Dear Reviewer,

Thank you so much for your nice comments and kind suggestions! We will reply simply to your questions and comments in this file. In the meantime, we will revise the manuscript and submit it once all the comments are collected.

General comments The study proposed a new uncertainty estimation that takes into account both spatial, temporal, and model uncertainties. The authors then compared the new uncertainty values with two classic uncertainty metrics and demonstrated the comprehensiveness of the new metric. As the new uncertainty estimation still bears some similarity with the two classical metrics, it could be used as an alternative metric. The reviewer recommends minor revision.

Specific comments Section 2.4 is missing.

RE: Yes, sorry for the mistake. Instead, we moved the statements for "underlying of the uncertainties" to previous section. The section 2.4 will be removed in the revised manuscript.

L16 on page 7: change "Similarity" to "Similarly".
L1 on page 9: change "can also be expressed as the normalized" to "can also be normalized"
L13 on page 9: change "more natural" to "more proper".
L1 on page 10: the use of "global atmospheric gauges" is not proper, change to "global precipitation gauges" instead. Change "representatives" to "representativeness".
L2 on page 10: change "grids dataset" to "gridded dataset". Change "provided by" to "stands for".
L28 on page 10: the percent biases are calculated wrongly. Suppose you use CMA annual precipitation as the base, then the percent biases are: (63.1/589.8)x 100% = 10.7%, and (232/589.8)x 100% =39.3%, respectively.

RE: We have corrected the above items.

L31-32 on page 10: Do you mean some areas have abrupt precipitation changes rather than following the general gradient? The use of "isolated areas" is confusing to me.

RE: Thanks for your correction. It is exactly what you're mentioning.

L4 on page 12: the description is confusing.

RE: L4: "*These differences show the general characteristics and their difference of all the three types of precipitation products.* "

The statement is based on Figure 4. Figure 4 shows the precipitation patterns of three different precipitation groups. Based on the comparisons among the precipitation datasets, the characteristics of each one have been clarified in the words before this sentence. We revised the sentence as "*These differences show the general characteristics of the three types of precipitation products.*"

L1 on page 14: change "non unit" to "no unit".
L18 on page 14: change "which may has" to "which may have".

RE: We have corrected the above items.

L8-9 on page 16: Figure 6i and 6j do not agree well for gauge-based and merged products, so it is not proper to generalize like this sentence.

RE: L8-9: "*The temporal evolution of the gauge-based products and merged products agree well with that of the CMA dataset, while the temporal evolution of GCMs ensemble is weaker and not well correlated with that of the CMA.*"

We also found that the average value of the merged-products are higher than the CMA data in Figure 6-I and Figure 6-j (L35 on P14 & L4 on P16). However, regarding the temporal variations (which can be quantified as the correlation), both the gauge-based products and merged products show good correlation with the CMA for all the subregions including (i) southwest and (j) northwest China.

L15 on page 16: change "divided" to "categorized" or something similar.

RE: Ok.

L25-28 on page 16: The comparison between gauge-based products and CMA was mentioned firstly according to Figure 7, and then the reason for the discrepancy between the merged products and CMA was discussed. The transition was missing in between.

RE: Thanks, we will move the explanations somewhere else to increase the readability.

L6-12 on page 18: Are the standard deviations of each precipitation data group related to the number of data products that you chose?

RE: Yes, but when the number of data products increases to a certain number (4-5 according to our experiments on the GCM products) the standard deviations (or the variance proportions which come later) will become stable. However, we limit the used products for 4 because we don't have enough independent gauge-based products or merged products.

L23-33 on page 18: It may be better to denote the subregion numbers in Figure 8, so the audience do not need to go back and forth to identify the subregions.

RE: OK, thanks. All the maps of subregions will be numbered.

L31-32 on page 20: It seems that higher U_s also correlated to regions with higher model uncertainty in Figure 9 g-i.

RE: Yes. The U_s (the third row in Figure 9) has similar patterns with that of the U_e (the fourth row in Figure 9), this is because in the original datasets, the regions with higher model uncertainty are always feature higher spatial heterogeneities (shown in Figure 5). The U_s and U_e just separate and quantify the uncertainty (or heterogeneity) of the two dimensions.

As we state in L19-20 on P7, we will focus our discussions on the U_e, we emphasize very little about the U_s or U_t. We will see if in somewhere we need to add such explanations on the similarities among different variance uncertainties.

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