



# Hydrological evaluation of gridded precipitation datasets in a Himalayan Catchment



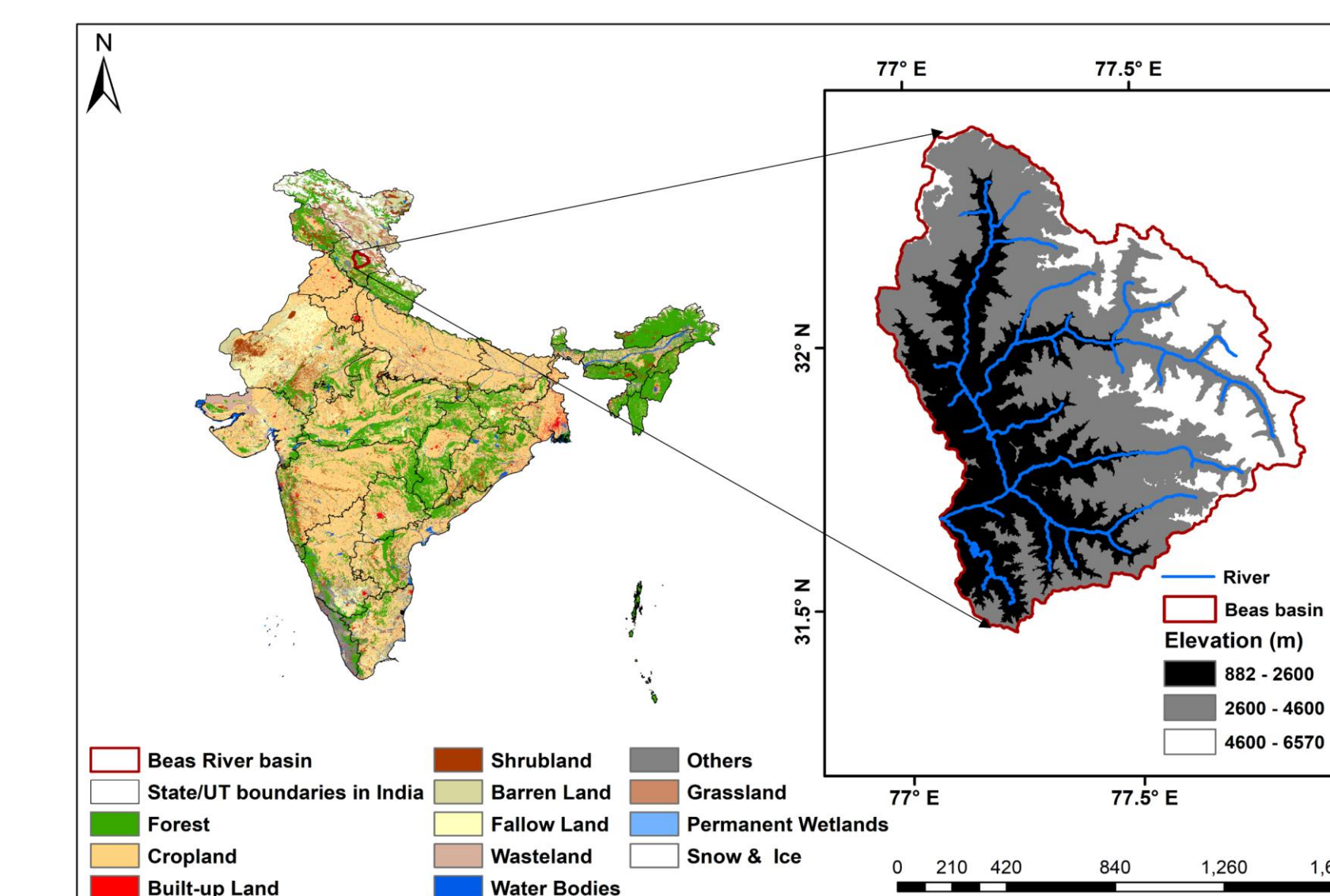
