Hydrology and
Earth System
Sciences

Open Access

Discussions

Interactive comment on "Should seasonal rainfall forecasts be used for flood preparedness?" *by* Erin Coughlan de Perez et al.

Erin Coughlan de Perez et al.

coughlan.erin@gmail.com

Received and published: 29 May 2017

COMMENT: The topic of the paper is important for practical applications. The research presented is of high quality, the paper is well written, and the methodology used is sound. I have only a few comments.

RESPONSE: Thank you for your specific comments, and we have incorporated further discussion on some of the critical points you have mentioned below. We appreciate that you see the value of this work for practical applications.

COMMENT: (1) I have problems with some of the terms used in the paper, such as drivers of flooding, flood-generating processes and etc. The paper is not identifying the drivers or processes, but rather identifying proxies or indicators of floodiness through correlation analyses.

RESPONSE: Thank you for this point; indeed reviewer #1 also mentioned this, and we have adjusted the language accordingly.

COMMENT: (2) While there are a few comments in the paper on the skill (or lack of skill) of seasonal GCMs in forecasting the proxies (indicators), they are dispersed in discussion and conclusions. I would like to see a more focused discussion on this, including implications, given the already low correlation between proxies and floodiness.

RESPONSE: This lack of skill can point in several directions for further research, and we have added the following paragraph before the discussion of seasonal hydrological modeling:

Seasonal skill in forecasting total 3-month rainfall anomalies is varied around the world; highest skill has been achieved during ENSO events in areas that have ENSO teleconnections (Barnston et al., 2010a; Weisheimer and Palmer, 2014). Given the low correlations we have found here between floodiness and either seasonal total rainfall or other rainfall indicators, forecasts of any of these proxies are unlikely to provide strong signals of increased risk. However, there have been several studies using large-scale climate patterns and sea-surface temperatures (SSTs) as predictors of flood risk, most focusing on the role of ENSO in changing global flood risk (Emerton et al., 2017; Ward et al., 2014, 2016). Further research on using SSTs and other climate patterns to directly forecast changes to flooding is merited, to explore whether such forecasts would give stronger indications of change in flood hazard than seasonal climate models of rainfall.

COMMENT: (3) I don't seem to be able to work out from the paper the source of the soil moisture data.

RESPONSE: This is mentioned on page 3 line 7-8: they are taken from the ERA-Interim Land dataset.

COMMENT: (4) Given many seasonal GCMs also produce surface runoff, I wonder

whether the authors would like to comment on the value of using surface runoff forecasts from the GCMs.

RESPONSE: Indeed, this is a good point. We refrained from including surface runoff in this paper, as it is no longer a rainfall indicator, but rather a rudimentary hydrological model. In the conclusions section, you can see that we do suggest people consider developing and running different seasonal hydrological models to provide specific floodiness seasonal forecasts, but we have not attempted to identify and evaluate those models that exist.

However, we did indeed analyze runoff from the ERA-Interim Land dataset, and the results are promising, in that even a crude hydrological model can greatly improve the correlation with floodiness. In case of interest: you can see the results at the end of this comment as per Figure 2 in the manuscript.

COMMENT: (5) Seasonal GCMs generally do a good job in forecasting large climate patterns (such as represented by SST based climate indices). It will be of value to add climate indices as predictors in analyses. It may well be that these will give the best correlations, especially when it is factored that GCMs are generally of low skill in forecasting climate variables directly.

RESPONSE: This is an excellent suggestion, and we also agree that this is likely to hold promise. Ward et al. have developed maps of the relationship between ENSO indices and global river discharge as well as global flood frequencies and durations (P J Ward, Kummu, & Lall, 2016; Philip J. Ward, Beets, Bouwer, Aerts, & Renssen, 2010). Emerton et al. 2017 also produced a study on the complexity of the relationship between ENSO and flood hazard (Emerton et al., 2017), and there has also been work done to link climate patterns with water scarcity (Veldkamp, Eisner, Wada, Aerts, & Ward, 2015).

We agree that this merits further research, including analysis of climate patterns beyond ENSO itself, and analysis of the connection with different types of floodiness.

As it would be beyond the scope of this paper to do a comprehensive study of these connections, we will instead pursue your suggestion as a separate paper, which will complement the current discussion of seasonal forecasts and floodiness.

