Hydrol. Earth Syst. Sci. Discuss., 11, C3762–C3764, 2014
www.hydrol-earth-syst-sci-discuss.net/11/C3762/2014/

Hydrology and Earth System Sciences
Discussions

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

Anonymous Referee #3

Received and published: 12 September 2014

DOI:10.5194/hessd-11-9067-2014

Satellite-driven downscaling of global reanalysis precipitation products for hydrological applications

Comments:

This manuscript proposed and evaluated a downscaling and error correction scheme for NASA's Global Land Data Assimilation System (GLDAS). A stochastic space-time error model (SREM2D), which originally developed for satellite rainfall error modeling and error hydrological propagation, was devised in the downscaling and error correc-

tion scheme to generate the error-adjusted ensembles of the GLDAS. The authors separated the scheme into two steps: calibration and validation processes. During the calibration process, the TRMM 3B42V7 multi-satellite precipitation products were used as reference ("satellite-driven" as the authors claimed), and SREM2D parameters were calculated for both TRM 3B42V7 and GLDAS. In the validation process, SREM2D was applied to generate error corrected ensembles for GLDAS. Then, the downscaled and error corrected GLDAS was evaluated for both precipitation error and simulated runoff error, using Stage IV ground gauge-corrected radar data as the reference.

The authors provided a good solution to mitigate the inability of original GLDAS in precipitation errors and underestimation of simulated rainfall runoffs. The overall performance of the manuscript is in good sharp, the literature review is comprehensive, the results are technically sufficient to support the authors' conclusions, and the discussions are clear and convincible. However, the authors still need to fully address the following issues that raised by the reviewer.

The reviewer realized that one major issue in the manuscript is the lacking of sufficient description of the methodology that used for downscaling and error correction of the GLDAS data. The procedure of the scheme is very clear through the flowcharts Fig. 3 and Fig. 6. However, how the authors performed the calibration and validation processes are unclear. For example, it seems that during the calibration process, the SREM2D parameters were calculated for TRMM3B42V7 and GLDAS, but how those parameters were used for calibration (how 3B42V7 calibrated GLDAS) is vague. Similarly, in the validation process, how the SREM2D model was performed to generate the error-corrected and downscaled GLDAS is not discussed in the paper. Through the authors' current description, people may argue why it was called calibration and validation, because there is no obvious evidence to support it.

Other issues in the paper:

P. 9068, line 16-20, hard to follow, need to rephrase.

P. 9071, line 26-28, the simple downscaling will introduce errors to the precipitation products, and then these errors are also propagated into the runoff simulations. Should it be the error correction process embedded in the downscaling scheme that increase the performance of runoffs?

P. 9085, line 24, should it be 437 flooding events?

Figure 2., to prove the similarity of cumulative probability in calibration and validation, only one image is enough, consider deleting the other three seasons or provide it for the whole year.

Figure 4., I agree the utilization of multiplicative error, but would it be better to display it in original unit (in real error) for Fig. 4? The logarithm error is not as obvious as the real error.

Figure 5., “three seasons” change to “four seasons”. One last question is, have you considered using Stage IV to downscale the GLDAS, would the performance of GLDAS ensembles be much better in terms of simulated runoffs? I understand that the authors would like to take the benefits of the global coverage of 3B42V7, just curious how it would be.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 11, 9067, 2014.