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Discussions

Interactive comment on "Satellite-driven downscaling of global reanalysis precipitation products for hydrological applications" *by* H. Seyyedi et al.

H. Seyyedi et al.

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We would like to thank Anonymous Referee #4 for his/her helpful comments and suggestions. Herein we provide brief answers to his/her comments but, during the final phase, we may provide further updates.

Major: 1- Sheffield et al., 2006 has been added to the literature review to provide more detailed information about the recently developed global products.

2- We believe that the benefits are mainly from characterizing the random error model component. Specifically, SREM2D is used to characterize the complex structure of

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error associated with the downscaling and errors in the original GLDAS product. For instance in our methodology SREM2D applies correction based on the probability of rain and no-rain at 25-km resolution driven by coarse resolution GLDAS fields, and correlation length of 25-km rainfall rate error. Maggioni et al., 2012 had quantified the difference between SREM2D and simpler error models (like the one suggested by the reviewer) for the purpose of error correction. They concluded that SREM2D represents more accurately the error structure than simpler multiplicative error models. (Maggioni, V., R.H. Reichle, and E.N. Anagnostou, 2012: The efficiency of assimilating satellite soil moisture retrievals in a land data assimilation system using different rainfall error models, Expedited Contributions – Journal of Hydrometeorology, Vol. 14, No. 1, 368-374, doi: /10.1175/JHM-D-12-0105.1.)

3- We did not test downscaling of GLDAS using Stage IV data. The ultimate goal of this research is to come up with a global downscaling and error correction technique for GLDAS. Stage IV is not available globally, but it was suitably used in this study as an independent dataset to verify the accuracy of the technique.

Minor: 1- P. 9071, line 3-9, Wu, et. al., 2014 has been added to the references to provided more recent studies relevant to the topic.

2- P.9047, L15: the different events were selected using a rain rate threshold of 1.5mm/h applied on GLDAS cells.

3- P. 9077, line 10-15, the Stage IV precipitation data was used as independent dataset for verification of the SREM2D-based GLDAS error correction and downscaling.

4- P9086, L14-16: Relative RMSE indicates the random component of the error.

5- Lines 16-19 has been rephrased as following: "This was explained by the properties of the random error propagation from precipitation to runoff simulations. The random error of the original GLDAS is either increasing (summer and fall seasons) or slightly decreasing (winter and spring) in flow simulations."

6- P9078, L1-2: We mentioned in line 23-24 page 9077 that the TRMM3B42V7 is the reference dataset: "The stochastic space-time error model of Hossain and Anagnostou (2006), originally developed for satellite rainfall error modeling (hereafter named SREM2D), was devised in this study to disaggregated and error correct GLDAS precipitation datasets using as reference the TRMM3B42V7 satellite precipitation product." We further revised subsequent text as following: "First, SREM2D parameters for GLDAS downscaling and error correction are determined from the calibration datasets of each season sing TRMM3B42V7 precipitation as reference. Then, SREM2D was applied to the GLDAS data during the validation period to produce downscaled and error adjusted GLDAS precipitation, which was evaluated against the independent Stage IV gauge adjusted radar-rainfall fields."

7- Figure 5 has been corrected to "four seasons".

8- The caption for figure10 has been changed as following: "Figure 10: Discharge time series driven by the different precipitation product over the basin indicated in Figure 1 and consisting of the selected validation events of each season. GLDAS is underestimating in all cases; meaningful improvement shown in the SREM2D adjusted GLDAS products."

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