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Hydrology and Earth System Sciences Discussions

Interactive comment on "Rainfall estimation over the Wadi Dhuliel arid catchment, Jordan from GSMaP_MVK+" *by* E. Abushandi and B. Merkel

E. Abushandi and B. Merkel

eyadshandi@yahoo.com

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We would like to thank reviewer #1 for the valuable comments and questions. We want to use these as an opportunity to clarify the interpretation, and some methodological aspects. The overall aim of this research paper was to optimize the use of available targeted remote sensing data tailored to ground data in arid region. We pursued this main objective through an intensive study of GSMaP_MVK+ data as well as ground data. Typically, meteorological data for the Wadi Dhuliel arid area are limited to daily rainfall, temperature, and in lucky cases wind speed and relative humidity records. Meteorological stations are sparse, with relatively short-term instrumental records. It is no wonder, then, that it is so difficult to make a comprehensive analysis of spatial rainfall using ground records. Therefore, the use of remote sensing data may overcome

the problem of the observed data scarcity.

As reviewer # 1 stated, there is no doubt that remote sensing capability to monitor rainfall is still under development and has -in particular- some weaknesses related to arid region applications. As a result, the disagreement between satellite estimates and surface reference data is the common phenomenon. This, however, has been stated in this paper.

In addition, there are on-going projects to improve the correlation between Satellite-based rainfall retrieval algorithms and the real rainfall magnitudes (e.g. The Wet-Net Precipitation Intercomparison Project, and the NASA GPM Project). Since GSMaP_MVK+ gives estimates of rainfall over a pixel area while the ground gauges provide a temporal accumulation of rainfall at a point, the GSMaP_MVK+ estimates can be very useful when it is necessary to understand the spatial distribution of rainfall.

Developing a new framework to re-adjust the GSMaP data by means of ground data and standard interpolation techniques was logically necessary. This new concept has caught our attention in order to achieve a reasonable representation of the true rainfall distribution. Of course, the re-adjustment scheme was developed after finding a positive correlation between GSMaP_MVK+ estimates and ground data.

As reviewer # 1 suggested, further details will be added into the discussion and conclusion sections to focus on the performance of GSMaP without re-adjustment process over this particular area. We acknowledge that this particular issue may not be sufficiently explained.

Reviewer # 1: page 1676, line 16: "... shows significant correlation" – those numbers are by no means indicating significant correlation. On the contrary, they indicate very poor correlation.

Answer: unfortunately, the correlation coefficients were mistyped in the present manuscript. All Spearman's correlation coefficients and P values will be corrected as

HESSD

8, C513–C516, 2011

follows:

'The heavy storm events correlation coefficient was 0.75 (P =0.084), while for light and moderate storm events rho was 0.62 (two tailed P =0.008) and 0.66 (two tailed P =0.071), respectively.'

Reviewer # 1: Page 1679, line 26: "Overall, GSMaP_MVK+ showed the best performance in comparison with other satellite products." – How did the authors reach this conclusion?

Answer: This sentence will be improved and moved to the discussion part in order to add some references. This conclusion has been proven by several related studies such as: (Dinku et al 2010a; Dinku et al 2010b; Sapiano 2010; Seto et al 2009; Tian et al 2010; Ushio et al 2009). The sentence will be as follows:

'However, it has been proven by several authors (Dinku et al 2010a; Dinku et al 2010b; Sapiano 2010; Seto et al 2009; Tian et al 2010; Ushio et al 2009) that the GSMaP MVK+ showed a better performance in comparison with other satellite products.'

References

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HESSD

8, C513–C516, 2011

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