Reliability of gridded precipitation products for water management studies : the case of Ankavia river basin in Madagascar

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Introduction

❑ CONTEXT

In the case of low coverage density of ground-based measurements, gridded precipitation products (GPPs) constitute an attractive alternative, the quality of which must nevertheless be verified.

Note : The choice of GPP has a significant impact on runoff estimation (Van, 2018)

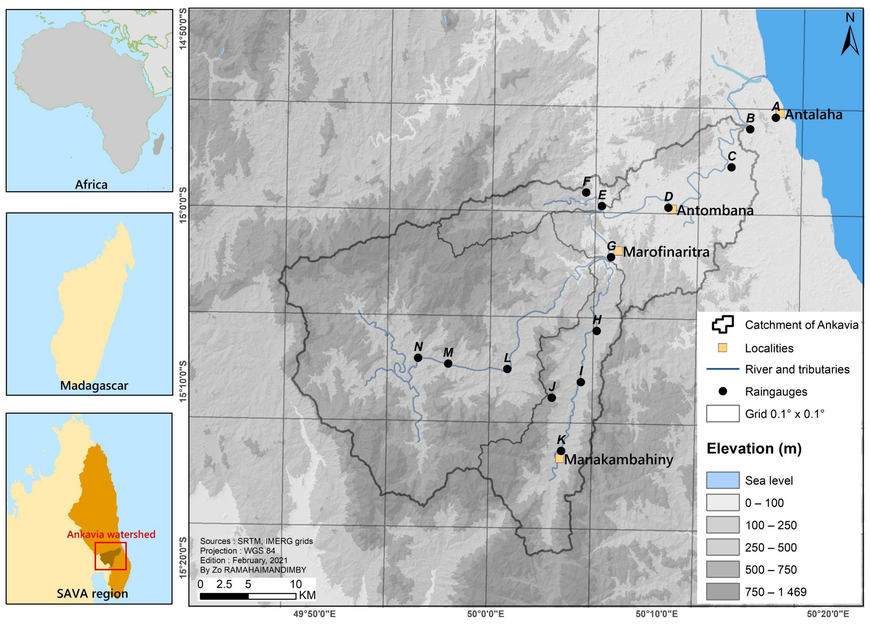
❑ OBJECTIVE

To evaluate at different time scales (hourly to yearly) the reliability of six GPPs (ARC2, CHIRPS, ERA5, IMERG, PERSIANN, RFEv2) against a 2-year record from a network of 14 rainfall gauges located in the Ankavia catchment as part of the GIRE-SAVA project (Madagascar).

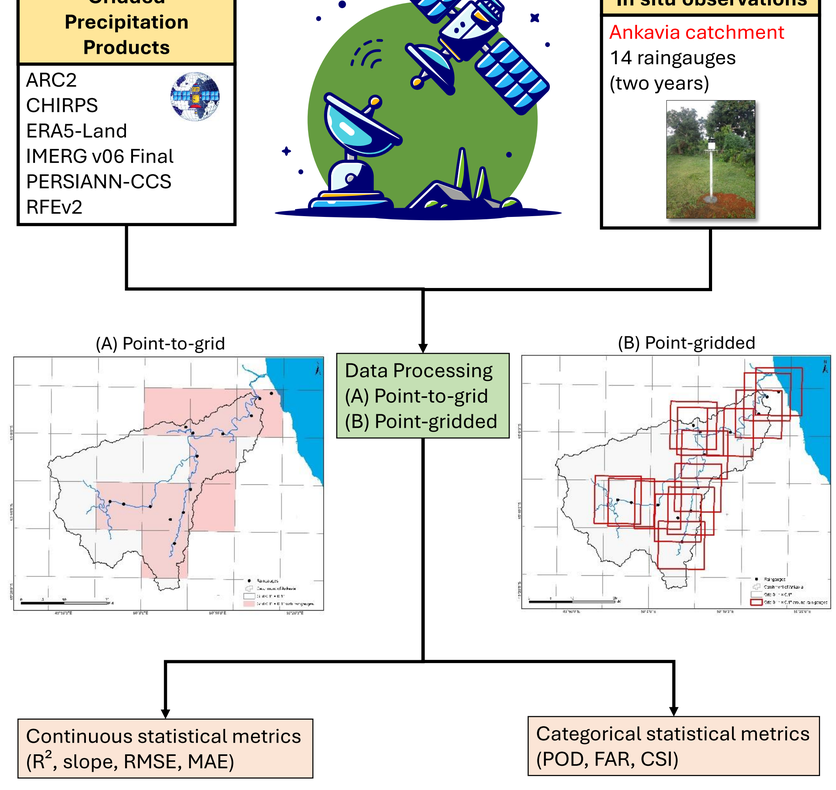
Materials & Methods

❑ The Ankavia catchment

Pilot basin : catchment of Ankavia (1116 km²),
District of Antalaha, SAVA region, Madagascar
Most equipped river basin in term of rainfall monitoring stations in the area : 14 rain gauges, but still has low coverage density

