ($\text{W m}^{-2} \mu\text{m}^{-1} \text{Sr}^{-1}$) across India during the month of September when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) trends. The warmer SST in the oceanic regions lead to positive SIF anomalies, while the colder SST leads to negative SIF anomalies.



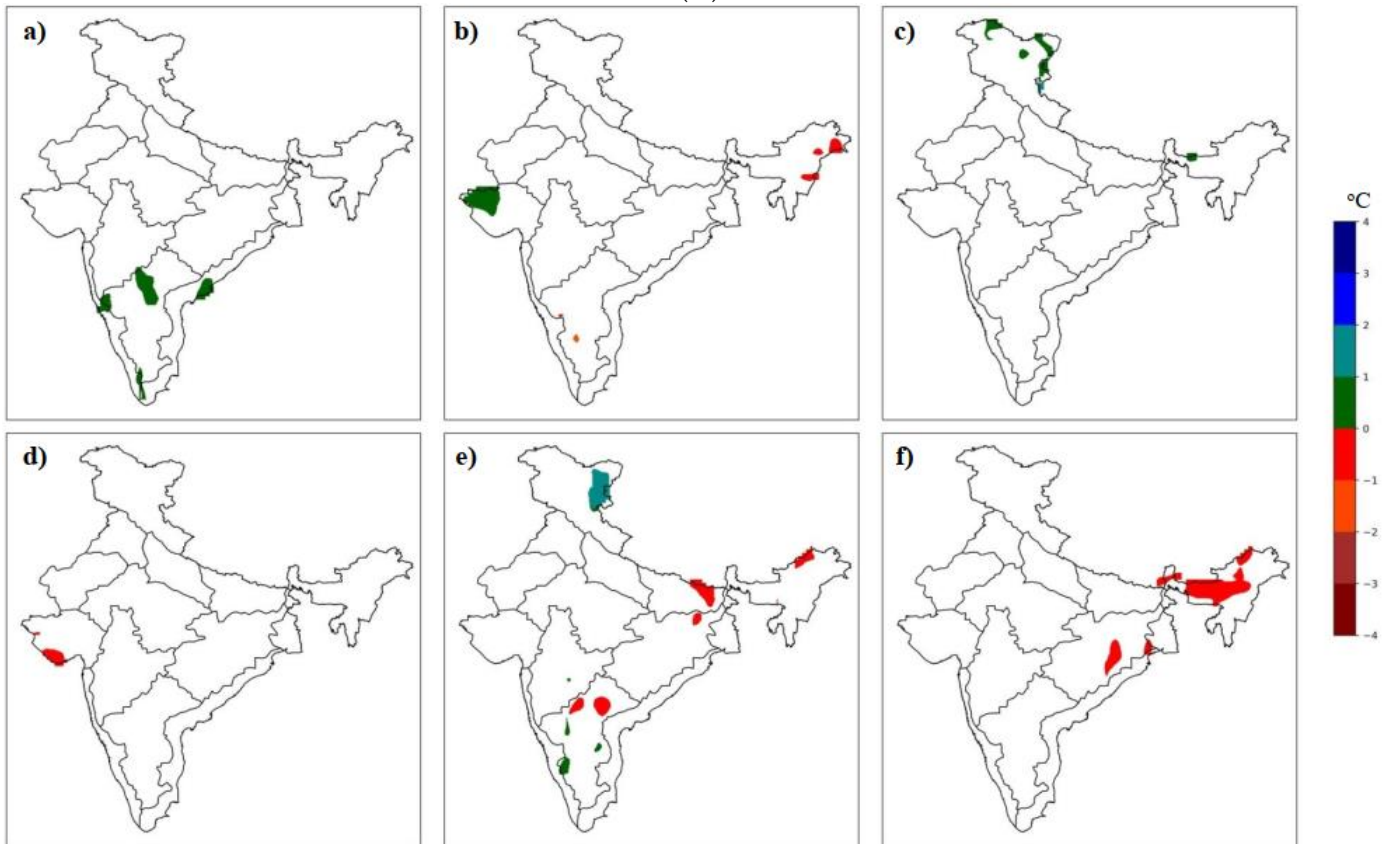
(i)



(ii)



