Error Characterization of TMPA-RT V7 Estimates over Krishna River Basin in India

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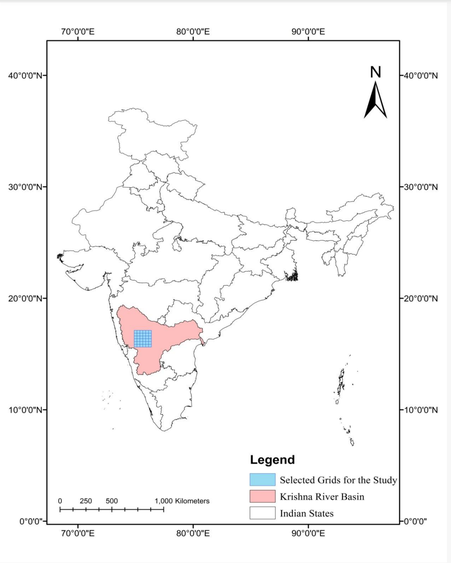
Abstract

In this study, we have carried out a detailed error characterization of TMPART-V7 estimates over the central part of Krishna river basin, India covering an area of about 20,000 Sq-km. Error characterization is performed with respect to rainfall intensity. The statistical measures used for characterization are Probability of Detection (POD), False Alarm Ratio (FAR) and Mean Hit Bias (MHB). Obtained results indicate that the POD is considerably less in low rainfall range (< 10 mm/day) as compared to moderate to heavy (> 10 mm/day) rainfall range. Moreover, FAR is also low in moderate to heavy rainfall ranges as compared to low rainfall range. Results indicate that the MHB in TMPA shows a different trend in different rainfall ranges i.e. TMPA-RT is overestimating the rainfall intensity up to 20 mm/day and beyond this range, it is underestimating. Finally, on the basis of our finding, it is recommended that the future effort on error correction should be made considering the rainfall intensity.

Introduction

- Availability of Near Real Time (NRT) Rainfall is one of the major constrain for Flood Early Warning System (FEWS) in most of the developing nations.
- NRT rainfall can be obtained through satellite remote sensing. Hence, an alternate source of NRT rainfall is Satellite based Rainfall Estimate (SRE).
- However, SREs is having significant error and uncertainties (Bitew and Gebremichael 2009). These errors mainly influence by rainfall intensity(Tan et al., 2015; Frédéric et al., 2009).
- Hence, the present work is aimed at error characterization of TMPA-RT (one of the most promising NRT SREs) with respect to rainfall intensity.

Study Area



Data

Reference Dataset: 0.25° x 0.25° gridded daily gauge rainfall dataset from Indian Meteorological Department (IMD) developed by Pai et al., 2014.

TMPA RT-V7: A real-time TRMM gridded data product, which is a merged rain product, derived using Geostationary IR data and Microwave observations (Huffman et al., 2007). The data is available at 3 hours temporal resolution and at 0.25° X 0.25° spatial resolution and data can be downloaded from (http://disc2.nascom.nasa.gov/Giovanni/tovas/)

Study Period: 2002-2013 (Indian Summer Monsoon

Methodology

Collection and Preprocessing of data (Summer Monsoon 2002-2013)

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Segregation of data into different precipitation intensity ranges

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Estimation of POD, FAR and MHB for each of the precipitation range

