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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Hydrological modeling of the Peruvian-Ecuadorian Amazon basin using GPM-IMERG satellite-based precipitation dataset" *by* Ricardo Zubieta et al.

Anonymous Referee #2

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This relatively short paper presents a preliminary assessment of the i-merg rainfall product in the Peruvian and Ecuadorian parts of the Amazonian Basin. I-merg is the new high resolution gridded product associated with the GPM mission , launched in 2014. This paper provides an illustration of the potential of this new product for hydrological applications in a region which high altitudes gradients (tropical andes) where the rain gauge network is very sparse

General :

The paper is clearly written . The study is not very original and the scientific impact of the results is limited because of the scarcity of the available 'reference' rain gauge network and the short study period. However the paper provides interesting information

on the behavior of i-merg over the Amazonia-Andes region and its potential use as a forcing field for hydrological models.

I believe this study would be worthy of publication ; however some additional details on the methodology (see below) and a more in depth discussion on the limitations of the data, method and results is needed .

DETAILED COMMENTS

1- Scarcity of the rain gauge network and impact on the comparison results

The authors had to work with a very scarce and unevenly spread network – (scarcity which makes satellite information all the more attractive) . They acknowledge briefly that the small number of gauges in part of the basin might explain the discrepancies between the sat/ground rainfall products and between the simulated/observed discharge , but there is no attempt to quantify the uncertainty in the ground rainfall product.

- the authors should elaborate on the abilty of their ground rainfall product PLU to reproduce the rainfall gradients in the mountaneous part of the basins. Is altitude taken into account in their interpolation method and if yes how and was the quantitative uncertainty assessed ?

- The authors have used krigging to provide a product at the 0.1° resolution over the 700000 km2 basin, from a total of 181 gauges.

o It would be informative to know what the de-correlation distance of the variogram model is .

o Is anisotropy considered when interpolating in the montaneous areas ?

o Also as kriging provides the estimation variance, the authors could provide a map showing the expected quality of the ground product (for instance ratio of kriging std over rainfall estimate for one day or an average over the season)

- The authors provide comparison of satellite/ground product for basin average ; they

should indicate what are the results when comparing only over the grid points that contain a gauge (or are within a short distance from gauges).

- Given the points above, how certain are you that satellite products are overestimating rainfall (p 5 -section 4.1) rather than the ground based product underestimating it.

2 – information on model calibration and sources of uncertainty in the model run.

Section 4.2 :

- A description of the model configuration is lacking – the size of the HRU – and a discussion on whether or not it allows to take advantage of the products improved spatial resolution is missing.

- How was the model calibrated and on which period/data sets ? is the model re-calibrated for each rainfall forcing ? if not/yes, why ?

- One of the benefit expected from new rainfall product like i-merg is their improved space/time resolution compared to coarser products. This important point is not discussed in the study. As the model is run a daily time step the beneft of improved time resolution cannot be assessed, however the authors could investigate the impact of the 0.1° grid provided by i-merg. For instance by smoothing or under sampling the product to a coarser resolution (0°5 for instance). And comparing the simulated discharge for both 0°1 and a coarser spatial resolution.

- Rainfall is not the only source of uncertainty in the simulated discharge ; the ability of the chosen model to represent the hydrological processes in the studied region, especially in the mountainous sub-basins, should be discussed. Other sources of uncertainty –among them model parameters estimation- that might impact the results should also be mentioned and if they have been quantified, the information should be provided.

3 – information on satellite products version

- importantly I could not find the information on the version of i-merg which has been used here.

- Since there were several releases of i-merg since the launch and given that i-merg (just like 3B42) is provided with a gauge calibrated version and an un-calibrated or RT version, both should be tested here. For a fair comparison with 3B42 RT and v7.

- P3 – line 15 to 35 – The degree of information on products should be the same for both i-merg and 3B42 : number /type of contribution satellites, basic description of the stimation method.

- 3B42 (and i-merg calibrated version) use some gauges from weather services – Could you check which are the gauges used here were included in TMPA/i-merg correction stage ?

Other minor corrections :

-In the introduction and throughout the text there seem to be some confusion between i) the satellite themselves (TRMM or GPMcore satellite) , ii) satellite constellations (the GPM international program includes the NASA-JAXA GPM core satellite -and TRMM while it was still going- and a constellation of other satellites from various agencies) and iii) the rainfall products which are derived from this satellite constellations and do not depend on one particular satellite (TMPA 3B42 can be run without the TRMM satellite itself. . . i-merg could be run without GPMcore if necessary) .

Exemple : intro p2 line 12-13 : ‘satellite data sets . . ...are uniformly distributed in space and time’ - Product like 3B42 or i-merg are provided on a regular space-time grid however the microwave satellite information itself is provided with a very irregular sampling and depends on individual orbits. . .. And as for gauges interpolation is done to prvide a final regularly gridded product.

P 2 – line 30-32 – confusion between GPMcore single satellite launched in 2014, and the GPM multi satellite/multiagencies constellation . . ...

Also : The improved resolution capacity of the latest products does not come from a specific satellite (though some members of the GPM constellation such as TRMM and more recently Megha-Tropiques , provide additional sampling specifically in the Tropics) but from the overall sampling capacity of the whole constellation. This should be mentioned more clearly in the intro.

Looking forward to see an improved version of this very interesting work.

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