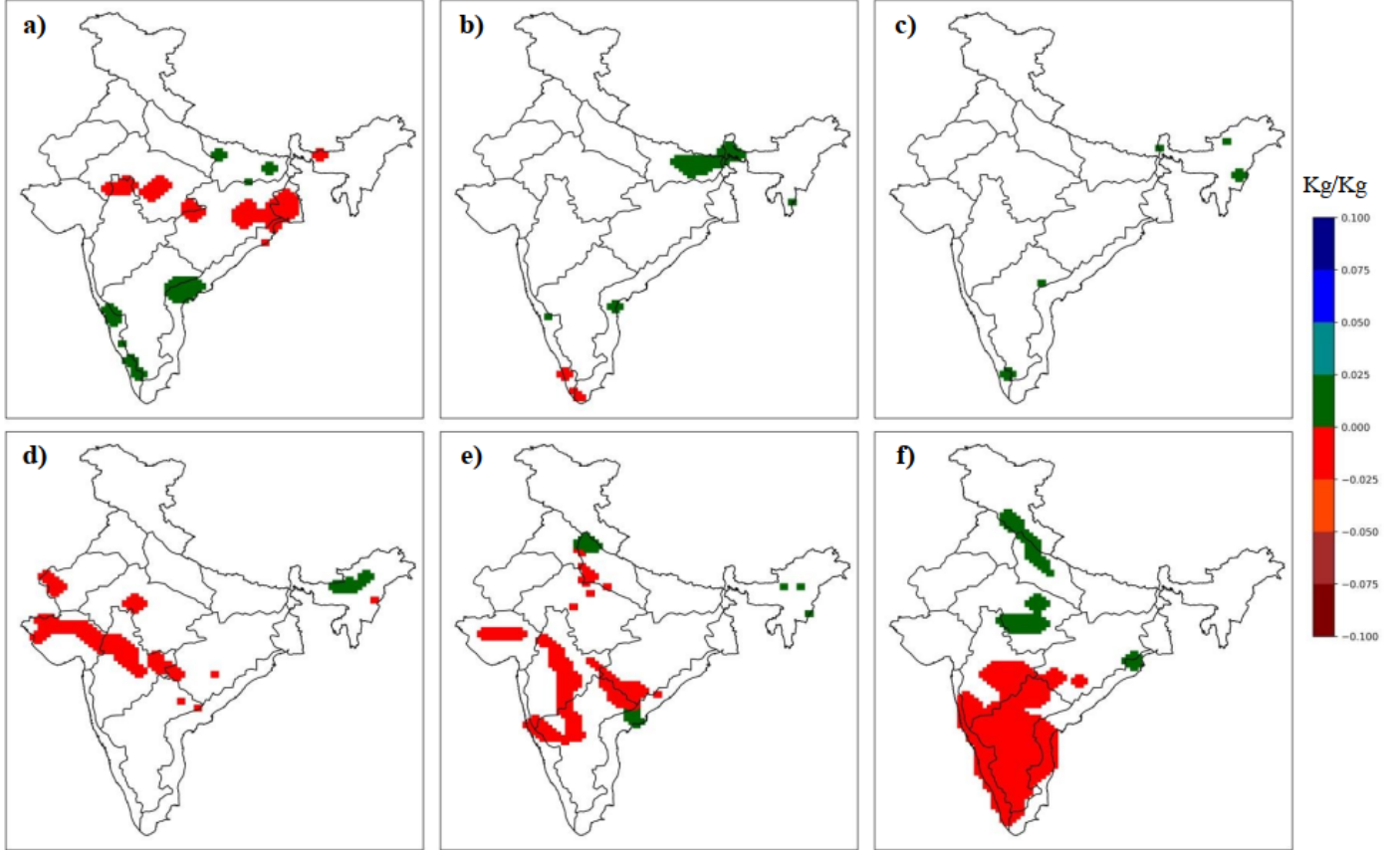
(iii)



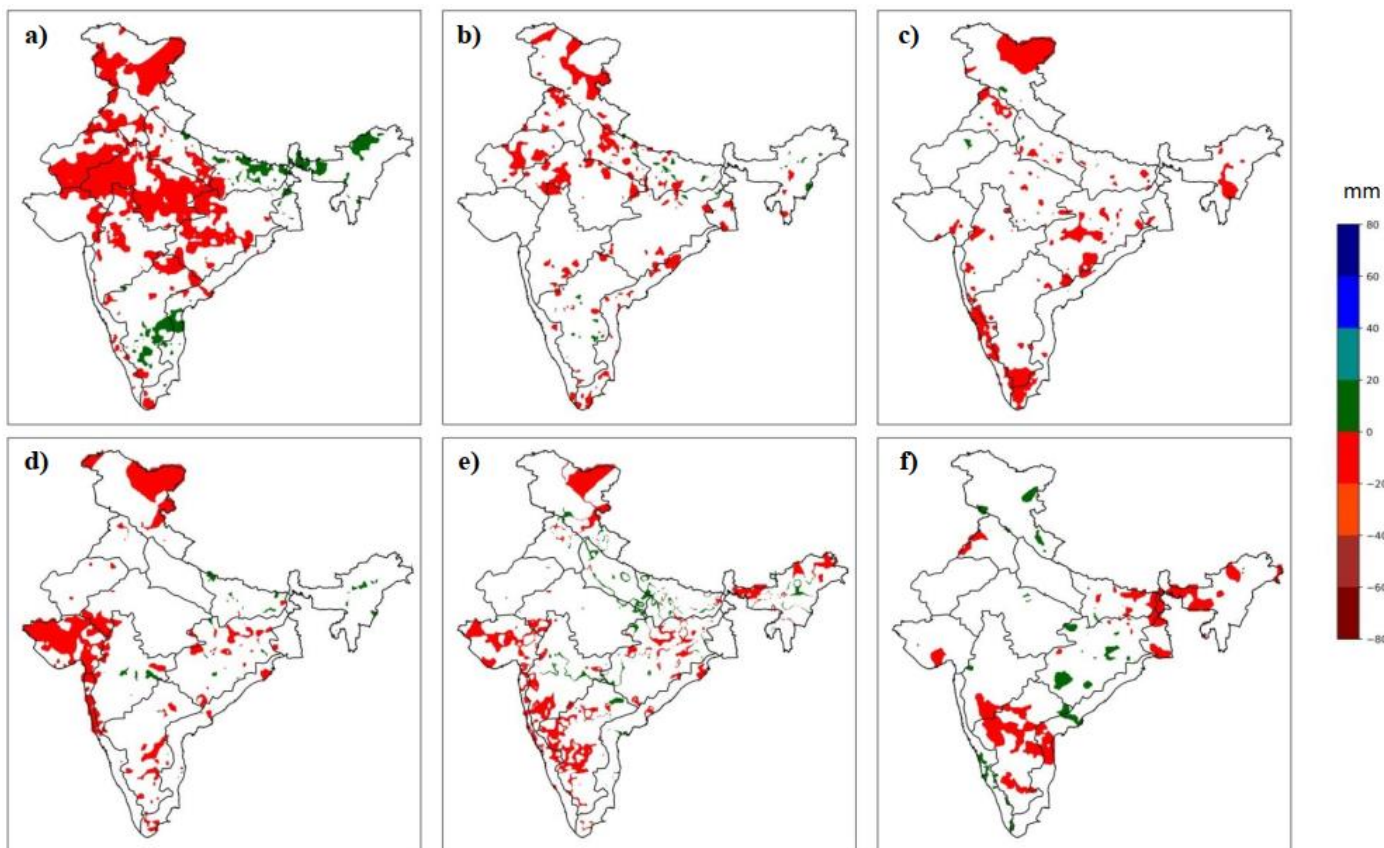
(iv)

