

Scale and Precipitation-Regime Dependent Biases in Gridded Rainfall Products over Complex Tropical Terrain: Insights from a Long-Term Dense Rain-Gauge Network

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Abstract ID:

Objective

- ❖ Performance and detection of different precipitation-product during heavy and extreme rainfall.
- ❖ To investigate how terrain characteristics and rain-gauge network density influence the gauge-to-grid representativeness, performance of IMERG, MSWEP, and IMD rainfall products.
- ❖ Does improved statistical agreement necessarily correspond to improved representation of the diurnal phase of precipitation

DATA AND METHODOLOGY

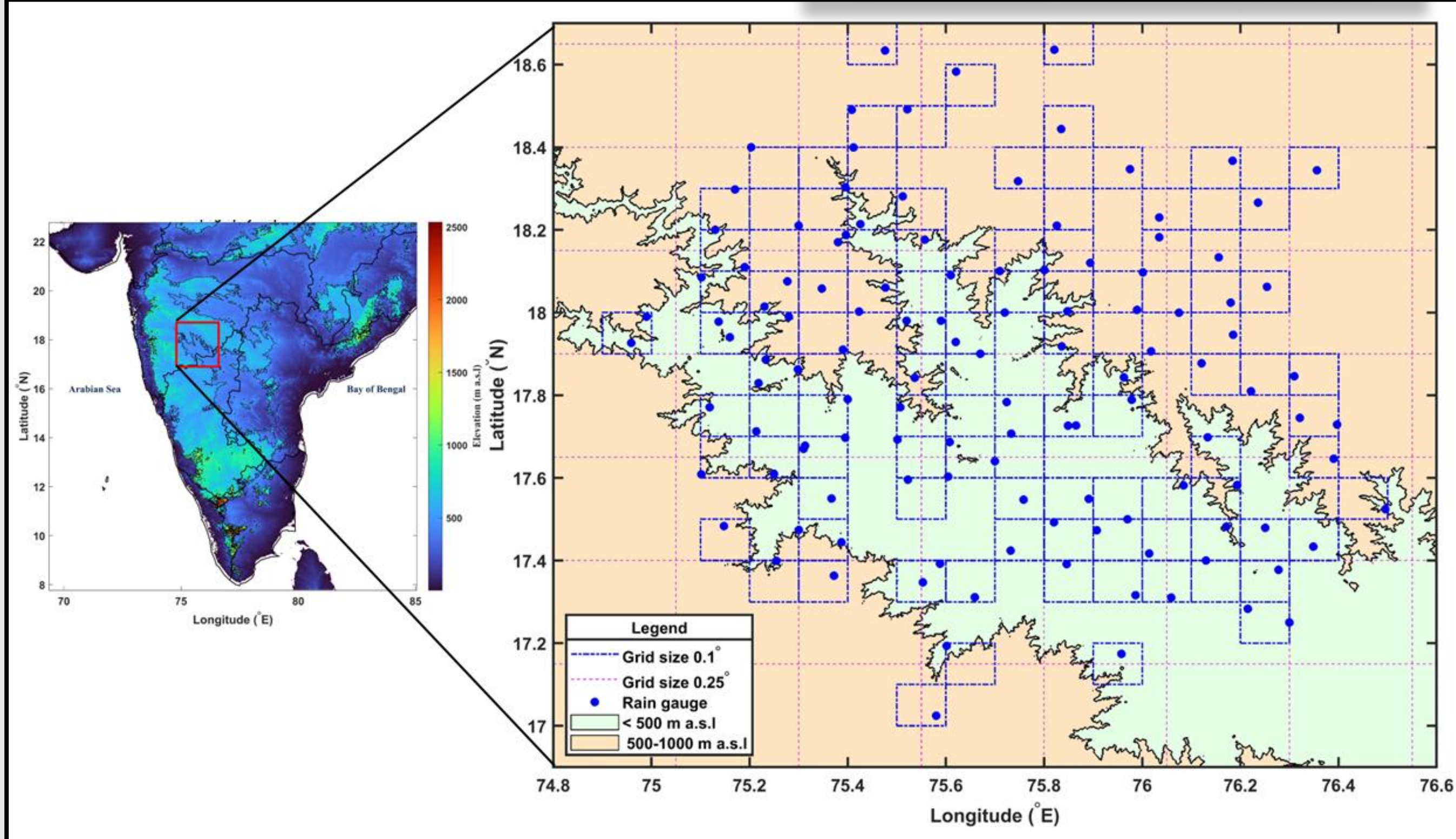
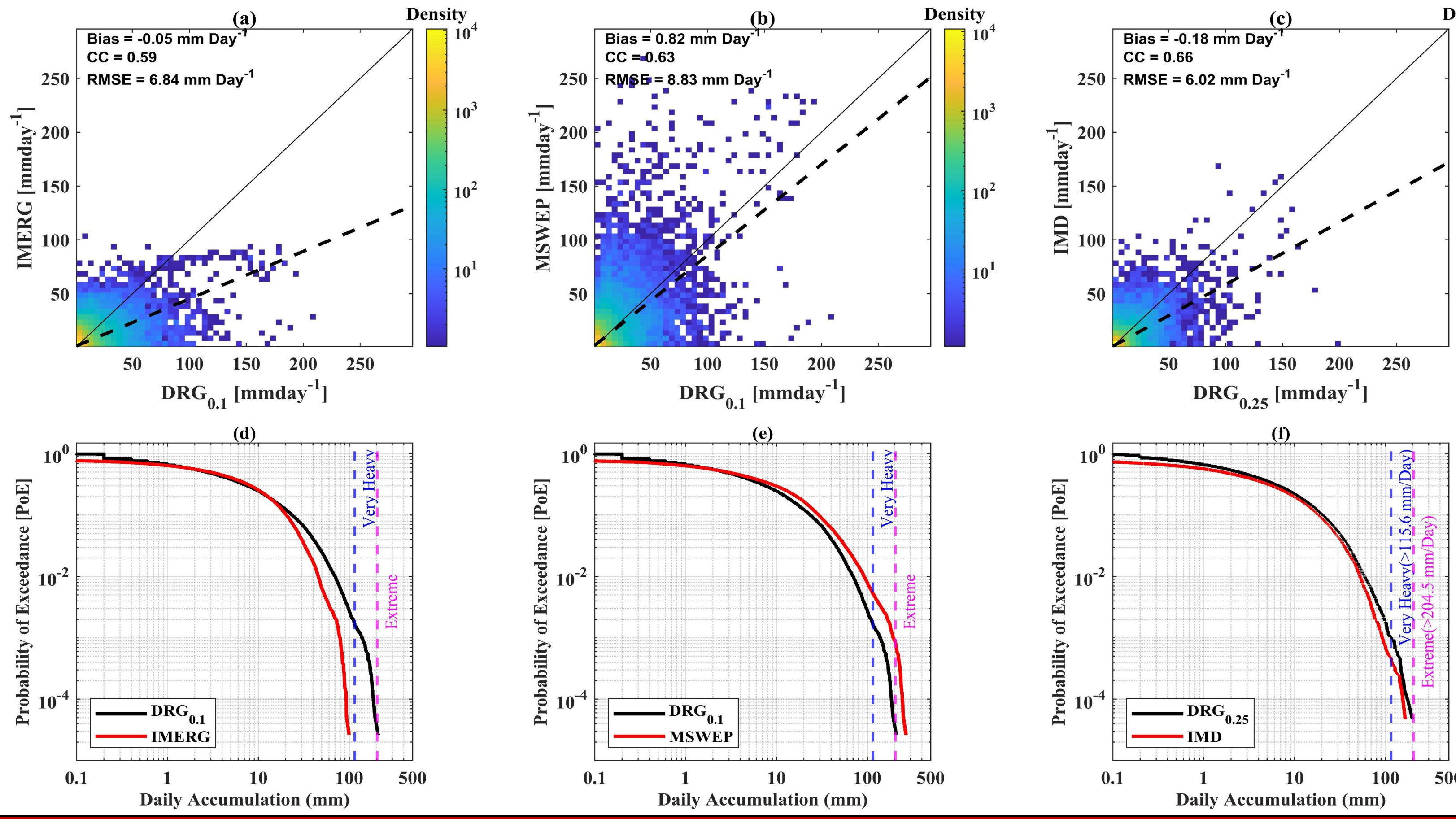


Figure 1: Spatial distribution of the dense rain gauge network across the study area.

