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Evaluation of Gridded Rainfall Products in the Selected Basins of Lower Mekong

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INTRODUCTION

Precipitation – a **key variable** in hydro-meteorological studies
Recorded gauge data are reliable and accurately reflect precipitation at earth's surface

However, reliable long-term gauge data are **scarce** especially in developing nations

Alternative
Gridded rainfall products (GRPs) – **freely available, easy access, global/regional coverage**

Challenges
Inherent uncertainties attributed by gridding techniques, gauge density, satellite measurement algorithms, etc.

Solution
Evaluation of GRPs against observed gauge data (
Statistical: single criterion- root mean squared error to multi-criteria techniques- Cooperative Game Theory
Categorical: Probability of Detection, False Alarm Ratio, etc.)

GRIDDED RAINFALL PRODUCTS (GRPs)

8 GRPs
Gauge-based GRP (APHRODITE, CPC, CRU, GPCC and SAOBS),

Satellite (TRMM)

Reanalyzed (CHIRPS, CMORPH)

Products	Spatial Resolution	Temporal Resolution	Period of Record	Data Source
Asian Precipitation Highly Resolved Observational Data Integration Towards Evaluation (APHRODITE)	0.25°	Daily	1951-2015	http://aphrodite.st.hirosaki-u.ac.jp/download/
Climate Prediction Center (CPC)	0.5°	Daily	1979-present	https://www.esrl.noaa.gov/psd/data/gridded/Tables/precipitation.html
Climate Research Unit (CRU)	0.5°	Monthly	1901-2015	https://data.ceda.ac.uk/badc/cru/data/cru_ts/cru_ts_4.05/data
Global Precipitation Climatology Center (GPCC)	0.25°	Monthly	1891-2016	https://opendata.dwd.de/climate_environment/GPCC/html/fulldata-monthly_v2018_doi_download.html
Southeast Asian OBServed (SAOBS)	0.25°,0.5°	Daily	1981-2014	https://sacad.database.bmkg.go.id/download/grid/download.php
Climate Hazard Group Infrared Precipitation with Stations (CHIRPS)	0.25°	Daily	1981-present	https://data.chc.ucsb.edu/products/CHIRPS-2.0/
CPC MORPHing (CMORPH)	0.25°,0.5°	Daily	1998-present	https://www.ncei.noaa.gov/data/cmorph-high-resolution-global-precipitation-estimates/access/daily/
Tropical Rainfall Measuring Mission (TRMM)	0.25°	Daily	1998-present	https://disc.gsfc.nasa.gov/datasets/TRMM_3B42_Daily_7/summary?keywords=TRMM_3B42

STUDY AREA

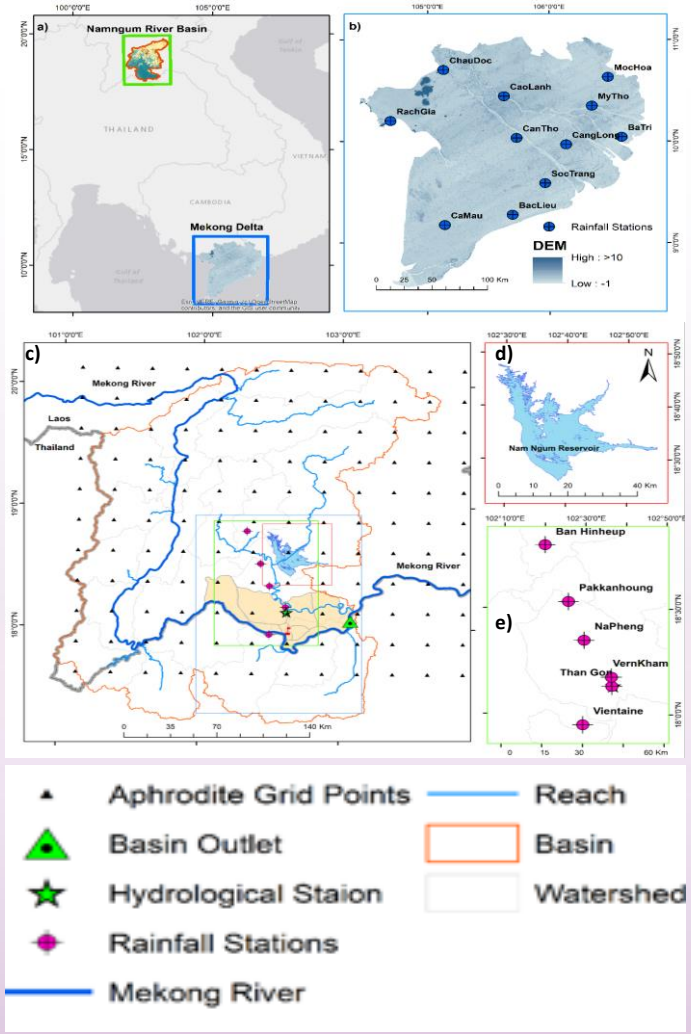
a) Location of subbasins in the Lower Mekong Region

