

Response to the Anonymous Referee #1

Comments on Itkin and Loew manuscript for HESS- 2012-404, “Multi-Satellite Rainfall Sampling Error Estimates – A Comparative Study”

General Comments

The authors address random sampling errors that result from a finite number of satellites. They do this in a simulation study using gauge arrays in two locations (mid-latitude and tropical) aggregated for various time scales. There are several points that deserve refinement before the manuscript is accepted. In general, the paper is understandable, but I would advise use of the HESS technical editing to improve the English grammar and usage.

We are thankful to the referee for the comments that help to improve our manuscript. Our detailed response follows below. We will do our best to bring our English spelling and grammar to the adequate level by reviewing the manuscript by a native speaker.

Specific Comments

1. P.11679,L.11 I’d say that “all available” is not applicable to GPCP; “a variety of” captures the sense of “various” that the authors are intending and could apply to all the products.

We agree with the Referee, GPCP does not include "all available" satellite information but a large variety of satellite data sources. We will revise this sentence.

2. P.11679,L.24 I’d say “rainfall process” is “observation process”. Rainfall intermittency just makes the observational intermittency worse.

We agree with the referee, sampling uncertainty is caused by the observational intermittency at first place. We will modify this sentence.

3. P.11679,L.27-29 The Huffman (1997) paper on estimating uncertainty has a somewhat different focus than the references cited, but should probably also be mentioned.

We deliberately did not include the paper by Huffman (1997), because we believe it has a focus different than that of our study. It characterizes the random error that contains effects of both, sampling uncertainty and measurement-algorithm deficiencies and does not untangle the contributions coming from each of the error types. However it provides a valuable description of the random errors in precipitation retrieval and we will add the reference in the revised manuscript.

4. P.11680,L.9 “biases” should be “additional biases”, as the authors correctly state in P.11685,L.13-14.

This sentence will be modified accordingly.

5. P.11682,L.9-11 The typical time-span of gauge data that matches a satellite snapshot was addressed in Villarini and Krajewski (2007), and in- deed an hour is a reasonable span.

We thank the Referee for bringing up this issue and pointing to the paper by Villarini and Krajewski

(2007) as it provides an additional insight of RMSE behaviour between rain gauges and satellite observations. It also helps to answer the comments raised by the seconds Referee. We will include this reference in the revised manuscript appropriately.

6. P.11685,L.13 “regular time intervals” is true in some sense, but in fact every overpass time at a particular spot isn’t exactly identical, just in a narrow time range.

This is correct, no overpass time is identical, only close to the others. We will modify this sentence accordingly.

7. Tables 4-5 The bias and RMSE are stated as extensive units, which makes it awkward to compare the various time intervals. It would work better to adopt an intensive unit, such as mm/day, so the results are easily comparable.

We will adopt mm/day as the unit for the tables 4 and 5 to make the comparison easier.

8. Fig.1 This figure is from last year. Is there a more current version?

Yes, currently there is a more up-to-date figure with Equatore crossing times. It can be accessed via the address provided with the figure (http://precip.gsfc.nasa.gov/times_allsat.jpg). We will include the latest figure, however it is not really important for our study as it does not extend further than 31st of December, 2009.

9. Fig.2 I strongly prefer putting these maps on the same scale so that it’s more obvious how the two arrays compare to each other.

We agree with the Referee and will provide maps of the same scale in the revised manuscript .

Technical Corrections

10. P.11683,L.13 “conical-scan”, right?

“Conical-scan imagers” is the correct term, thank you.

11. P.11684,L.14 I think “cross-track imagers” is “conical-scan imagers”.

That is correct, it must be “conical-scan imagers”

12. P.11684,L.17 A grammar correction the editor might miss – “forth” is “fourth”.

Correct, that's a typo.

13. Fig.5,7 As in Fig.6, I’d say “satellite” should be “simulated satellite”.

Thank you, we will replace it.