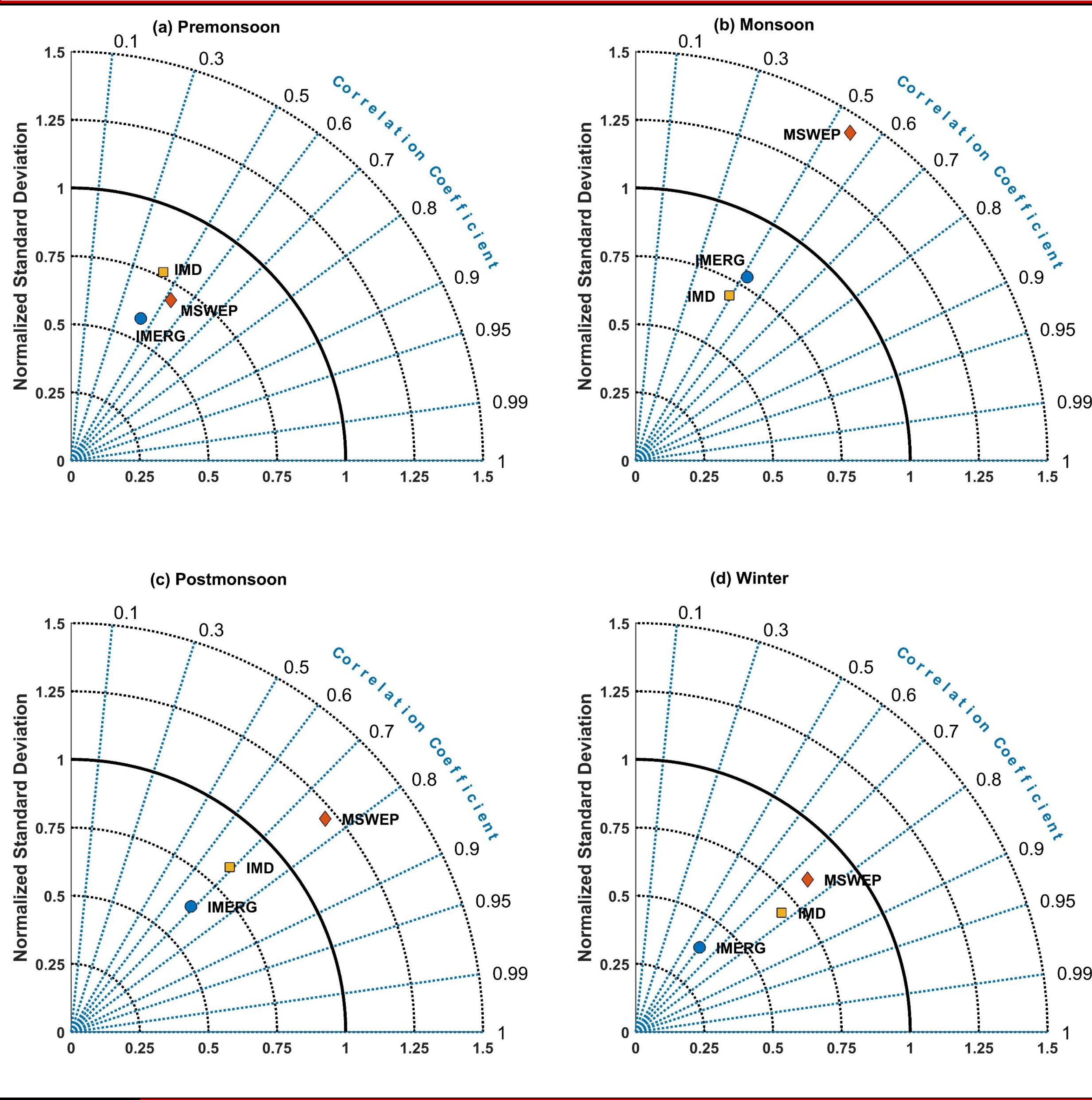
1. Blue dots: Individual rain gauge.
2. Regions below 500 m a.s.l (light green)
3. Regions between 500-1000 m a.s.l. (light orange).
4. A broader 0.25° grid (magenta dashed lines)
Data Product: IMD
5. A finer 0.1° grid (blue dash-dot lines)
Data Product: IMERG and MSWEP
6. Years 2017-2024