Figure S4: (i) Regions showing statistically significant composite anomalies of specific humidity (Kg/Kg) across India during the month of July when, SST anomalies of the Western Indian Ocean

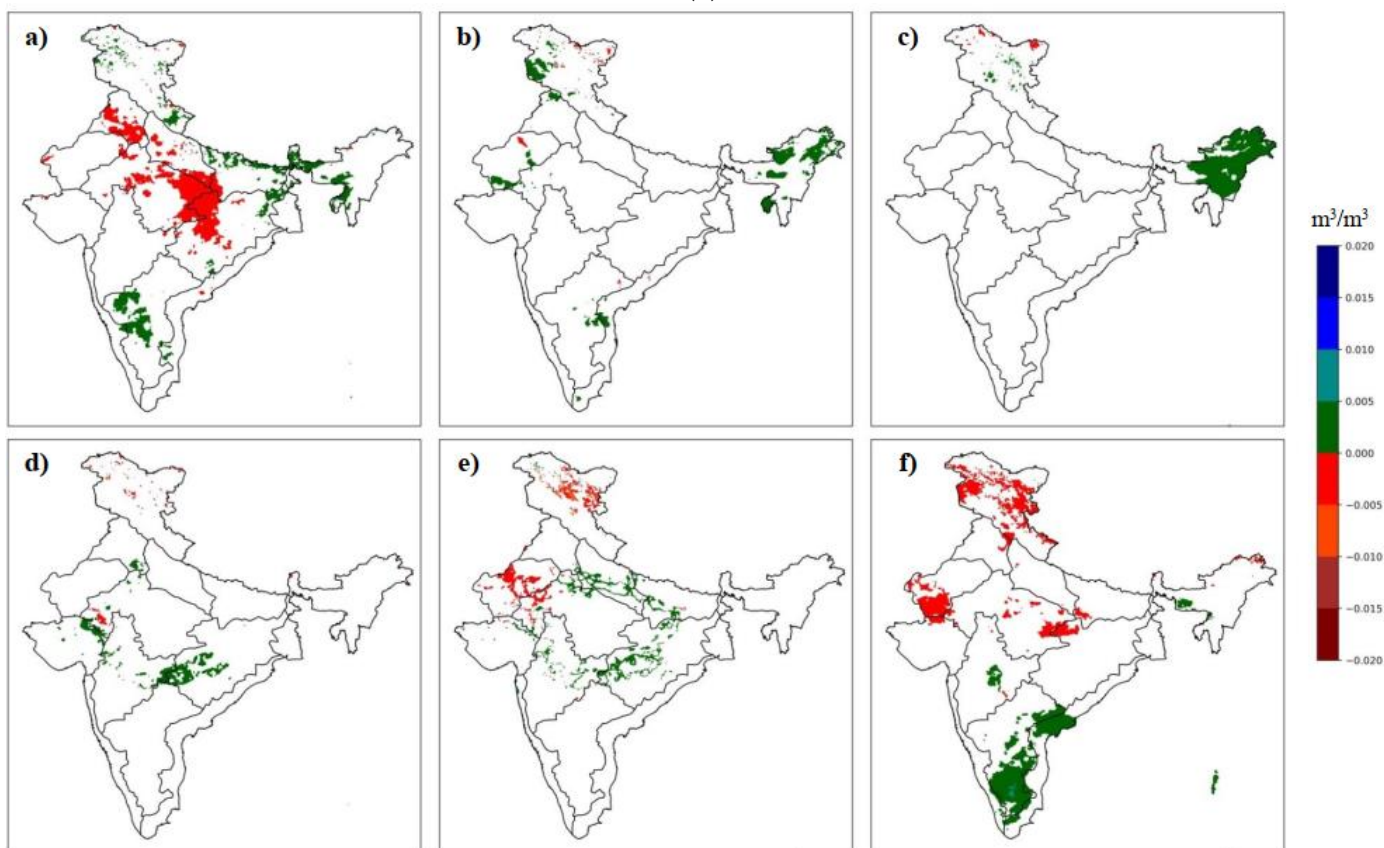
(a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. (ii) Regions showing statistically significant composite anomalies of rainfall (mm) across India during the month of July when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. (iii) Regions showing statistically significant composite anomalies of soil moisture (m³/m³) across India during the month of July when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. (iv) Regions showing statistically significant composite anomalies of air temperature (oC) across India during the month of July when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations.



