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Hydrology and Earth System Sciences Discussions

Interactive comment on "Experiences in using the TRMM data to complement rain gauge data in the Ecuadorian coastal foothills" *by* M. Arias-Hidalgo et al.

Anonymous Referee #2

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The authors are to be commended on attempting to develop an approach that can leverage satellite precipitation data for hydrological modeling in rain gauge poor regions of the world. However, the results of the proposed approach are not better, as described in the paper, than using rain gauge data which causes me to question the utility of the proposed method. Additionally, there are numerous issues with grammar and word choice that decreases the overall readability of the manuscript. I tried to indicate a few of these areas in my comments below. I agree with the concerns of Reviewer #1, which I believe must be addressed before this paper is fully accepted for publication. Commentary below are keyed to issues identified by both Reviewer #1 and

myself (Reviewer #2) whose comments are linked to each section of the manuscript.

Reviewer #1 - Comment #1 - The first reviewer is quite right in that the specific TRMM product used is not clearly identified. I believe that the authors are referring to the research version of TRMM 3B42 but this needs to be clearly indicated as there can be major difference between research and real-time versions of 3B42. Additionally, the version of TRMM used (version 6 or 7) needs to be clearly indicated - the authors are probably using V6 as V7 was only recently released.

Referring to the length of the simulation I am also curious as to the limited (one year) time period selected. I would imagine that ENSO would have a significant impact on rainfall in this region. Perhaps comparison of an El Nino versus La Nina years would provide greater insights in terms of the overall applicability of the proposed method.

Finally, the authors need to realize that early in 2009 there were addition of more satellite data to the TRMM product, which has improved the quality of TRMM in recent years (Huffmann et al. 2010). So I would suggest that modeling focus on the later post-2008 period, which reflects the current abilities of TRMM and its ultimate successor (GPM) to monitor precipitation around the planet.

Reviewer #1 - Comment #2 - I also agree with this reviewers comments. In the case of the smaller subbasins the centroid of a TRMM grid cell is acting as effectively one "rain gauge" and this may not be valid in areas with large spatial variations in precipitation like the study area where there is a distinct spatial trend caused by orography. However, the overall Guayas River watershed is certainly large enough to delineate spatial trends in precipitation based on satellite products.

Reviewer #2 Abstract - The abstract is extremely vague in places and the meaning that the authors are attempting to convey is unclear. Specific numbers or description of spatial trends need to be provided. Specific examples include: pg. 12436, line 5 "radar-based precipitation" Is the author talking about some ground based radar system or TRMM PR ?

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pg. 12436, line 6 "at least it records somewhat the spatial pattern" pg. 12436, line 7 "The bias remains more or less steady" pg. 12436, line 10 "measuring spot" (and also elsewhere in the paper) I presume you mean the centroid of the quarter degree satellite grid?

1. Introduction - This section is generally in good shape. Included below are some minor comments are included below: pg. 12436, line 25 - Check your verb tense agreement pg. 12437, line 27-28 - Please specify what you mean by very good results. Additionally, what to you mean by error? Issues with bias, probability of detection, false alarms, or all of the above. I believe you are focusing only on bias and if so please indicate. Please realize that "error" identified through comparison of ground and satellite products encompasses more than bias.

pg. 12438, lines 11-12 - Provide a brief discussion about why TRMM underestimates precipitation due to orography. This after all is the main rationale for the approach developed in this study.

pg. 12438, line 12-14 - The sentence that begins "To worsen the scenario ..." is awkward and needs to be reworded.

pg. 12438, line 14-16 - The sentence that begins "Given this background, ..." is disjunct from the concepts presented earlier in this paragraph. Please revise or delete

pg. 12438, line 27-28 - Please specify what you mean when you indicate that simulations were not accurate.

2.1 The Vinces River catchment - There are some areas in this section that are very confusing and I agree with reviewer #1 that the location and description of the Vince Sub-basin or the location of streamflow gauges is not clear either in the narrative or in Figure 1. Is there a streamflow gauge at the outlet of each subbasin? The location of the Quevedo at Quevedo station at the basin outlet needs to be emphasized in the narrative? Specific comments include: pg. 12439, line 24-25 - The sentence that

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begins "The drainage area ..." is very confusing.Please revise

pg. 12440, line 1- Please describe the nature of the spatial trend in rainfall, based on I presume rain gauge data

pg. 12440, lines 4-5 - Poor word choice "going from" Please revise

2.2 The hydrologic model - More details need to be provided that describe the hydrological model set-up and how precipitation data is incorporated into their model. More details on how the model was calibrated need to be provided. It is unclear how the parameter values in Tables A1-A3 were obtained? Finally, Nash-Sutcliffe coefficients need to also be presented with mass balance error values in Table A4 so that the reader can fully evaluate streamflow simulation results. Why are values not included from the Quevedo at Quevedo station? Additionally, what time scale do these Nash values represent? Daily? Monthly?

3. TRMM-based methodology and results - There are several issues/concerns/suggestions I have regarding this section.

(1) Why did the authors decide to base there spatial interpolation on IDW, which is a method that is known to create bulleye like artifacts, versus Co-Kriging where you can correlate precipitation with elevation and therefore more accurately delineate orographic affects?

(2) If the authors are using the research version of TRMM 3B42 then they are applying second bias correction over that which is already associated with the research version of the product. This suggests that the gauge used by NASA to adjust TRMM is not representative for the examined watershed. Some discussion of this issue would strengthen the authors case for the development of their proposal approach.

(3) Perhaps comparison of real-time and research versions of TRMM 3B42 would be to elucidate the cause of bias in the satellite data in their watershed. Once the issue is identified then the authors will be in a much better position to provide a rationalized

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defense of their proposed approach.

4. Performance of complementary TRMM data for the HMS model - This section is highly confusing as written. The authors need to present Nash-Sutcliffe coefficients and mass balance error results in a Table for the Quevedo at Quevedo station basin outlet) and include rain gauge only simulations, TRMM only simulation, and simulations based on combination of rain gauge and TRMM data based on the approaches discussed in the previous section. The revised narrative needs to reference this table and then discuss specific events, perhaps from different subbasins, during which the combined approach yields better results than the rain gauge only simulations. This can be demonstrated though documenting the number of peak flow events that are better or worse (in terms of mass balance error and peak timing for the proposed approach versus simulations based on raingauge data. As written the authors make no compelling case why their proposed approach is better than just using rain gauge data to drive hydrological simulations in their basin.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 12435, 2012.