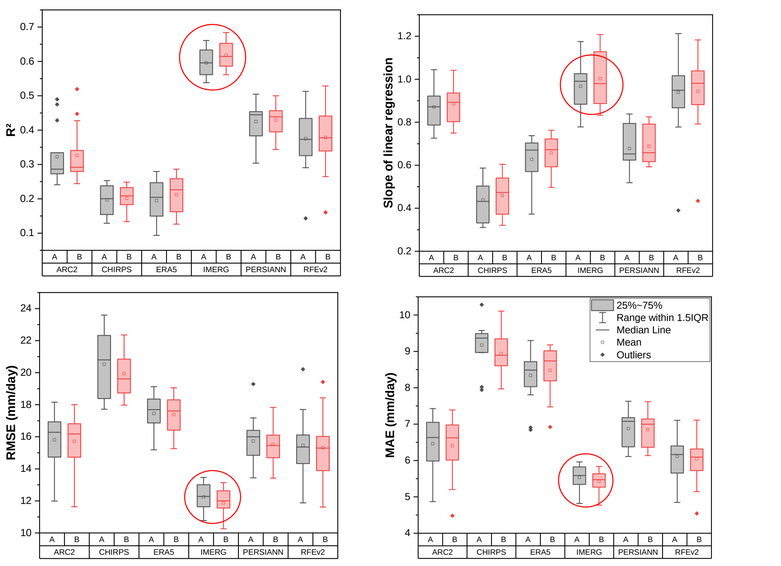


❑ Methodology



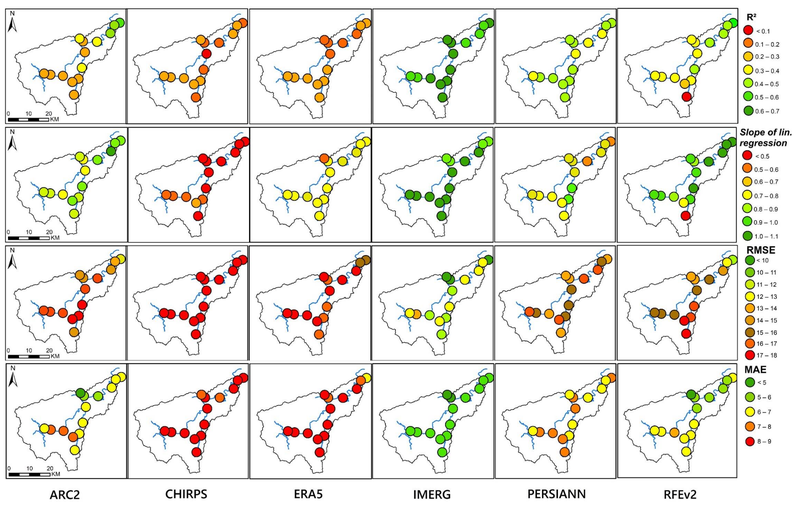
Results

❑ Overall GPP performance at daily time scale



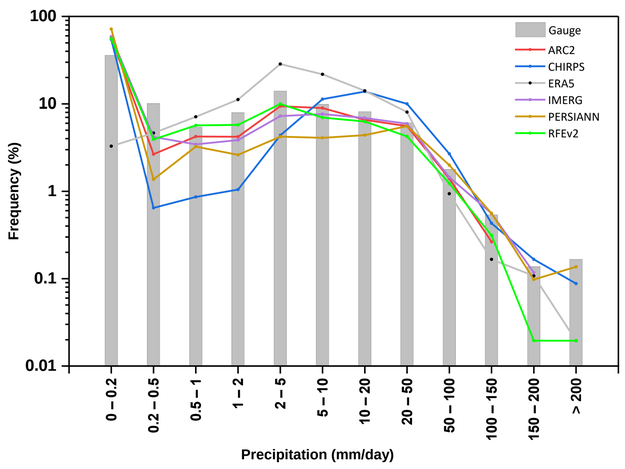
IMERG outperforms all the SPPs : ↑R² ↑a ↓RMSE ↓MAE
B: best approach