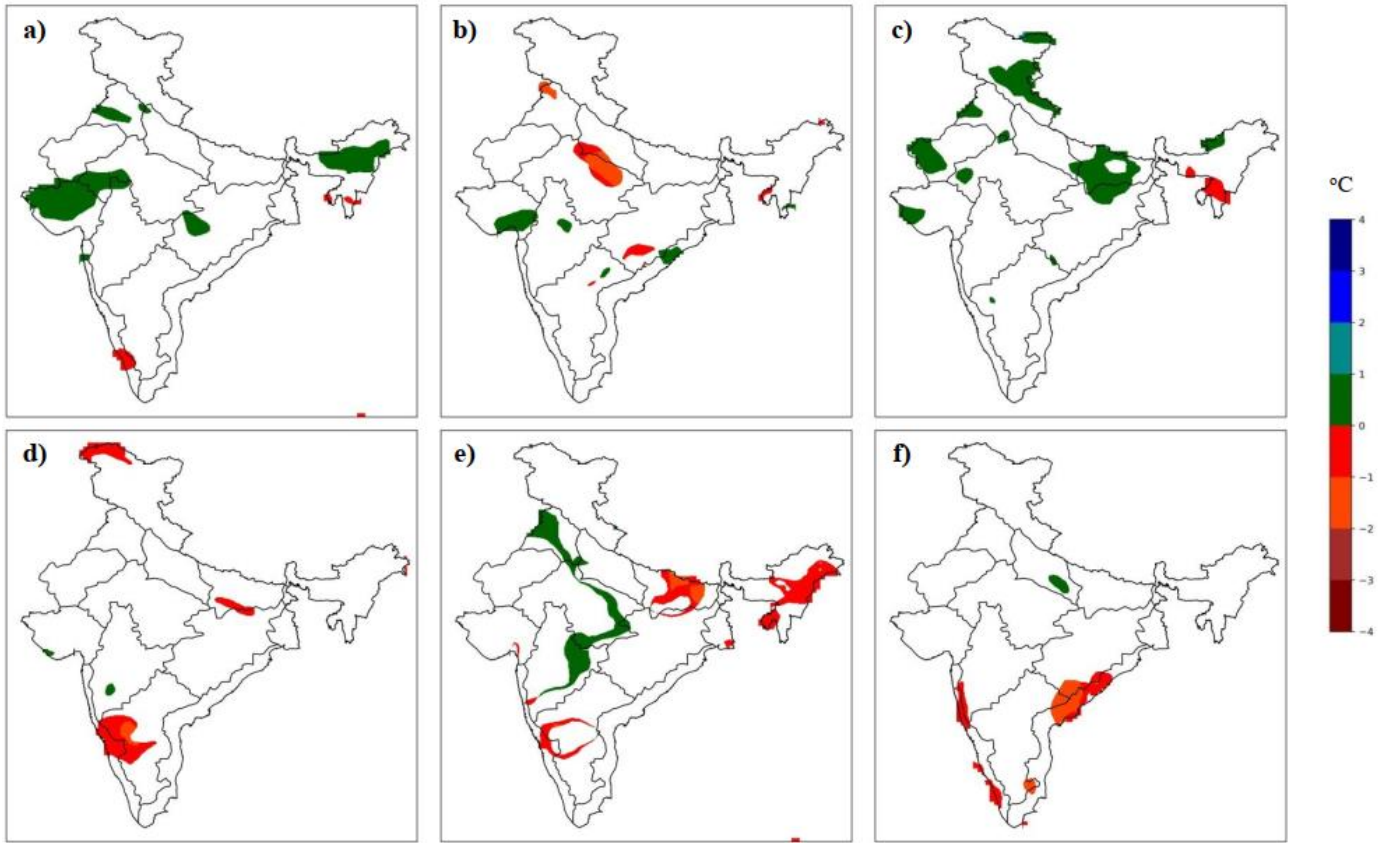
(i)



(ii)