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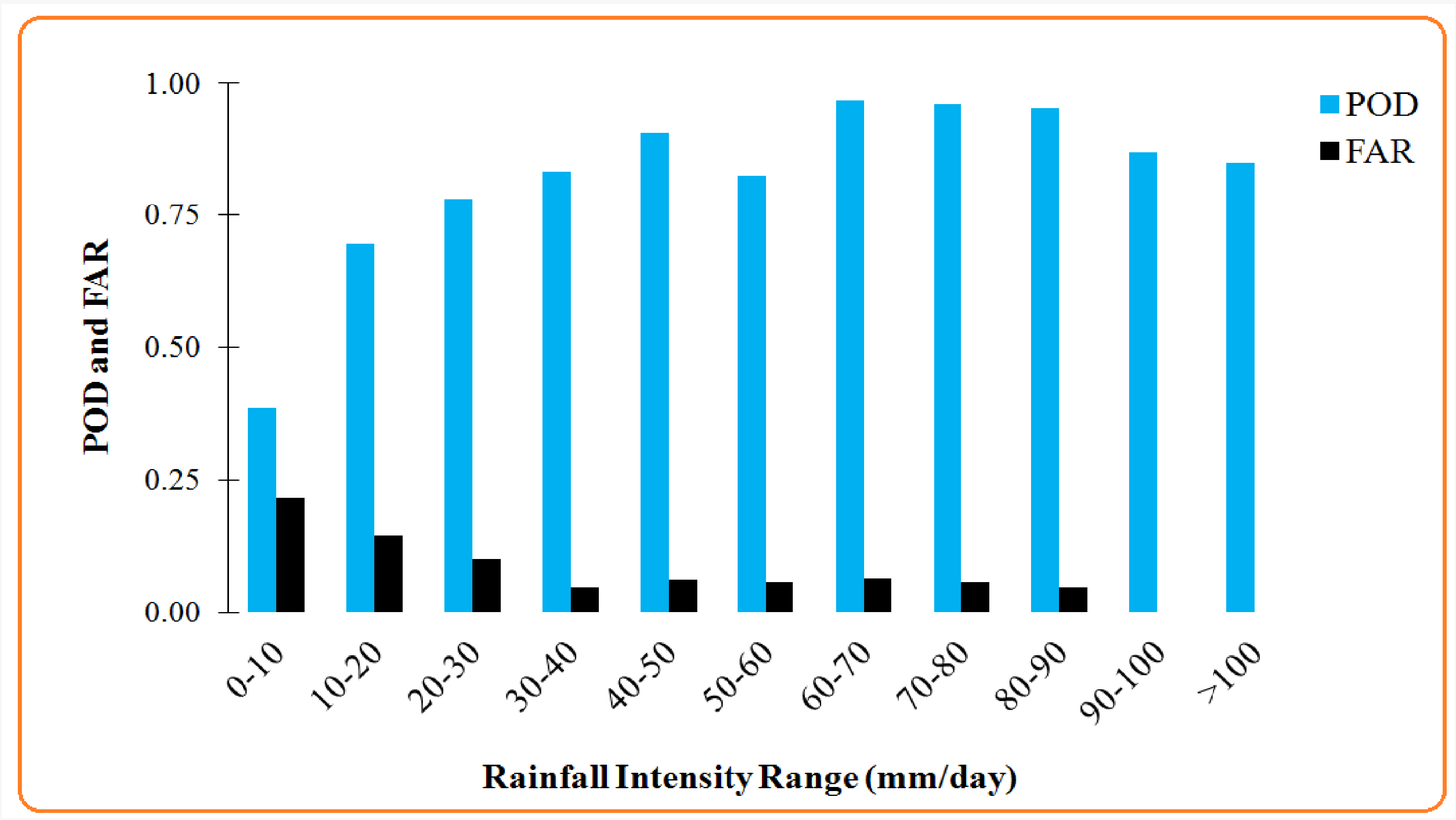
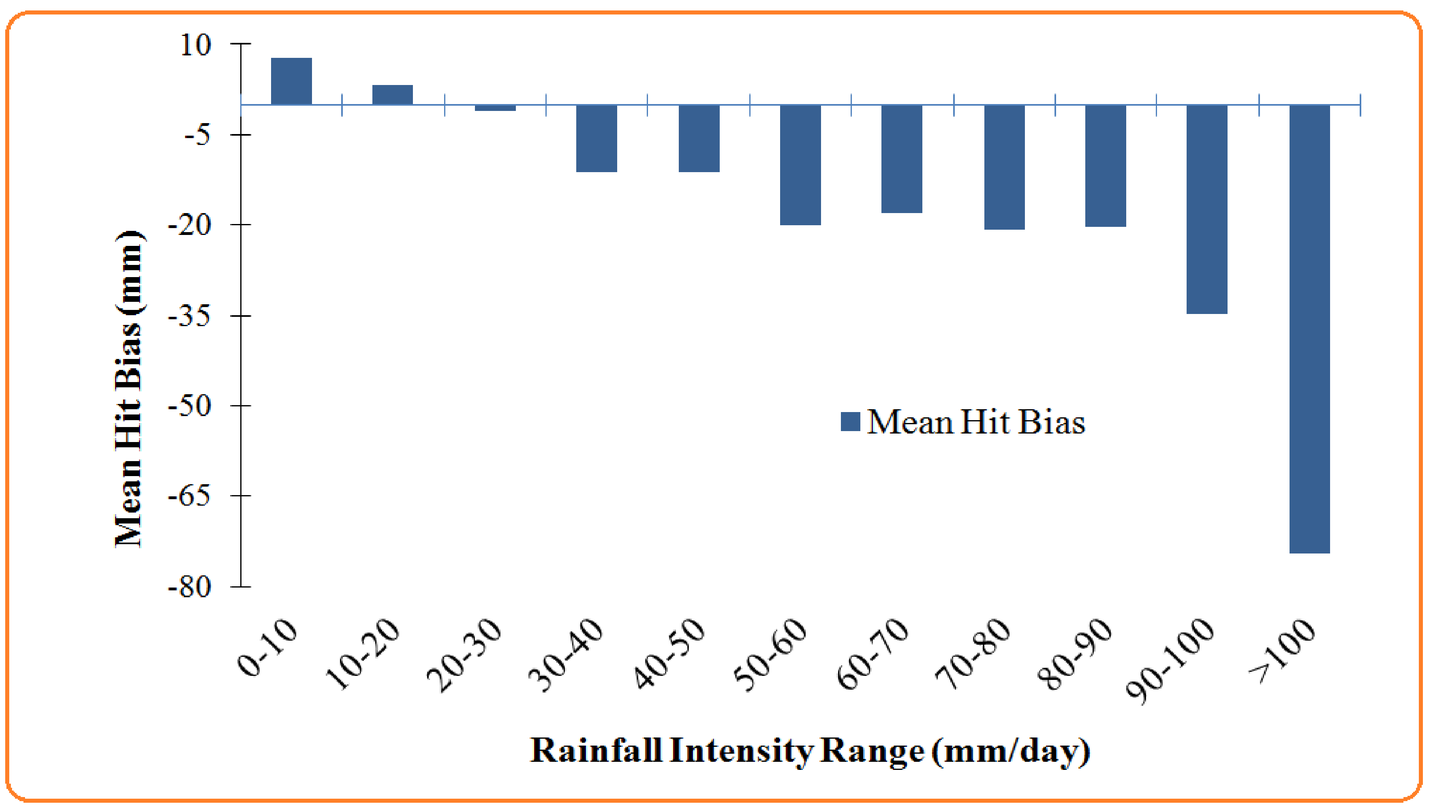
Analysis of obtained results

