Answer to comments from Referee 1 (round 2)

On “Consistency of satellite precipitation estimates in space and over time compared with gauge observations and snow-hydrological modelling in the Lake Titicaca region”

General reply

We are sincerely grateful to the anonymous reviewer. The paper has been substantially revised based on its comments. We acknowledge all the points raised and we have spent time on carefully addressing them all. See our answers below. Changes in the text are highlighted in yellow.

Referee comment

Thank you for making the changes which I believe have resulted in a better paper.

Author’s response

Thank you.

Referee comment

I have a few more comments.

"It is worth mentioning that other precipitation datasets with coarser resolution (>0.25°) are currently available but we did not use them because (1) the difference between point-gauge and grid-cell-average measurement would introduce inconsistency and because (2) such low resolution datasets are better suited for observation of global scale precipitation patterns rather than the local dynamics studied here."

I disagree with this (newly added) statement. There are numerous situations where a coarse resolution dataset (e.g., JRA-55 with its 0.7° resolution) would provide a much better performance than a high resolution dataset (e.g., IMERG with its 0.1° resolution). Why would it matter to an end-user whether there's a potential discrepancy between point-gauge and grid-cell-average measurements? For most applications all that matters is the accuracy of the dataset.

Author’s response

We agree that coarse resolution datasets may provide a better performance than high resolution datasets. However, the part of the text you mentioned aim at explain why we did not consider these datasets in our study. We did not use those coarse resolution datasets based on: (1) the available reference gauge network and (2) the specifics of the studied basins.

Firstly, most of the considered grid-cell used to assess SPP potential include only one gauge. As discussed (see discussion 5.2 Page 27 Line 31 to Page28 line 8), a point gauge measurement is not totally representative of a surface area measurement. Therefore, assessing precipitation dataset consistency by comparing reference point measurement with superficial area measurement suffer some inconsistency. This inconsistency will inevitably increase for precipitation dataset with grid size

superior to 0.25° (>625 km^2) and especially for JRA-55 and its 0.7° (4900 km^2) grid-cell size. Therefore, we believe that assessing coarse resolution dataset with the available gauge network will not be representative of their actual potential.

Secondly, those coarse resolution datasets may not be suited for two of the considered basins. Actually, 0.7° grid size products like JRA-55 present a grid size (4900km^2) bigger than the surface area of the Katari and Keka basins (2588 km^2 and 801 km^2, respectively). Therefore, for these basins the precipitation will be hardly measured from SPPs with grid-cell size superior to their superficial extent. Furthermore, the snow cover dynamic analyses was applied over a superficial extent smaller than the non-considered SPPs grid-cell size. Therefore, coarse resolution SPP will be unsuited to follow the snow cover dynamic extent dynamic over this region. Therefore, the coarse resolution SPPs are not suited in an end users perspective to follow the considered streamflow and/or snow cover dynamics.

Modifications to the text

We understand that our choice might be unclear after reading these highlighted lines. We modified the text to:

"Other precipitation datasets with coarser resolution (>0.25°) are currently available but we did not use them because: (1) the scarce available gauges network will not warrant a consistent potential assessment in reason to the difference between point-gauge and grid-cell-average measurement (Tang et al., 2017) and (2) the considered catchments and snow analyses zone area are smaller than the grid-cell size of such coarse resolution precipitation datasets. However, it is worth mentioning that in specific situations, coarse resolution SPPs could perform better than higher resolution SPPs (Beck et al., 2018) and that reanalyzes precipitation datasets tend to be a better choice in cold regions/periods (Huffman et al., 1995). Such statement cannot be verified in the present study in reason to the scarce gauge network context and considered catchments and snow analysis zone area."

Referee comment

You should explicitly mention (at least in the introduction and conclusion sections) that reanalyzes tend to be a better choice in cold regions/periods. The latter has been known for several decades (see, e.g., Huffman et al., 1995) but is generally not communicated well in most precipitation dataset evaluation studies which can lead to confusion.

Author's response

We now mention the problem you presented regarding the reanalyzes precipitation datasets and cold regions/period. However, we limit this statement to the methods´ section after justifying why they were not considered but could be relevant in particular cases (see previous comment).

Referee comment

Regarding the figures, my suggestion to use perceptually uniform color scales was not followed. Let me give you another reference: https://arxiv.org/abs/1509.03700. In addition, the use of only red and green in color scales is not recommended as many males have red-green color blindness

(https://nei.nih.gov/health/color_blindness/facts_about). The resolution of some of the figures is also a bit low (in Figure 7, for example, the lines are very pixelated).

Author's response

We did not clearly understand what you were expecting for and we are sorry that our changes did not match your request.

We now use a divergent color map for figure 5c (bias) and return to the initial blue color for figure 5c (CC and RMSE) to avoid any problem for blindness readers.

Figure 6 also use now blue color to avoid any problem for blindness readers.

Resolution of Figure 7 was improved from 300 dpi to 450 dpi.

We changed Figure 9 color bar for a "divergent" one.

Note that we did not proceed to any changes in Figure 2 because the current color bar is very effective to represent the regional precipitation pattern.

Referee comment

Finally, "Global-scale evaluation of 23 precipitation datasets" should be "Global-scale evaluation of 22 precipitation datasets", and the Beck et al. (2018) reference is missing from the references list.

Author's response

Actually, in table 1 we miswrote Beck et al., 2017 for Beck et al., 2018. However, we also added the reference Beck et al., 2018 to justify on the potential benefits of coarse resolution dataset (see Page 7 line 22-23):

"However, it is worth mentioning that in specific situations, coarse resolution SPPs could perform better than higher resolution SPPs (Beck et al. 2018)"