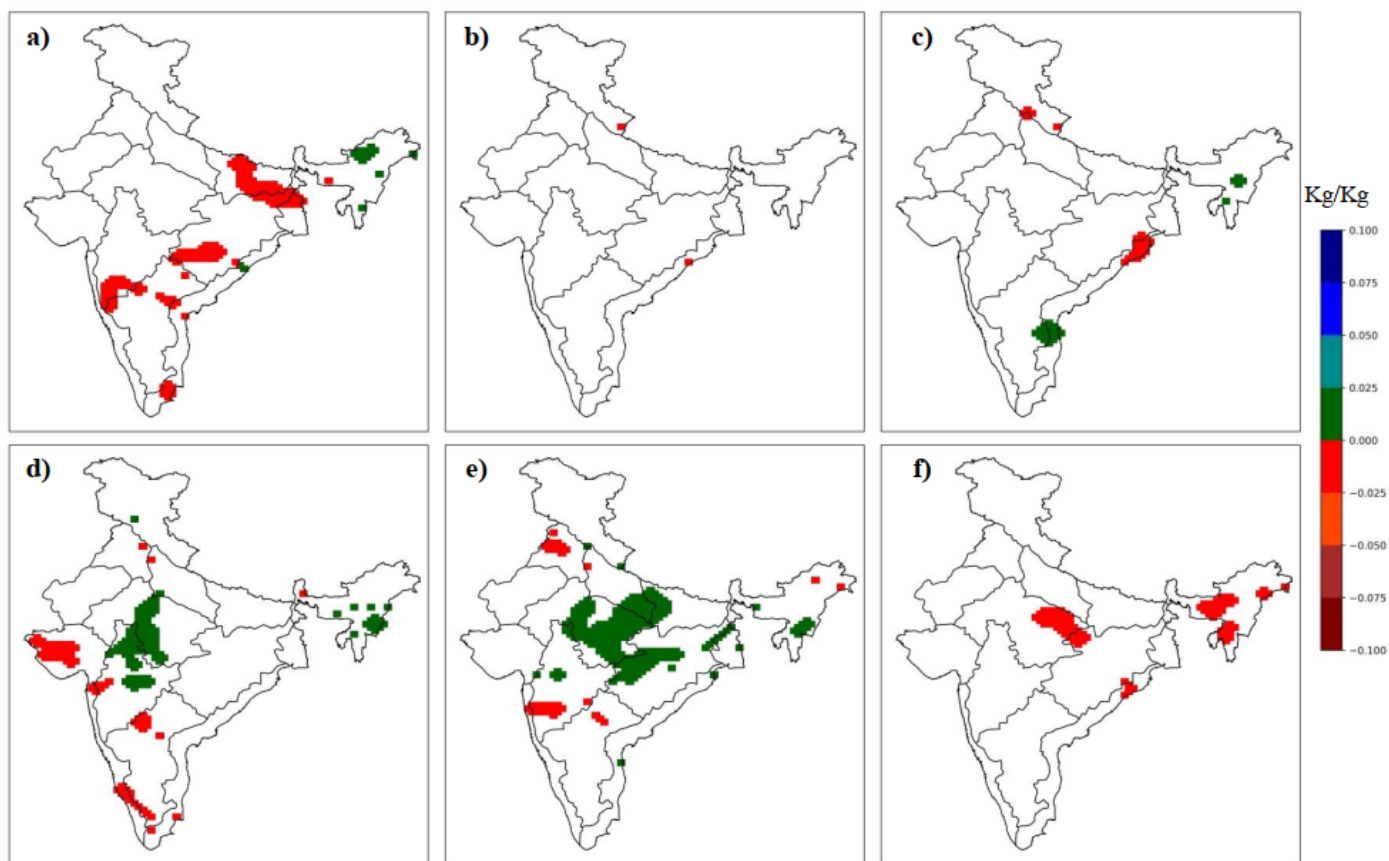


(iii)