b) Vietnam Mekong Delta (VMD) with rain gauge stations under considerations

c) Namngum River Basin (NRB)

d) Namngum Reservoir

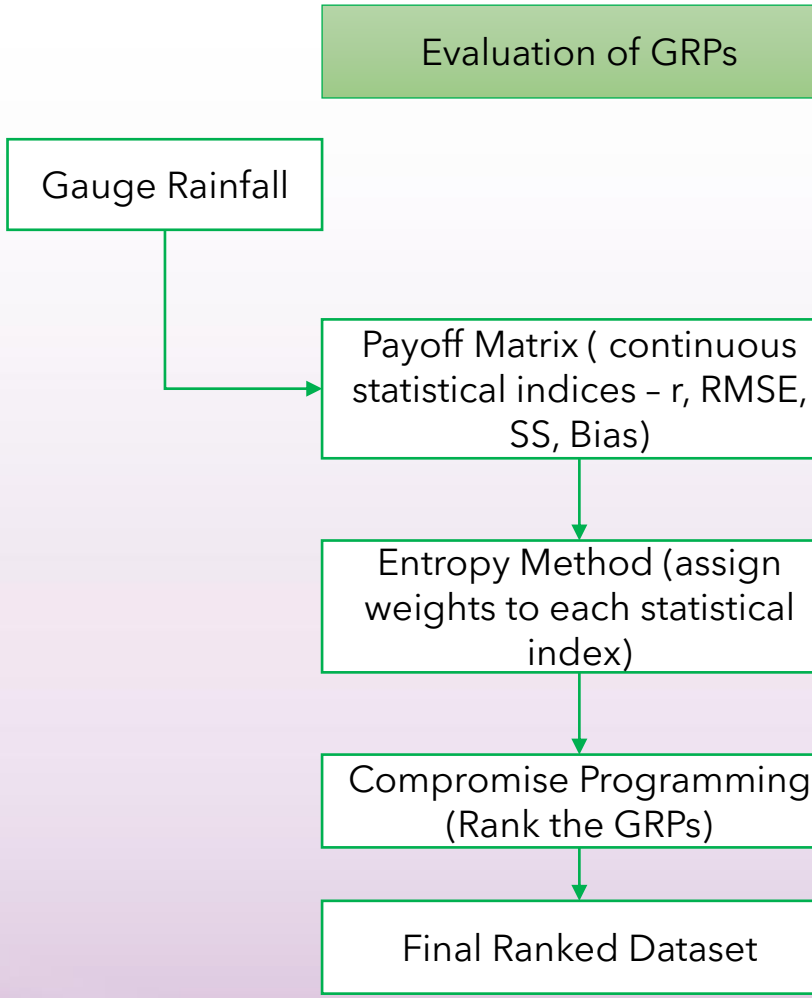
e) Rain gauge stations for NRB



METHOD

Entropy-Compromise Programming (Raju et. al. 2016)

- Several evaluation techniques- most of them rely on skill of evaluator to weigh the evaluation indices
- Entropy method –automatically assigns weight (free from bias introduced by evaluator) and Compromise Programming rank them based on the weight and distance of evaluation indices from the observed metrics

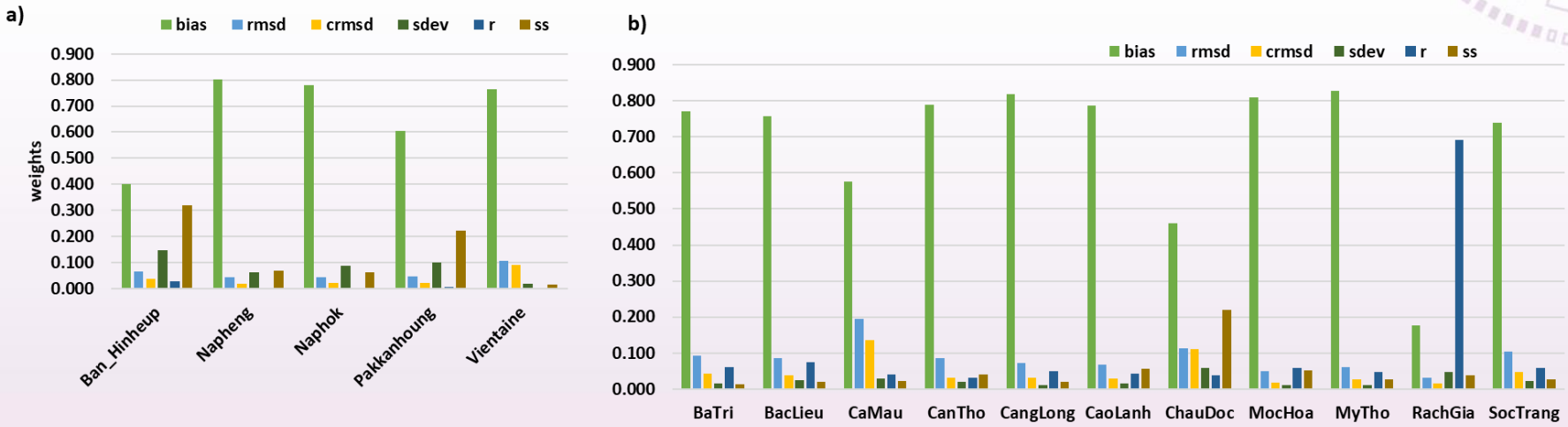


r: Correlation Coefficient
RMSE: Root Mean Squared Error
SS: Skill Score

(pixel-to-point comparison is made)