—————————————————
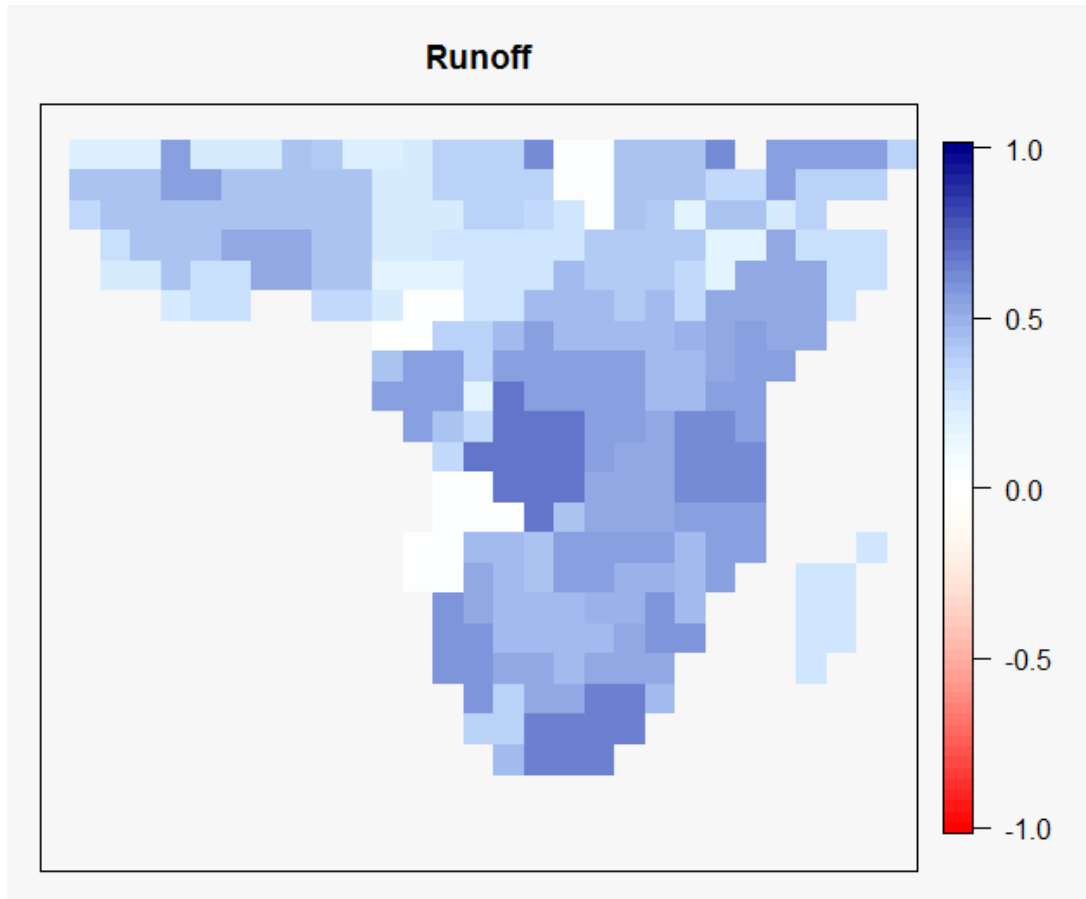
Fig. 1. Correlation of seasonal average runoff and floodiness for FPUs in Africa. These are anomaly rank correlations between runoff and percentage floodiness at the 5-year return period at the FPU level.
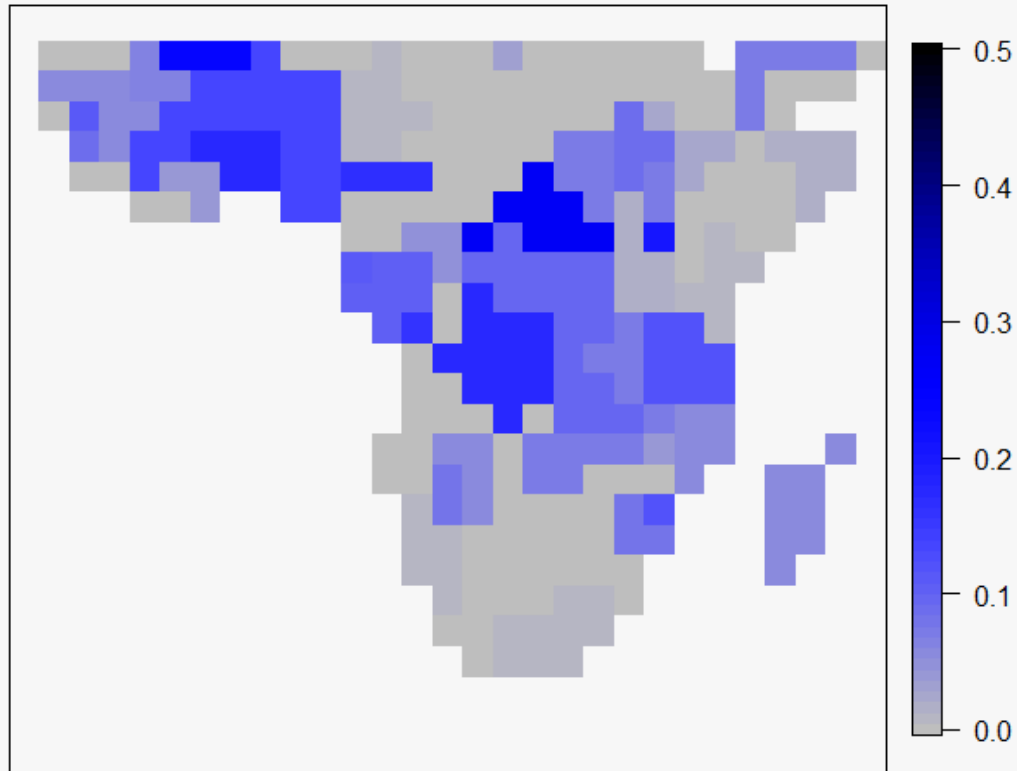
Fig. 2. The improvement relative to seasonal total rainfall – locations in blue show a higher anomaly correlation for this variable than for seasonal total rainfall anomalies.