RESULTS

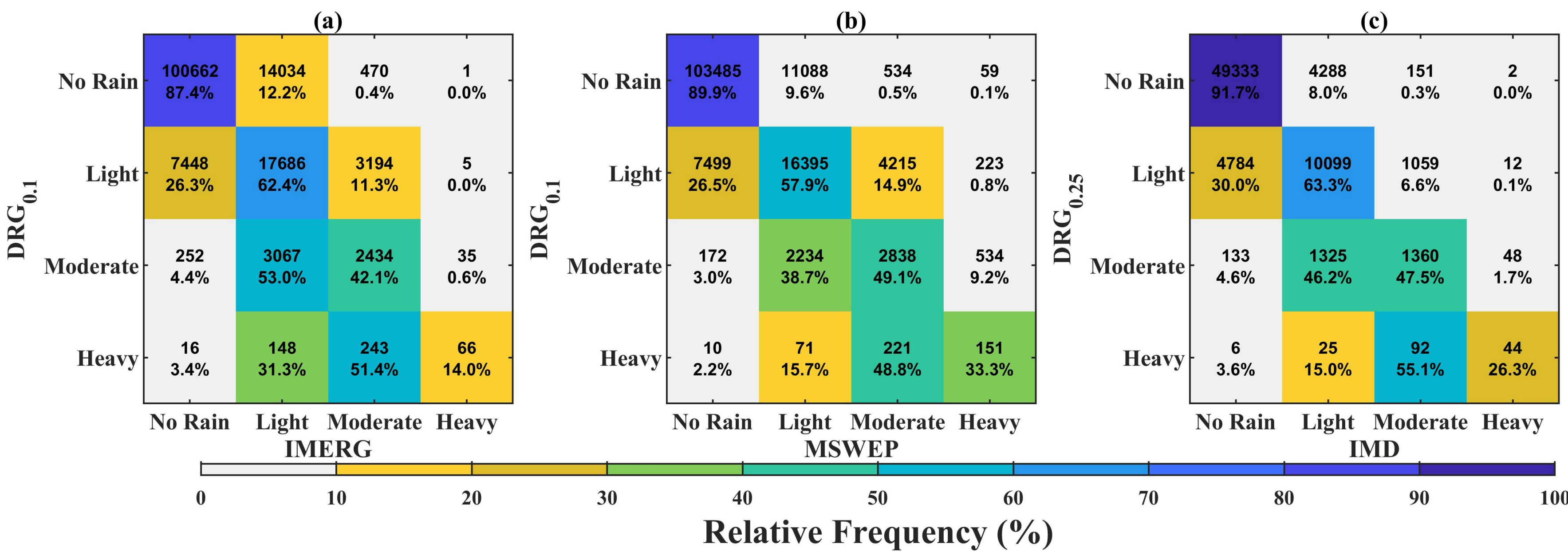
Intercomparison of daily accumulated rainfall