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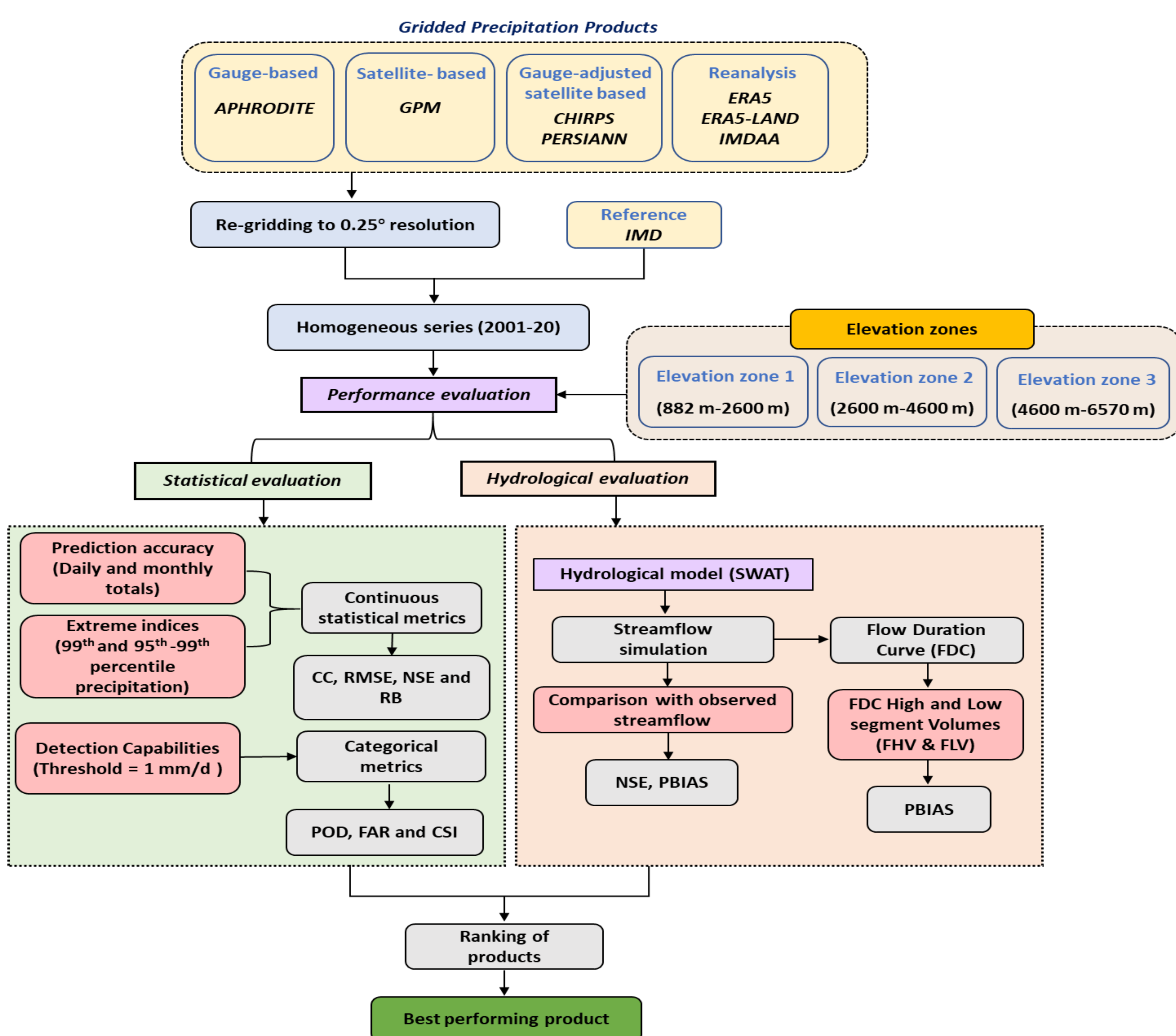
## Background & Motivation

