



## **Africa's rainfall: Systematic literature comparison of rainfall products**

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There exist many operational rainfall products covering either the entire globe or only (part of) Africa. These products are very different. They are given at different resolutions, based on different algorithms and different kinds of observations (gauges, satellite, radar, ...). Another possible source of rainfall data are the models and reanalysis. All these precipitation estimates have different performances and the "best" one depends on the user's application.

They have been compared over various parts of Africa in a number of studies. However, it is difficult to compare the products. Quantitative results depend on the resolution and the domain chosen for the validation, the reference dataset, and the method used. These studies are used to assess the qualitative/relative performance of the products over different regions.

By systematically comparing the rainfall products, we can identify their strengths and limitations, and the factors influencing their performances. We observed that performance of a product can vary a lot from region to region. The algorithms and the kind of data used in the product also have a big influence on the product's behaviour. For example, products created for drought monitoring tend to underestimate precipitation. There are also some factors influencing all the products. Gauge-density is important for both gauge-only and satellite-based products since most of the latter category also use gauges for bias adjustment or calibration. All products have difficulties with orographic rainfall. Rainfall from warm-cloud processes is also generally underestimated by satellite-based products. The performance of all estimates depends on the rainfall regime which varies in time and space. Some climates are more difficult than others to estimate. Reanalysis and global circulation models have poor performance over the Tropics but they can be improved by dynamically downscaling with a regional model. We remark that only a few products are using data from a model alongside satellites and gauges data