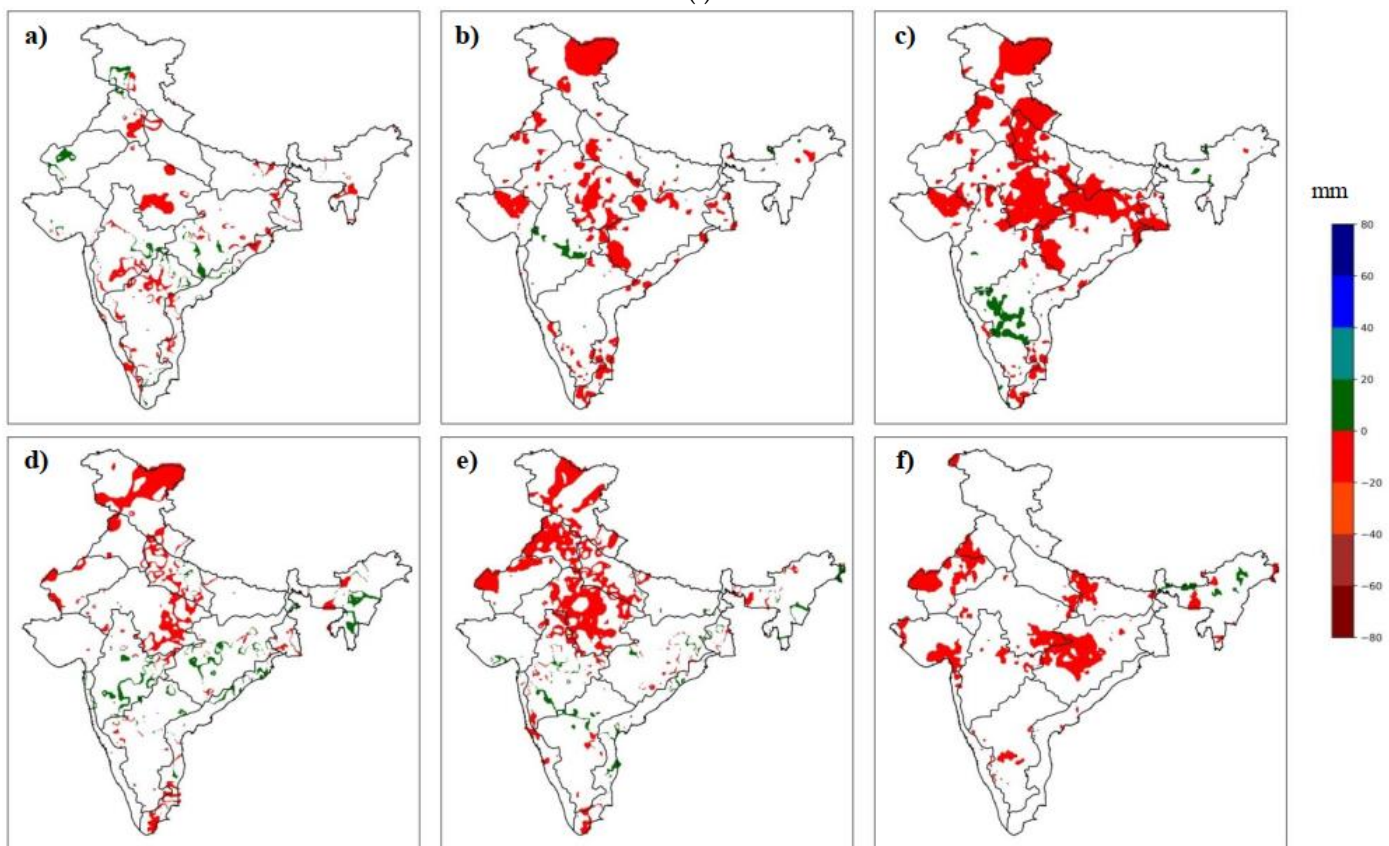


(iv)

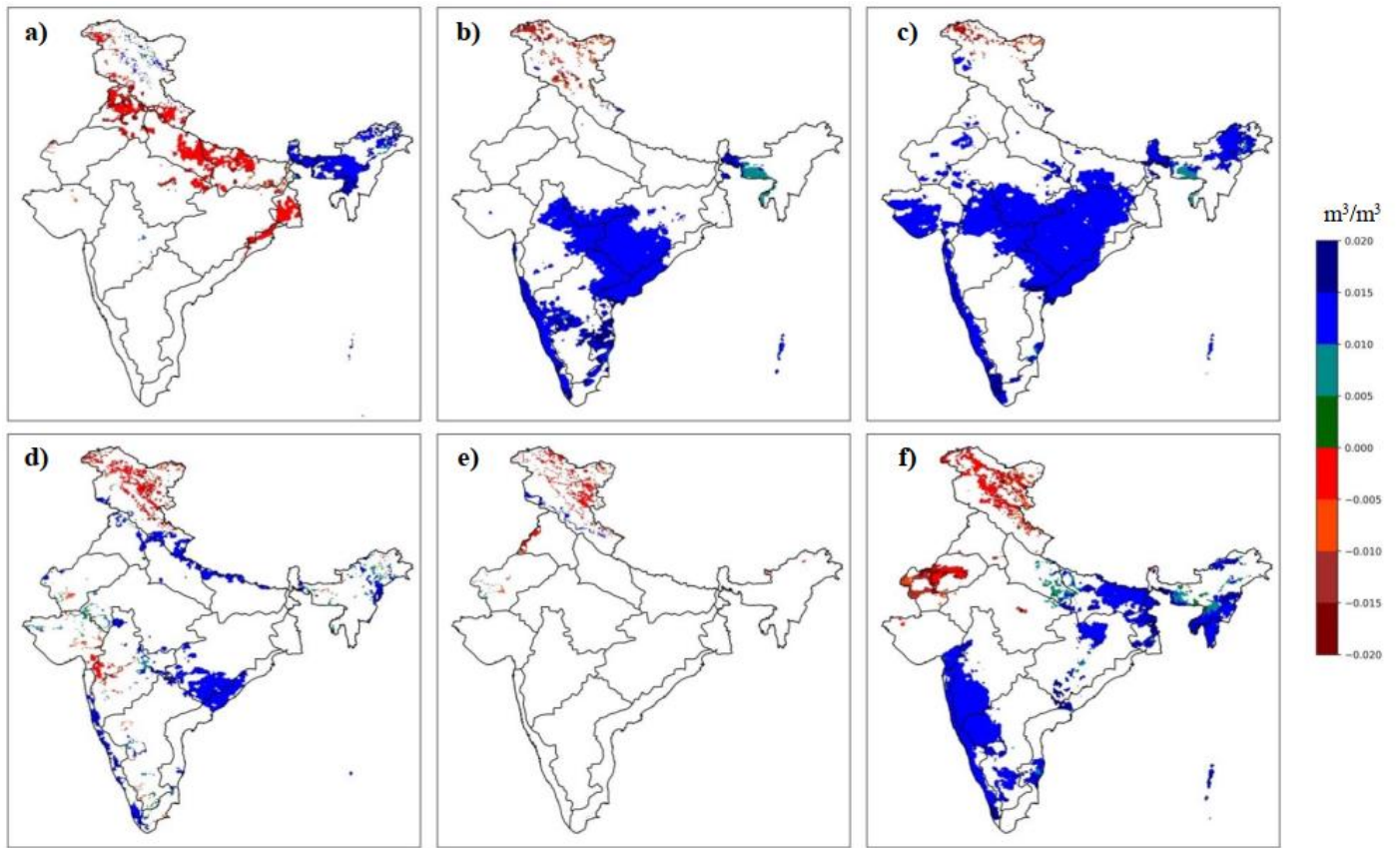
Figure S5. (i) Regions showing statistically significant composite anomalies of specific humidity (Kg/Kg) across India during the month of August when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. (ii) Regions showing statistically significant composite anomalies of rainfall (mm) across India during the month of August when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. (iii) Regions showing statistically significant composite anomalies of soil moisture (m3/m3) across India during the month of August when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. (iv) Regions showing statistically significant composite anomalies of air temperature (oC) across India during the month of August when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations.



