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Comment on hess-2021-250

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Community comment on "Performance of the Global Forecast System's Medium-Range Precipitation Forecasts in the Niger River Basin Using Multiple Satellite-Based Products" by Haowen Yue et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-250-CC1>, 2021

Comments on Manuscript # hess-2021-250

Title: Performance of the Global Forecast System's Medium-Range Precipitation Forecasts in the Niger River Basin

Yue et al.

Summary

The study evaluates the accuracy of medium range precipitation forecasts from the Global Forecast System (GFS) over major reservoir dams of the Niger Basin situated in three different latitudinal/climatic sub-regions – namely, Sahel, Savannah and Guinea coast with annual rainfall of 400-600mm, 900-1200mm and 1500-2000mm, respectively. The authors used the IMERG Final rainfall product as reference, and also included IMERG Early, CHIRPS and climatologically corrected IMERG Early product in the comparison. The authors found that the GFS forecast tends to overestimate rainfall in wet regions (Guinea coast and western Savannah) and estimates well in the drier Sahel. At the watershed scale, daily GFS forecast was found unsatisfactory in 4 out of 6 watersheds mainly suffering from large random errors, high false alarm, overestimation of low rain rates and underestimation of high rain rates. The GFS accuracy was found to deteriorate with increasing lead time.

Overview Comment:

I enjoyed reading this interesting work that has the potential to contribute to reservoir operations in the Niger Basin. I think the topic of the manuscript fits well to the journal. The use of language needs minor edits and the structure could be improved. I listed my main and minor comments below, that I think will improve the flow, the clarity and the significance of the manuscript.

Main Comments:

1) Abstract: It is not clear which rainfall dataset is used as reference for performance analysis of the GFS forecast. Only later in the text it is mentioned that IMERG Final is the

reference dataset. Please provide the numerical values for the performance statistics. For example, the numerical values for the overestimation, underestimation, large random errors, high false alarm etc should be provided. Moreover, a statement that other satellite products are also compared should be provided in abstract.

2) Abstract: Last sentence: It is not clear whether the authors performed an analysis to support this statement. If yes, this statement should be supported with the method and findings utilized, otherwise it is a general statement and should be removed from abstract.

3) I think Section 2.Data and Methodology should be divided into two sections namely "2. Study Area and Datasets" and "3. Methodology". Lines 141-196 should move to the 2.1. Study Area section. Current Sections 2.1-2.3 should move to new "2.2. Datasets" section. Current Section 2.4 should move to "3.Methodology" section. This section should also include other data processing methods used in the study such as scale matching between products, basin-scale conversion etc. as well as study time period.

4) IMERG Early Cal: This product is not shown in Figure 3 and shown in Figure 4 but not discussed in text. The reader has no information about this product until Section 3.5. To eliminate this confusion, please discuss the motivation for producing this rainfall dataset and the methodology for adjusting IMERG Early using IMERG Final in the Methodology section (Lines 347-352 in the manuscript). It may be worthwhile to indicate that the advantage of simple climatological correction for IMERG Early would be the shorter lag time (a few hours) compared to IMERG Final (3.5 months).

5) Section 3.4: This section shows the scatterplots comparing correspondence between daily rainfall events between IMERG Final and GFS. Therefore, it is not related to uncertainty but a different way of comparing daily events. Section 3.4 can therefore be merged with Section 3.3.

6) Section 3.6: Please discuss the methodology for changing spatial scale of the products in the Methodology section. Moreover, indicate the reference rainfall product used in this section (IMERG Final). It may be helpful for the reader to include the watershed area next to each watershed name in Figure 9. Also somewhere in the manuscript, the number of rainfall product grids over each dam watershed should be provided.

7) I suggest that the title of the manuscript should be modified to include the use of satellite rainfall products in the comparison. For example something similar to "Performance evaluation of the Global Forecast System's Medium-Range Precipitation Forecasts in the Niger River Basin using multiple satellite-based products."

8) In conclusion section, a discussion on the study findings for dam operation would be beneficial for the reader since the focus is on dam watersheds (for example the impact of change in lead time performance in dam operation).

Minor Comments:

Line 37: Typo "Nige" should be corrected "Niger"

Line 36: Figure 1: Figure should appear in the same or next page of the first referral.

Lines 56-59: This last sentence should move to the next paragraph.

Line 61: A reference (Huffman etal.) to IMERG product should be provided early in this paragraph.

Line 76: Typo, please correct "IMERG Fsatellite gauged)"

Line 80: Please provide temporal and spatial resolutions in parenthesis.

Line 82: Replace "motivate" with "motivated"

Line 106: Typo. "mass-flus"

Line 118: Remove "Earth Data"

Line 164: Unit is missing for Markala Dam watershed size.

Line 199: Replace "previous" with "upstream"

Table 1: Is there a source for this information?

Figure 1: Please overlay GFS, IMERG and other satellite-product grids on this figure as a reference and to better understand dataset scale in comparison to dam watershed scale.

Line 209: Replace "coefficient if variation" with "coefficient of variation"

Line 207: Coefficient of variation is used in the modified KGE measure proposed by Kling et al (2012) and generally denoted by KGE'. Therefore, please include this information in description of KGE used in this study.

Lines 211-212: I do not recall this classification by Kling et al. (2012). Please check to make sure correct citation is provided for this KGE classification.

Lines 215-216: The following information is also important and can be included here: R measure is important in reproducing the temporal dynamics.

Figure 2: It will help readability if horizontal lines are drawn to represent the regions (4,8,12 degrees) as shown in Figure 1.

Figure 3: Please include which year this graph represents in the caption or text.

Line 254: Please provide the methodology used to calculate watershed-averaged rainfall in the methodology section. How many rainfall grids represent each basin etc.

Figure 4: Check spelling for Goronye sub-basin throughout the manuscript, for example in Figure 1 it is Goronyo.

Figure 7: Please provide time period information in caption. Color coding of the markers, similar to Figure 5, will improve readability.

Line 327: I suggest modifying the sentence: The overestimation by IMERG Early is particularly...

Figure 10: This figure should come after first referral in the text (Section 3.7).

Lines 393-394: Check grammar.

Figure 12: "daily" should be removed from x and y axis titles.

Abstract: Include the findings from Sections 3.6 and 3.7 in the abstract.

Line 432: Typo "featured emerged" replace with "features emerged"

Lines 449-450: I did not see a section on calibration of GFS using IMERG-Early. Please clarify or remove this sentence.