## Study area

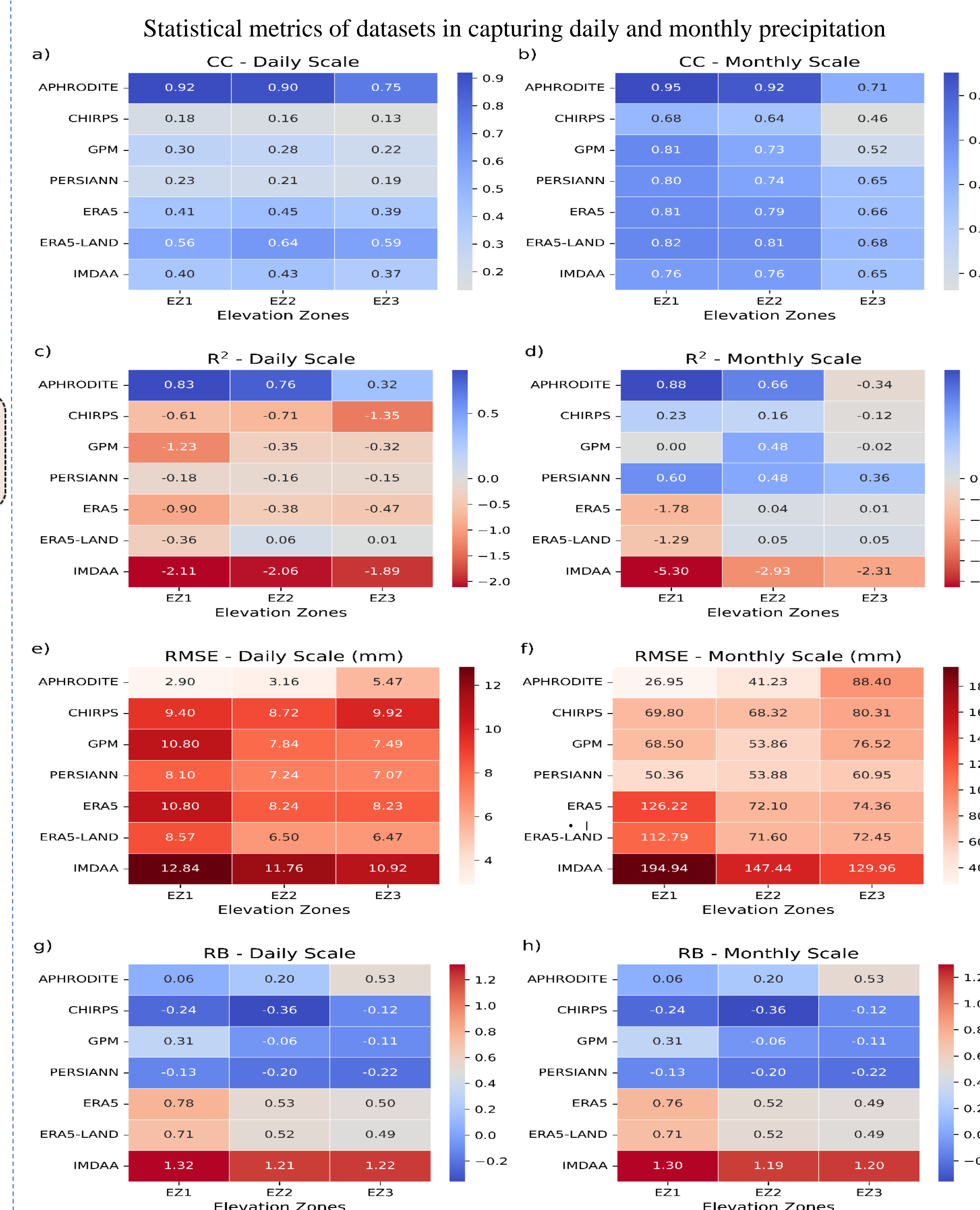
- Accurate precipitation representation is critical for hydrological modeling and climate impact studies, particularly in areas with limited data and complex topography such as the Himalayas.
- Recently, gridded precipitation datasets have become widely used to overcome the limitations of sparse gauge networks. However, their utility for hydrological applications cannot be assessed solely through statistical comparison with gauged precipitation, as this comparison is limited in Himalayan basins due to scarcity of gauges.
- So, this study evaluated seven precipitation datasets including APHRODITE, CHIRPS, GPM, and PERSIANN, ERA5, ERA5-LAND and IMDAA datasets both statistically and hydrologically in the Himalayan Upper Beas catchment using IMD precipitation data as reference.



