# A Method for Bias Correction of Remotely Sensed Precipitation across Western Ghats Region of India

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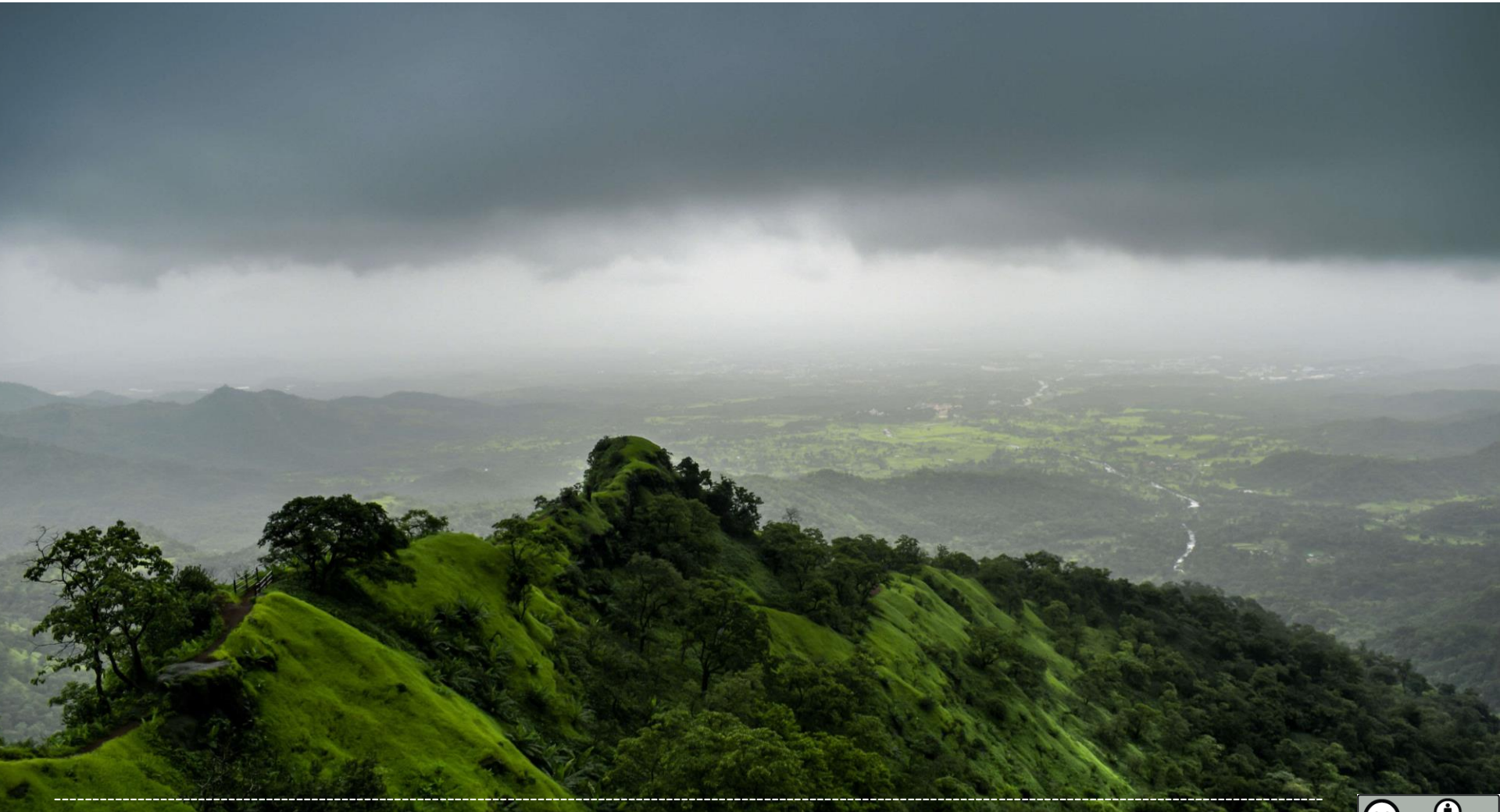