❑ SPP performance across the watershed



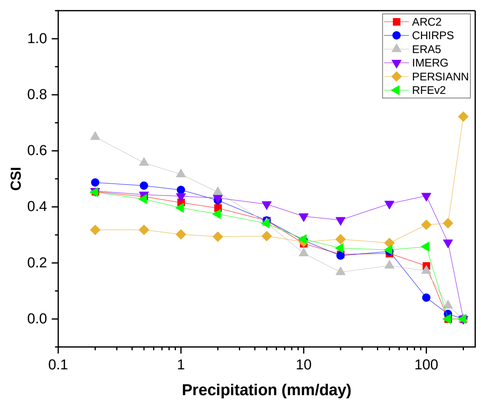
IMERG : good and fairly uniform levels of agreement
No particular spatial trend for all SPPs

❑ Probability Density Function (PDF)



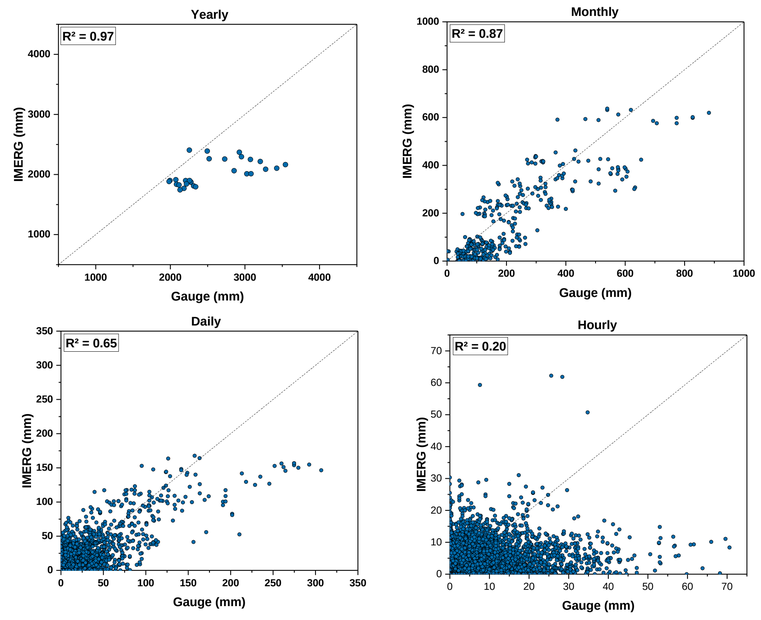
0 – 0.2 : ARC2, CHIRPS, IMERG, PERSIANN, RFEv2; ERA5
0.2 – 150 : ARC2, CHIRPS, IMERG, PERSIANN, RFEv2; ERA5
> 150 : ARC2, IMERG, ERA5, RFEv2, CHIRPS, PERSIANN

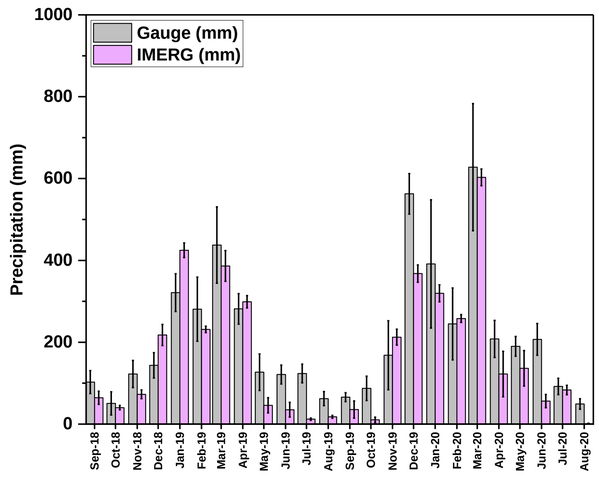
❑ Precipitation detection ability



CSI value :
ERA5 best in 0.2 – 2 mm/day
IMERG best in 2–100 mm/day
PERSIANN best in > 150 mm/day
IMERG > PERSIANN in 0.2-100 mm/day

❑ Different time scale assessment (yearly to hourly) [Only for IMERG]





R² : Yearly > Monthly> Daily> Hourly

Conclusions

- Large difference among GPPs in comparison to *in situ* rain gauges.
- Performance at daily scale : IMERG > RFEv2 > ARC2 > PERSIANN > CHIRPS ~ ERA5
- Limitations of IMERG : difficulty to detect rainfall > 100 mm/day – low R² at hourly time scales
- IMERG : most reliable input for hydrological modeling in the area

Acknowlegments

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