## Methods



## Results



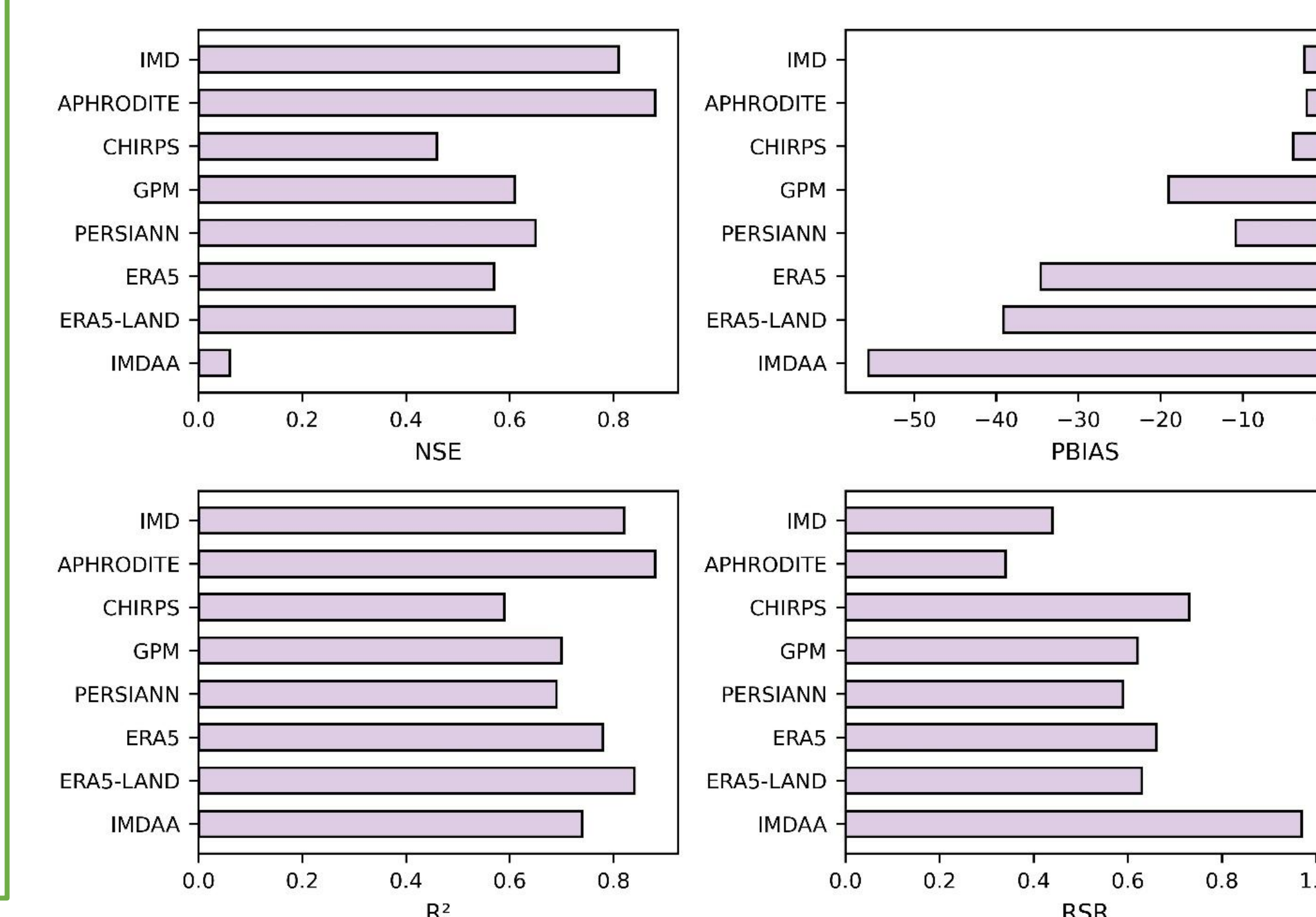
**Statistical evaluation**

- APHRODITE - "Very Good"
- ERA5-LAND - "Good"
- ERA5, GPM & PERSIANN - "Satisfactory"
- CHIRPS and IMDAA - "Unsatisfactory"

