Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-164-RC1, 2018

Hydrology and Earth System Sciences
Discussions

Interactive comment on "The potential of global re-analysis datasets in identifying flood events in Southern Africa" *by* Gaby J. Gründemann et al.

Anonymous Referee #1

Received and published: 30 May 2018

General Comments

This paper assesses the potential of using re-analysis datasets with hydrological models to identify flood events in the Limpopo River basin. They evaluate climatological forcing's at 0.5 and 0.25 deg spatial resolution, and different hydrological and land surface models of the WRR datasets. While it is a model intercomparison paper, the objective is to identify timing and magnitude of floods. The novel aspect of the article is a flood detection comparison with reported observed flood damaged, which tries to link what is modeled to the actual impacts. The analysis focus on evaluating coarse spatiotemporal resolution dataset and models, which are not the most up to date and appropriated to assess local scale floods in small catchments. As the current generation of land surface and hydrological models are currently available at much higher

resolution (i.e., 5-10-5 km), these models could potentially be more appropriated and yield better skill in detecting floods. Nonetheless, I understand that the authors are constrained by the data and models available at the WRR dataset. However, WRR could have been updated for a more novel study. The paper is clear and concise, and the authors acknowledge limitations on data, models, and analysis, and well as listed aspects for improvement. Despite the limitations, this study intended to inform the scientific community on the potentials and limitation of currently available data and model for flood applications.

Specific Comments / Major Points

1. Page 2 Line 19 and Page 3 line 8: Can you expand the explanation of the term "spatially symmetrical"?

2. Page 3 Line 21: I would say . . . managing floods at the regional and basin scales . . .. I'm not sure to what extent forecasting at 0.25deg resolution is aiding flooding management at local scales.

3. Section 2.3.2 Disaster Data: I understand flood damage data is scarce and has its several limitations, which leads to data aggregation as an alternative to consolidate a standard analysis. However, it would be interesting to see few point results for maybe one or two cases where the location and time of the flood events are reported, and how do the models perform regarding flood timing, magnitude, and detection. This additional analysis would bring more meaningful insights on the potential use of these models for flooding management and flood detection, rather than a sub-basin aggregation.

4. Section 3.1: The models, in the context they were applied in this study, were not designed to evaluate discharge and floods at small catchments with < 4km^2, as the grid size is of at least $\sim$625 km^2 (0.25deg). As an (expected) result, the timing, magnitude, and flood detection are poorly captured. As these models are not appropriated to be applied in small catchments, can you expand on what is the purpose of evalu-

ating the small catchments in this study, why is it a reasonable approach, and which knowledge/information do you expect the scientific community will gain from it?

5. Section 3.1: Coefficient of determination could be used instead of linear Pearson to represent how much of the variability can be represented by the proposed models.

6. Page 11 Line 11. Can you expand on why do you think LISFLOOD perform worst using higher resolution forcing's data? I'd guess something related to model calibration.

7. This study was conducted considering data and models at daily time resolution, can you comment about the implications of temporal resolution on the forcing's data and modeling on the identification of short flashy floods. To what extent does it play a role in correctly identifying the flood category in places like southern Africa where rainfall if general driven by short and intense convective cells.

Technical Corrections / Minor Points

1. Page 2 Line 32: . . . determine climatic extremes as well as its uncertainties at global. . .

2. Page 3 Line 20: as an illustration, I'd list some examples of currently available flooding forecast systems currently available.

3. Page 4 Line 15: it would be nice to see the location of dams and reservoirs mapped in Figure 1., as it expands our sense about the basin dynamics and importance of representation of lake and reservoirs in hydrological models.

4. Page 14 Line 22: . . .whereas flood events occur at the basin or finer scales. . .

5. Page 15 Line 4. I'd say there is a critical need for both higher resolution re-analysis supporting data and flood forecasting systems to properly capture timing, intensity, and location of flood impacts.

6. Page 15 Line 22. I would change to something like: "This shows that some large-scale models (i.e., WaterGAP3) have some skill in capturing observed and reported

damaging floods, while others perform poorly. The finds here presented, highlights the importance of model intercomparison and evaluation studies to inform the scientific community on model's strengths and weakness as well as plausible applications".

7. Figure 1: Use a different color for the basin delineation; include the other river tributaries of a lower order, especially the ones where gauges were evaluated; use a different color for the circle and square.

8. Figure 2: Maybe you can check if a log scale in the y-axis of the NSE plots would improve the representation of the values around zero.

9. Figure 4: The 'X' points are very confusing and hard to follow through, maybe consider dots with a light line connecting them in the background.

10. Figure 5: Full name of POD and FAP in the figure caption.

11. Figure 6: Improve the figure quality regarding dpi. Change color scheme to opposite colors (i.e., red and blue) rather than light and dark (i.e., light blue and dark blue). Otherwise it's hard to see the differences.

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