RESULTS

- Bias dominates the weights distribution ranging **between 40 to 80%** across all stations in both the subbasins

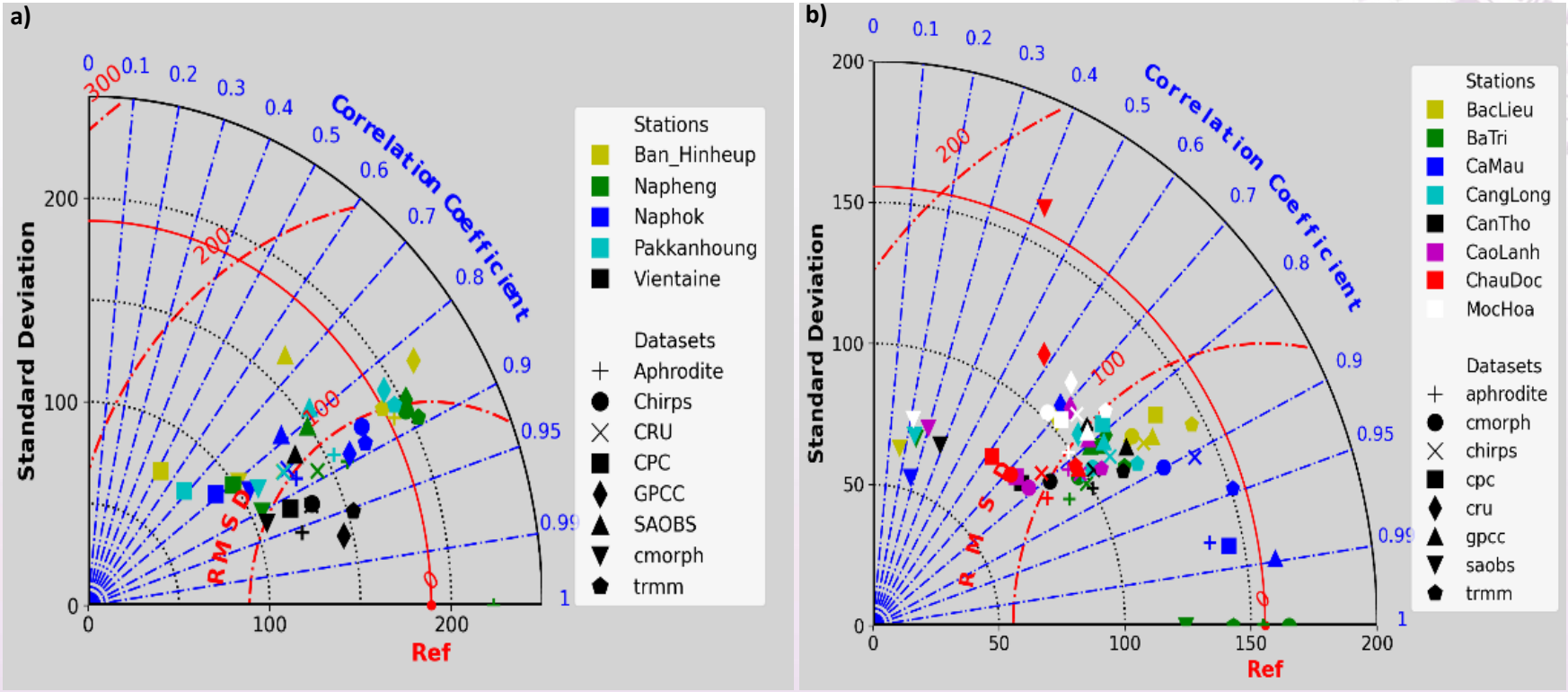


Distribution of weight among the statistical indices considered for evaluation
a) NRB b) VMD

RESULTS

GPCC at monthly scale outperformed all other datasets for both sub-basins

APHRODITE at daily scale outperformed other datasets for **NRB** while **TRMM** ranked top in **VMD**



Taylor diagrams housing performance of GRPs against observed rainfall **a) Namngum River Basin b) Vietnam Mekong Delta** based on 3 statistical indices (correlation coefficient, root mean squared error and standard deviation)

CONCLUSIONS

- **Plethora of GRPs** available with inherent **uncertainties**
- Prior **evaluation** is required
- Most of the evaluation technique are dependent on **the skill of evaluator**, Entropy based Compromise Programming automatically weighs evaluation indices and rank dataset
- Choice of the GRP shall be guided by the nature of application and evaluation indices to be used

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THANK YOU