Results





- POD (FAR) is significantly high (low) for the rainfall intensity greater than 10 mm/day, indicate the detection capability of TMPA-RT is very high for the moderate to high rainfall intensity (>10mm/day). Moreover, there is no false precipitation for the rainfall intensity greater than 90 mm/day.
- In summer monsoon, miss precipitation is more problematic as compared to false precipitation.
- During hit event, problem of overestimation mainly exists for the rainfall intensity up to 20 mm/day, however, beyond 20 mm/day, TMPA-RT shows underestimation. Moreover, a huge underestimation can be seen for the rainfall intensity greater than 90 mm/day.
- For the study period, TMPA is having more underestimation problem as compared to overestimation during hit event.

Conclusions

- Miss precipitation and hit error is the major sources of error during summer monsoon in TMPA-RT.
- The detection capability of TMPA-RT is very high for the rainfall intensity greater than 10 mm/day.
- The overall results indicate that the rainfall intensity plays an important role in the error characterization of TMPA-RT.
- During hit event, TMPA-RT overestimates the light rainfall intensity (< 20 mm/day). However, it underestimate the moderate to high rainfall intensity (> 20 mm/day).
- Problem of underestimation is severe as compared to overestimation during hit event.

Future Recommendations

- On the basis of our finding, it is recommended that the future effort on error correction should be made considering the rainfall intensity as well.
- The primary focus should be on the improvement in miss precipitation and hit error of TMPA-RT during summer monsoon over similar climate regions.

Selected References

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