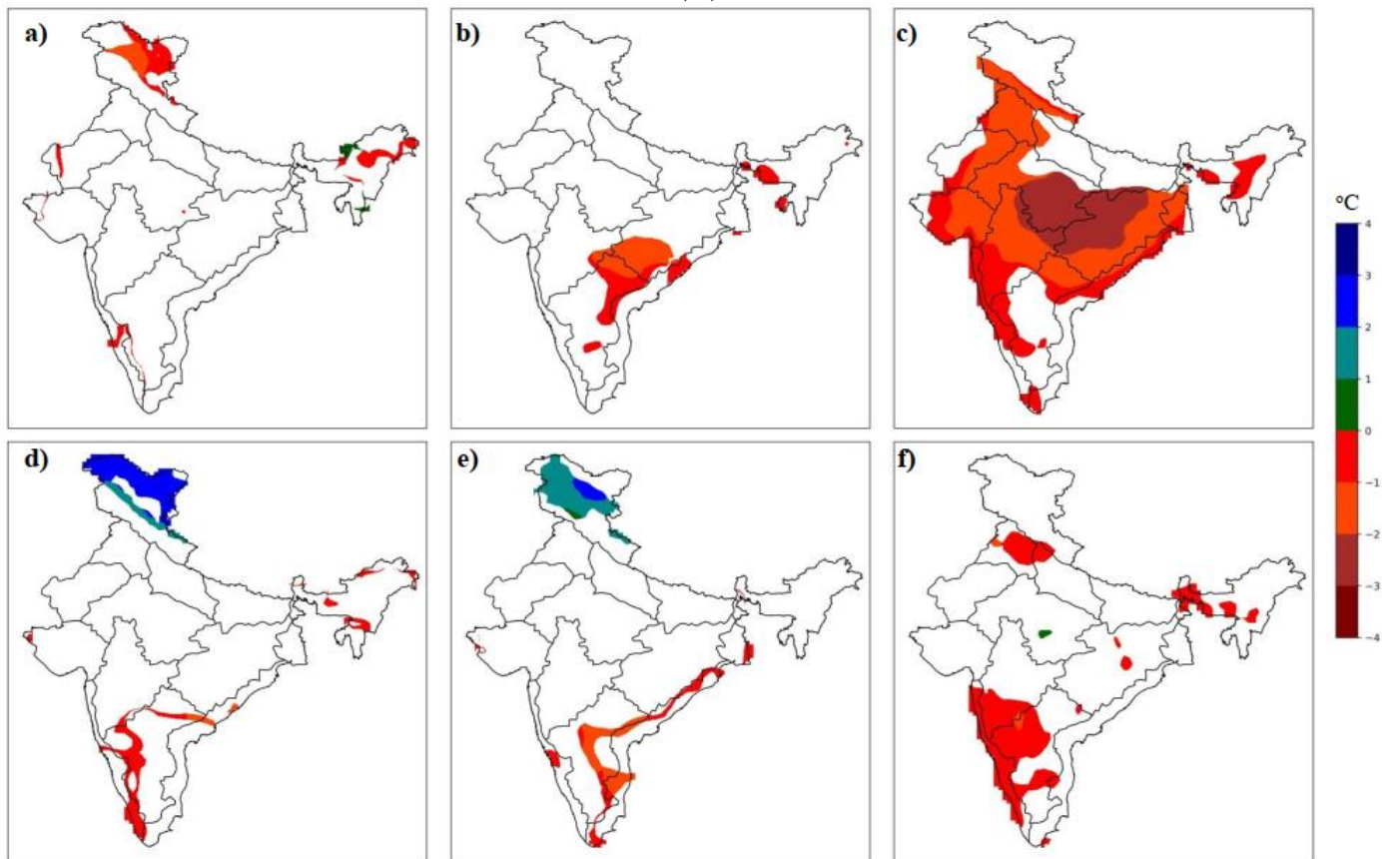
(i)



(ii)



(iii)



(iv)

Figure S6: (i) Regions showing statistically significant composite anomalies of specific humidity (Kg/Kg) across India during the month of September when, SST anomalies of the Western Indian

Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. (ii) Regions showing statistically significant composite anomalies of rainfall (mm) across India during the month of September when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. (iii) Regions showing statistically significant composite anomalies of soil moisture (m³/m³) across India during the month of September when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. (iv) Regions showing statistically significant composite anomalies of air temperature (oC) across India during the month of September when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations.