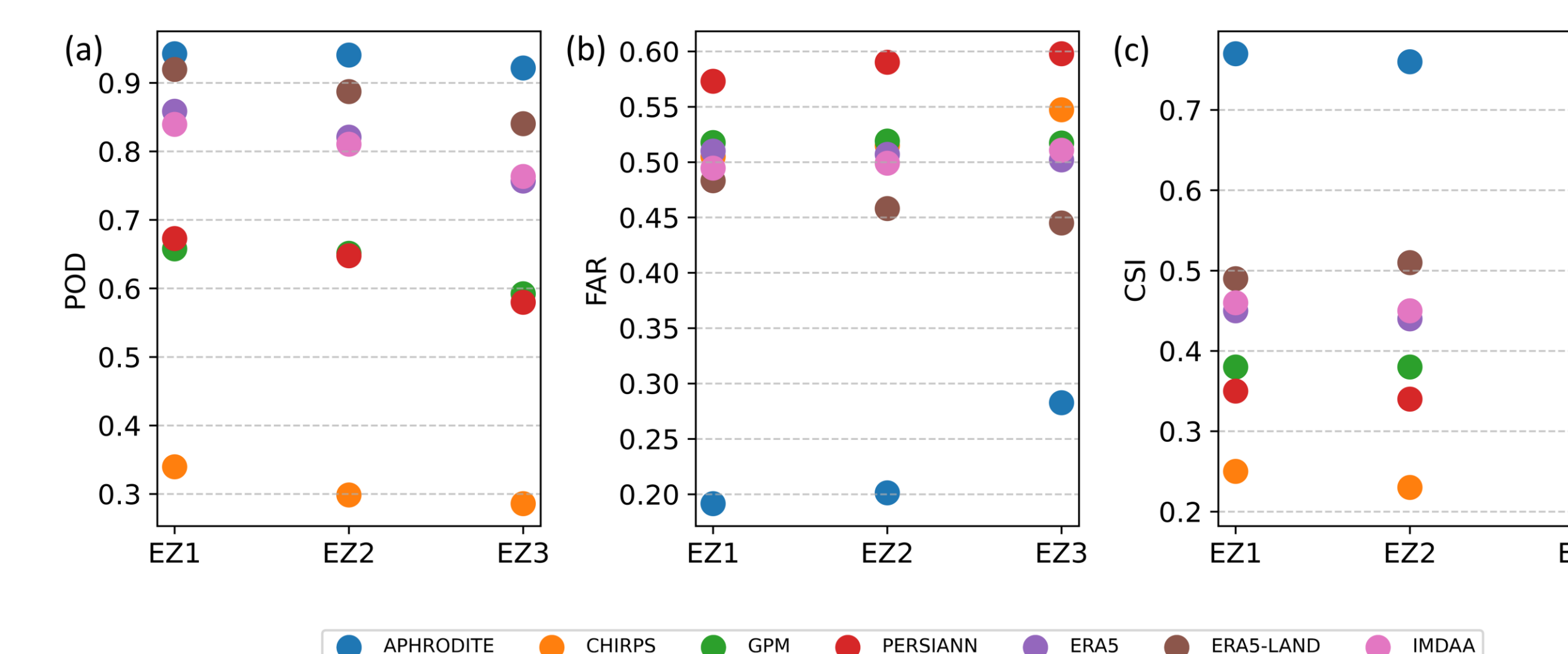
**Hydrological evaluation**

- APHRODITE - "Very good"
- PERSIANN - "Good"
- GPM - "Satisfactory"
- Others - "Unsatisfactory"

NSE, PBIAS, R<sup>2</sup> and RSR of daily streamflow obtained using the precipitation datasets



(a) Probability of Detection (POD), (b) False Alarm Ratio (FAR) and (c) Critical Success Index (CSI) of precipitation datasets in detecting precipitation events (≥1 mm)



## Key takeaways

- APHRODITE, PERSIANN and GPM were able to reproduce the streamflow. In contrast, ERA5 and ERA5-LAND failed to deliver reliable streamflow simulations despite their "satisfactory" performance in statistical evaluation.
- These findings suggest that statistical evaluation alone can lead to false conclusions and inappropriate selection of datasets for hydrological modelling.
- Therefore, this study strongly recommends the employment of both statistical and hydrological evaluation to select reliable datasets for hydrological modelling in complex Himalayan basins like Upper Beas.

## References

- D. N. Moriasi, J. G. Arnold, M. W. Van Liew, R. L. Bingner, R. D. Harmel, T. L. Veith, 2007. Model Evaluation Guidelines for Systematic Quantification of Accuracy in Watershed Simulations. Trans. ASABE 50, 885–900. <https://doi.org/10.13031/2013.23153>.
- Kumar, V., Borgemeister, C., Tischbein, B., Kumar, N., 2024. Evaluation and inter-comparison of twenty-three gridded rainfall products representing a typical urban monsoon climate in India. Theor. Appl. Climatol. 155, 9529–9553. <https://doi.org/10.1007/s00704-024-05191-3>