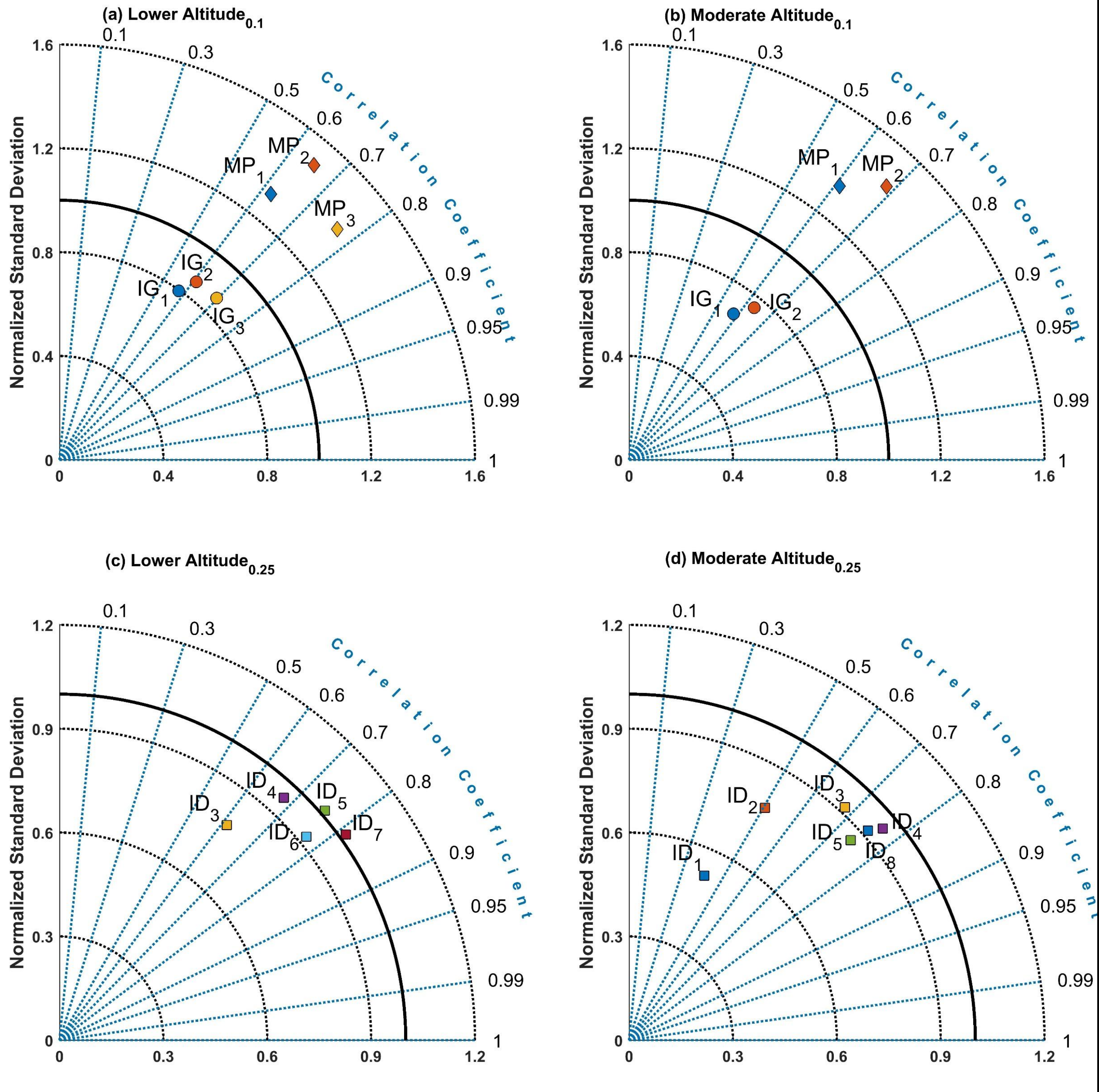
Seasonal Performance



Comparison of daily rainfall classification performance



Influence of Terrain and Gauge-to-Grid Representativeness



CONCLUSIONS

•**Heavy Rainfall Performance:** IMERG underestimates heavy rainfall, and IMD smooths out localized extremes. MSWEP V3 does the best job of capturing heavy rain, though it can sometimes overestimate it.

•**Terrain & Gauge Density:** Denser gauge networks improve grid-cell representativeness, while sub-grid rainfall variability and terrain effects contribute to differences in product performance, particularly for the coarser IMD dataset.

•**Statistical vs. Temporal Accuracy:** Good statistical scores don't guarantee accurate daily rainfall timing. Standard metrics (like RMSE or bias) aren't enough to capture temporal errors.

ACKNOWLEDGEMENTS

Diurnal-Phase fidelity