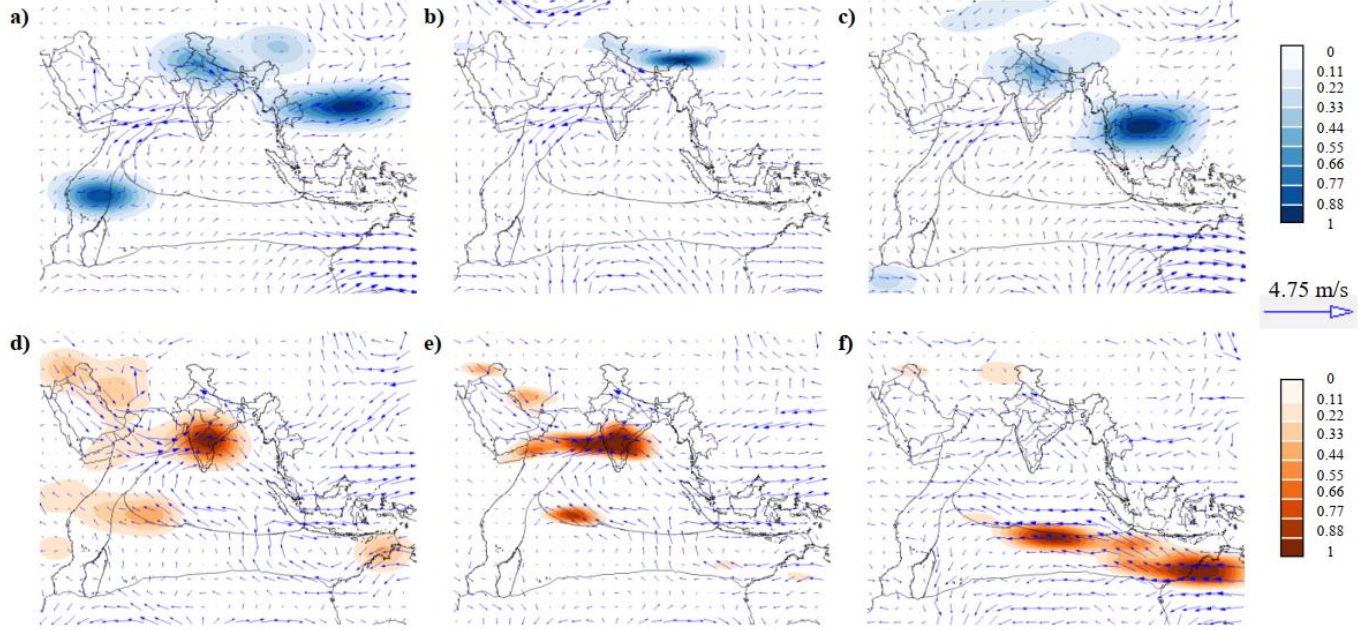


Figure S7. Density contour plot of summer monsoon wind at 850 hPa during June when, SST anomalies of the Western Indian Ocean (a,d), Northern Indian Ocean (b,e), and Central Indian Ocean (c,f) demonstrated positive (upper) and negative (lower) variations. Colouration indicates the density estimate of wind speed anomalies, which are statistically significant and the arrows indicate the wind direction.

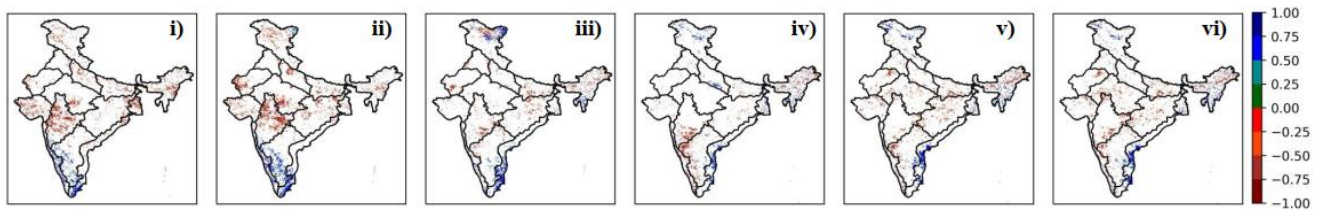


Figure S8. shows the correlation of SIF anomalies with NINO3 SST anomalies during June at i) lag 0, ii) lag 1, iii) lag 2, iv) lag 3, and v) lag 4, and vi) lag 5. Statistically significant correlation coefficient (p-value < 0.05, r-value > 0.5) is depicted and other values are masked out. (Software used: Python version 3.7 (2019), <https://www.python.org/>)