

Interactive comment on “Comparison and evaluation of satellite derived precipitation products for hydrological modeling of the Zambezi River Basin” by T. Cohen Liechti et al.

Anonymous Referee #2

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Review: Comparison and evaluation of satellite derived precipitation products for hydrological modeling of the Zambezi River Basin

By T. Cohen Liechti, J. P. Matos¹, J.-L. Boillat¹, and A. J. Schleiss

General comments

This is a nice piece of work inter-comparing and evaluating satellite precipitation products (TRMM 3B42, FEWS RFE 2.0 and CMORPH) for the purpose of hydrological modeling of the Zambezi Basin. The relative performance of the satellite products was also assessed by comparisons with surface rain gauge measurements. I enjoyed

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reading and reviewing this manuscript, and would like to read the revised version.

The overall presentation of this manuscript is well structured and clear. However, some details of the description are not very clear and concise. The statistics used needs to be justified. The language, in general, is pretty good, but I did notice a few grammar errors and typos. In summary, this interesting research is conducted reasonably well, and results are helpful to partially mitigate the lack of adequate evaluation of satellite products over Africa. Therefore, I recommend that this manuscript be accepted for publication in Hydrology and Earth System Sciences, after the following comments are carefully addressed.

Specific comments

1) Page 8176, Line 24, “...bias is null”, clarify please.

2) More detailed description about ground data is required. As a reader when I read through the entire manuscript, I'm still not sure whether these 32 ARA and 48 GSOD stations are referred to rain gauges. Since gauge measurements are discussed in Introduction and Conclusions, I guess they must be rain gauges. I'd like to know more info about these stations. Are they weighted gauges, tipping bucket gauges or other types? What are the sampling solution and temporal interval for raw gauge data? How many gauges at each station? If there is only one gauge at each station, I'd like to suggest using word “gauge” to replace “station”.

Accurately measuring rainfall from gauges poses difficult challenges. Gauges data are subject to many possible error sources such as mechanical and electrical problems due to the harsh environment, inadequate calibration before and after deployment. In addition, gauge data error sources can result from the sampling mechanism, wind effects, off-level gauge placement, funnel surface wetting and evaporation, or animal and human interference, etc. The gauge data used in this study are not exempted from these problems. Therefore, “an extensive automated quality control is applied to correctly decode as much of the synoptic data as possible, and to eliminate the

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random errors” in this study. I’d like to learn more about the “extensive automated quality control”. Relevant references might be also helpful.

ARA is listed in Table 1, but why GSOD is not listed there?

3) Page 8179, Line 10, Huffman et al 2007 is about TMPA, instead of GPCC. You may need to move the reference a few lines ahead to TRMM 3B42.

4) Any particular considerations to use R^2 instead of r ? In statistics, R^2 is usually referred to as “coefficient of multiple determination” which is a measure of the fit of a multiple linear regression ($y=a_0+a_1x_1+ \dots +a_nx_n$). R^2 is not the square of the Pearson correlation coefficient between y and any of x_i ($i=1,2, \dots ,n$). For a simple linear regression ($Y=a+bx$), $R^2=r^2$, $r=R$ or $r=-r$. So r provides more information than R^2 . In this study, as described (Lines 3-4, Page 8181), R^2 is square of the Pearson correlation coefficient between two time series at the same pixel. In this case, I think the Pearson correlation coefficient r , instead of R^2 , should be used.

R^2 is used in Figs 3,6,7 whereas r is shown in Fig 4. They had better be consistent.

I don’t understand Eq. 2. Double check it and make sure it’s precise.

5) About Table 2. The gauge numbers in the table is less than maximum possible (32/48 for ARA/GSOD). The explanation seems to have been provided at Lines 9-13 on Page 8182. Suggest moving it to the 1st paragraph of Page 8182 right after Table 2 was first mentioned.

What’s the threshold unit in Table 2? The unit should be provided in both text and Table 2.

6) Page 8187, 1st paragraph. Proper references may be required here when discussing the gauge’s point measurements. A number of studies (e.g., Fisher 2007, J. Appl. Meteor. Climatol.; Wang and Wolff 2010, J. Appl. Meteor. Climatol.) have reported that cautions must be taken when the gauge measurements are used as the “ground truth” reference for the area-averaged rainfall due to the fact that gauges lack areal

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representativeness.

7) Figs 5, 8 would be more informative if the correlation, bias and sample size were shown in the figures.

8) Version number for each rain product should be provided, as many studies have shown different comparison results using different versions of the same product.

9) A few minor issues: Table 1, 3B42 resolution 0.25o, not 0.25”

Fig 4, bottom panel, monthly is labeled as “10-daily”

Figs 6,7 need to label y-axis.

A bit of grammar check and proofreading would be helpful, e.g. Page 8179, Line 27, “precipitations . . . on the afternoon, . . .”

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