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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.

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We would like to thank the reviewer for his/her insightful comments. Herein we provide answers to the comments to facilitate further interaction on the points listed in his/her review.

Major comments: We agree with the reviewer that precipitation values from GLDAS at 100km spatial resolution exhibit resolution effects when compared to the higher resolution products e.g. TRMM3B42V7 or stage IV radar data. This underestimation is also reflected in hydrological simulations. In addition to the scaling issue, GLDAS ex-

hibits product biases and random errors. Recognizing these GLDAS uncertainties, the herein study attempts to implement an error model to correct for the combined effect of these error sources (quantification error and resolution effect) using as reference a higher resolution satellite product, which represents less biased precipitation fields and higher spatial resolution. To answer the reviewer's question as to whether the conclusions of figures 5 and 7 would be held the same if we were to aggregate the high resolution products to the same course resolution the answer is likely not. However, the intent of this paper is not to evaluate the relative significance of the GLDAS product resolution effect to the systematic and random errors of this product, but to demonstrate the use of satellite precipitation data for driving a combined error correction and downscaling technique by assessing the degree of improvement in representing basin average rainfall and the corresponding runoff simulations. This is important because GLDAS data are available globally and are frequently used in many flood frequency applications. The herein study argues that applying GLADS reanalysis products without a proper correction and downscaling would significantly bias the basin rainfall and streamflow simulations and consequently any derived flood frequency analysis. Applying the satellite rainfall based correction makes the data compare favorably with independent reference rainfall and streamflow time series, which is shown in figures 5, 10 and the statistics of figure 8. More importantly it is shown that the quantiles of the corrected GLDAS compare well with the reference rainfall and streamflow quantiles, which indicates that the technique can be applied globally to derive adjustments to the GLDAS-driven hydrologic simulations prior to using these data for flood frequency studies.

Regarding the spatial pattern of downscaled precipitation, we would like to note that we have looked qualitatively at SREM2D derived spatial patterns and they seem to improve the spatial distribution of precipitation relative to the reference rainfall. Attached please find figure showing a randomly selected sample image of precipitation spatial patterns depicted in the original GLDAS (100 km) and the corresponding downscaled GLDAS, TRMM, and Stage IV radar at 25 km resolution.

Minor comments: 1- “Hossain and Anagnostou (2006)” has been added to the references. 2- The sentence has been changes as below: “In this study we present implementation of a two dimensional stochastic error model (SREM2D) for downscaling and adjusting GLDAS precipitation data using as reference the higher resolution and accuracy TRMM3B42V7 satellite precipitation product.”

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

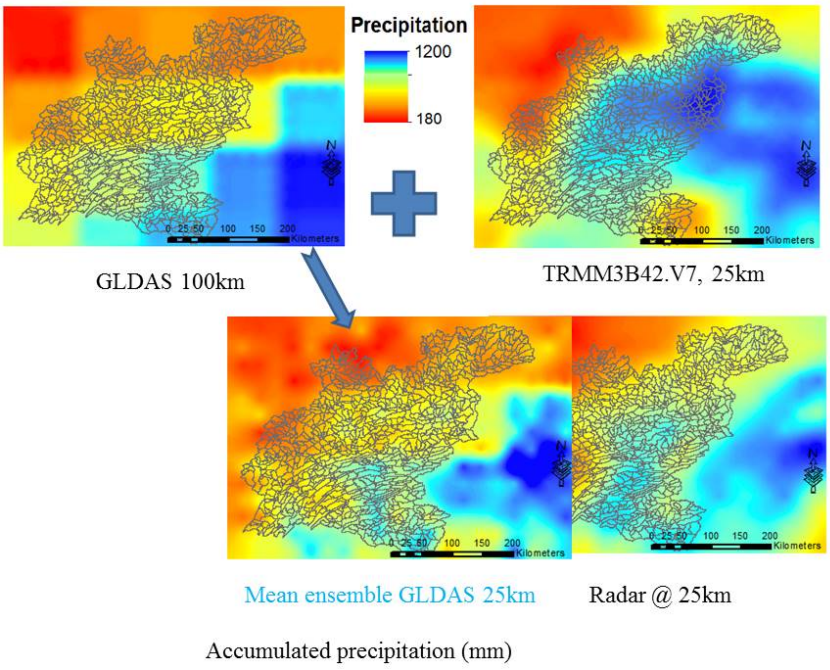

Fig. 1.