## The Western Ghats

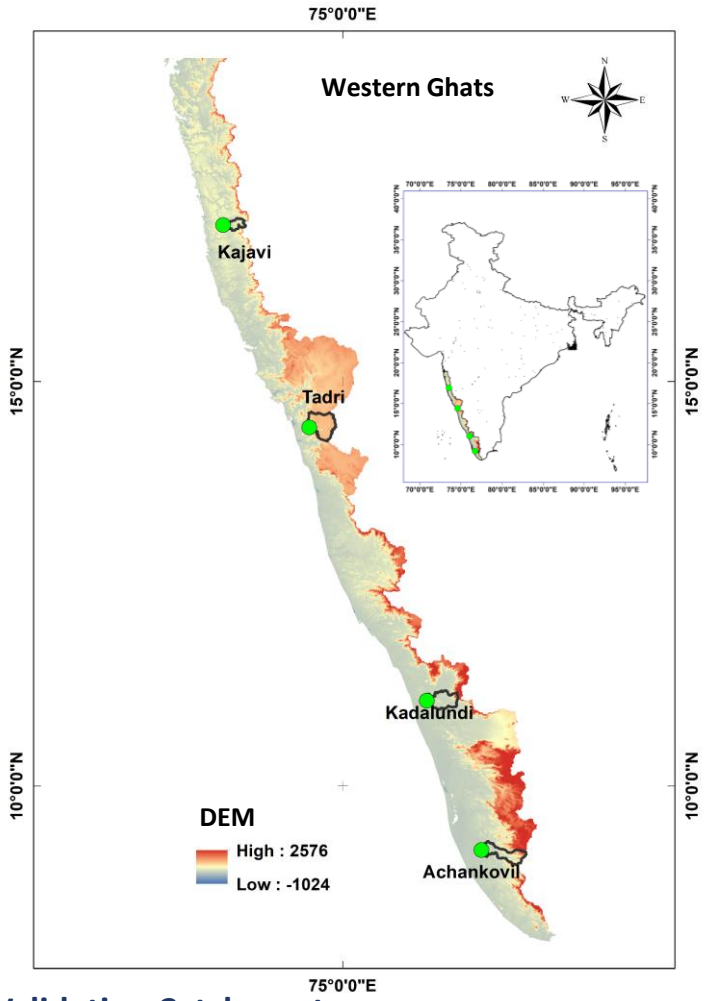
- The western Ghats are the mountainous range with an area of 140,000 square kilometers, stretches to 1600 kilometers parallel to west coast of India
- It include a diversity of ecosystems ranging from tropical wet evergreen forests to montane grasslands
- West of western Ghats receives an average annual rainfall of 2000 mm to 7800mm

## Problem Statement

Previous studies reported that most of the remotely sensed (RS) precipitation products underestimates rainfall in the Western Ghats region, especially during monsoon season

## Research Objectives

- Develop a generic approach for the bias correction of different satellite and processed rainfall products across Western Ghats region of India.
- Test the efficacy of bias corrected rainfall in hydrological modelling




### Validation Catchments

| River | Station | Area ($km^2$) | Avg. Annual Rain (mm) |
|---|---|---|---|
| Achankovil | Thumpamon | 810 | 2600 |
| Kadalundi | Karathodu | 750 | 3201 |
| Tadri | Santeguli | 1090 | 2956 |
| Kajavi | Anjanari | 315 | 2550 |

## Methodology

- Quality controlled interpolated gridded rain gauge data from Indian Meteorological Department (IMD) is used as the base.

| Product | Resolution | Source |
|---|---|---|
| IMD | 0.25◦× .25◦ | Indian Meteorological Department |
| TRMM_3B42_Daily | 0.25◦× .25◦ | NASA GES DISC |
| PERSIANN | 0.25◦× .25◦ | CHRS at the University of California, Irvine |

