

Response to Editor

General comments

Abstract: You might want to add the interesting aspect that rainfall estimation and streamflow estimation capability depend on season, because this is an important piece of information for algorithm and model developers.

Response: I have included the following sentences to the abstract part. “Moreover, climatic season of the DRB influences rainfall and streamflow estimation. This information is important for modifying rainfall estimation algorithm”

Your conclusions section is mostly a repetition of results. Recommendations to "research communities and decision-makers", who you say benefit from your study, are completely missing. Some ideas for further research, possibly at shorter time scale, or, conversely, on longer time scale (e.g. for climate change studies) would also be of interest here.

Responses: modified a bit the conclusion part by explaining the implications of results.

Recommendation: The beneficiaries of this study are both scientific communities and water resource managers. As well, I have indicated further research. As such, I have rewritten the last sentences on recommendation and further research idea as follow: “The results of this study are of interest to both scientific communities and water resource managers, and this paper has made a good contribution to improve understanding of the latest SREs for Ethiopia and the DRB. The selected SREs in this study should be test for climate studies.”

Specific comments

Line 43: [communication](#) -> commercial.

Response: corrected as suggested.

Lines 45-54: Please rephrase these statements and separate gauges from radar, as they have very different characteristics: gauges are (as you state) point measurements, but radars can sense rain over a large area, unless topographic features block the view. Of course both are sparse, but for good coverage one requires a lot more gauges than radars.

Response: rephrased the sentences and separated the gauge and radar as suggested.

“Ground-based rainfall measurements using rain gauge is a direct and generally accurate near the sensor location. However, rain gauges either are of poor density to represent spatial and temporal variability of precipitation, or may not even exist in many basins especially in developing countries (Behrangi et al., 2011). Rain gauge based rainfall measurement techniques provide point measurements and subject to missing data due to mainly measurement errors (Kidd et al., 2012; Maggioni et al., 2016). It may also be infeasible to install and maintain dense ground-based gauging stations in remote areas like mountains, deserts, forests and large water bodies (Dinku et al., 2018; Tapiador et al., 2012). On the other hand, radar rainfall measurement technique cover larger area and provide rainfall data at high spatial and temporal scales (Sahlaoui and Mordane, 2019). However, radar rainfall measurements have limitations due to attenuation of radar signal

by several features that negatively affect the quality of rainfall measurement (Villarini and Krajewski, 2010; Berne and Krajewski, 2013; Sahlaoui and Mordane, 2019).”

Line 86: **PERSSINN** -> **PERSIANN**

Response: Done as suggested.

Lines 175-181: Note that TRMM3B42 is succeeded by IMERG.

Line 199: Please do not mix satellite missions and algorithm names: GPM is a satellite mission, just like TRMM (TRopical Rainfall Measurement Mission). GPM is the follow-up mission to TRMM, IMERG is the successor algorithm of TMPA.

Responses: Corrected as suggested.

Line 247: **through** -> **throughout**

Response: corrected as suggested.

Table 2: I agree with referee 1 that POD, CSI, and FAR are not appropriate statistics for monthly means, as there will be few data points with monthly mean precipitation rate equal to 0. See also next comment.

Line 261: Please reply to referee 1's comment regarding categorical metrics: Why do you believe that non-zero/zero separation makes sense for monthly data? The author's reply is insufficient, and since this is a major comment by the referee, some changes to the manuscript should be made to clarify the issue.

Response: As described in responses to reference 1, categorical indices such as POD, FAR and CSI were used for detecting zeros/non-zeros rainfall for the individual months of the year but not for the mean monthly rainfall, which may not be always zero. For the Dhidhessa River Basin, October to February months are dry season where rainfall is zero at all. Therefore, for the study periods from 2001 to 2014, there are many points with monthly rainfall rate with 0 values. In this concept, POD, FAR and CSI are applicable for determining rainfall detection capability of satellite. For example, Ayehu et al. (2018) effectively applied this methods for the upper Blue Nile Basin, where Dhidhessa River Basin is located.

Lines 345-346: **This could be due (...)** variability. More likely, the seasonal variability is much larger than the interannual variability. The seasonal variability is, apparently, captured reasonably well, causing a higher degree of correlation for monthly data.

Response: corrected as suggested.

Lines 414-416: **The result shows (...) volume.** -> The results show that the peak streamflow is underestimated for all rainfall products, including gauges, but the streamflow volume is generally overestimated.

Response: Done.

Line 423: **more devaite** -> **deviate more**

Response: Corrected

Line 424: **clsr** -> closer

Response: Corrected.

Lines 437: **3B43 product did not use adequate gauge data.** What about spatial resolution?

Response: The coarseness of the dataset is also another reason. As such, the sentence is modified as follows. “The reasons could be attributed to the fact that gauge adjustment for 3B43 product did not use adequate gauge data from Ethiopian highlands due to lack of data (Haile et al., 2013) and coarse spatial resolution of the dataset (Huffman et al., 2007).”

Line 456: **differences in watershed characteristics.** Please expand on this: do you mean different prevalent meteorological regimes?

Line 456: differences in watershed characteristics. Please expand on this: do you mean different prevalent meteorological regimes?

Response: watershed characteristics includes the biophysical variables of a watershed. The sentence is modified as follows. “...differences in watershed characteristics such as topography, vegetation cover and climatic conditions”.

Line 472-473: **IMERG6 showed better rainfall detection (...) than 3B43** Of course, as IMERG is the successor to 3B42/TMPA.

Response: Yes, but this statement is included here to show that the better performance of IMERG is better than its successor (3B42/TMPA) for the study area.

Line 483: **stremflow** -> streamflow

Response: Corrected.

Line 486: **guage** -> gauge

Response: Corrected.

Lines 508-510: Remove time and the results showed that the product better performed for the DRB in detecting and streamflow simulation performance, as it is redundant.

Response: Done.

Line 543: **“CHIRS2”** -> CHIRPS2

Response: Done.

Figure 1: What do you mean by gauging station? Is there only a rain gauge? And the weather station encompasses a rain gauge as well? What is the meaning of the green triangles?

Response: the “gauging station” is corrected to streamflow gauge station and “weather station” is corrected to rain gauge stations to avoid confusion.

Figure 1: A figure of the climatological seasonal cycle of precipitation would be helpful here.

Response: Figure 1 is a location map while mean monthly climatological precipitation of the Dhidhessa River basin for all SREs are shown in Figure 9.

Figure 3 caption: annual -> monthly

Response: Corrected.

Figure 4 caption: monthly -> annual

Response: Corrected.

Figure 5 legend: E -> monthly

Response: Corrected.