- The bias between IMD and RS rainfall products follows a pattern, with higher positive bias during monsoon season in all the 126 rainfall grids of the Western Ghats region
- A rainfall multiplier (Ɛp) is calculated using the following equation for each month of the 126 grid cells

*Ɛp = Average daily IMD rainfall of the month / Average daily RS rainfall of the month*

- The *Ɛp* of each month for 126 grid cells forms the error distribution for that month
- Rainfall corrected with this error distribution is then used to run a hydrological model to get streamflow predictions

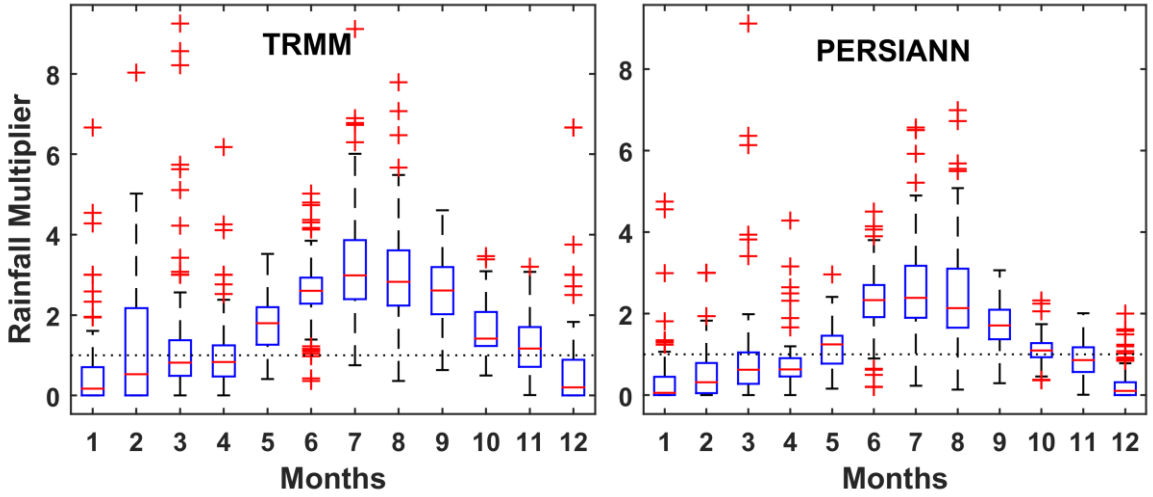
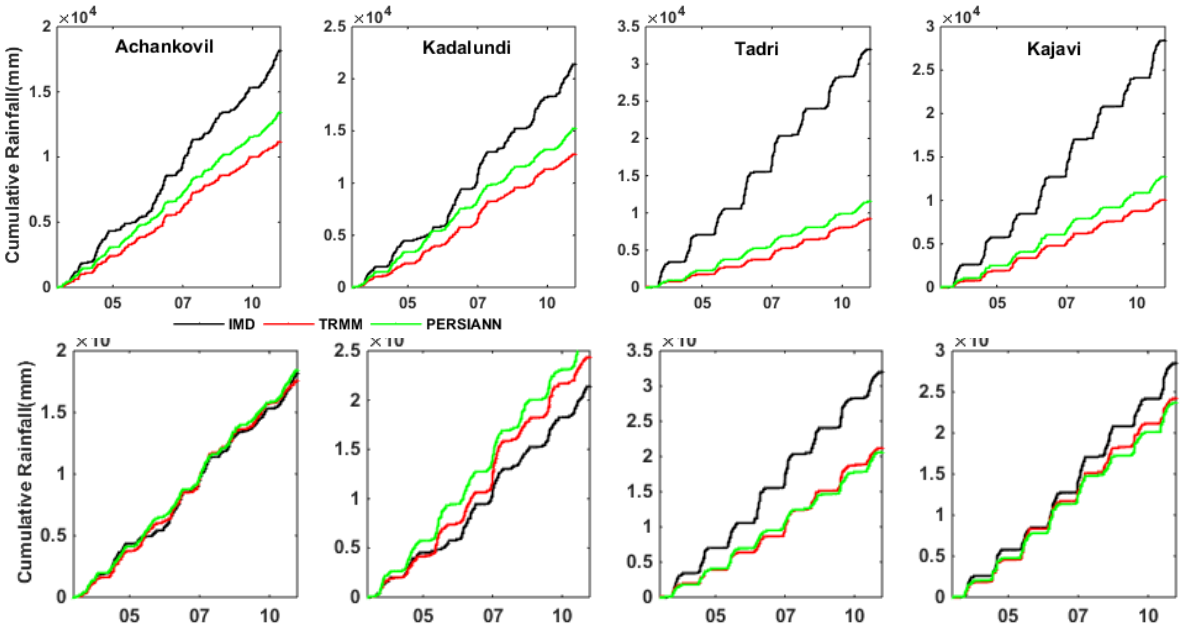
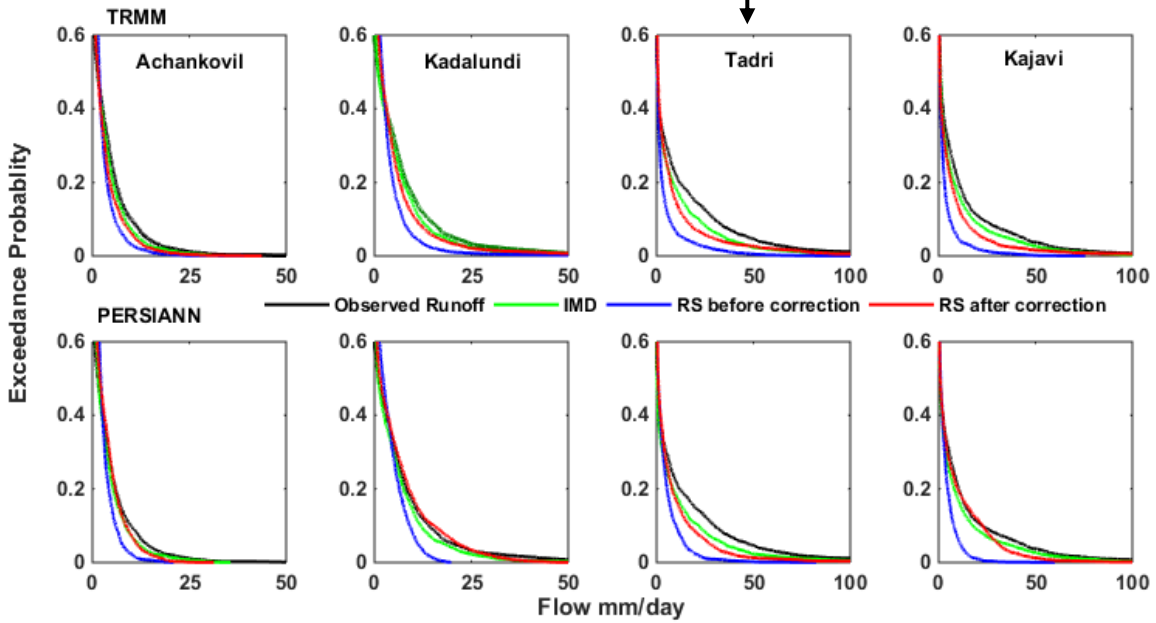


**Fig :** Comparison of cumulated daily rainfall before (top row) and after (bottom row) bias correction in the validation catchments →




- The efficacy of the bias corrected TRMM and PERSIANN rainfall is the tested with the help of **GR4J** rainfall-runoff model
- Model was calibrated and validated for the Period 2003-2007 and 2008-2010

**Fig :** Comparison of daily runoff before and after the bias correction of TRMM and PERSIANN rainfall ↓




## Conclusions

- Systematic multiplicative bias was observed with RS precipitation products and IMD rainfall in the western Ghats region
- The proposed rainfall multiplier method helps to reduce the bias in different rainfall products and provide improved runoff estimations at Western Ghats.