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Hydrology and Earth System Sciences
Discussions

# *Interactive comment on* "Extending flood forecasting lead time in large watershed by coupling WRF QPF with distributed hydrological model" *by* Ji Li et al.

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REVIEW OF EXTENDING FLOOD FORECASTING LEAD TIME IN LARGE WATERSHED BY COUPLING WRF QPF WITH DISTRIBUTED HYDROLOGICAL MODEL BY LI ET AL.

In this study the authors have coupled a distributed hydrological model, the Liuxihe model, with the numerical weather forecasts of the WRF regional atmospheric model in order to forecast floods at a large watershed in China. Since the watershed has a size of approximately 58,000 sq km, their atmospheric model spatial grid resolution of 20 km may be appropriate.



The study first provides a comparison of WRF model's quantitative precipitation forecasts (QPFs) of basin-average rainfall against the rain gauge-based observations of basin-average rainfall at hourly intervals for 24 hr, 48 hr and 72 hour lead times. It finds that the WRF QPFs consistently overestimate the basin average rainfall when compared against the corresponding rain gauge observations for all of the three lead times. Hence, it proposes a method for correcting the overestimation bias of the WRF QPFs by scaling these QPFs by the corresponding basin-average rainfall observations of the existing rain gauges in the watershed. The flood forecasting results by their hydrologic model, based on bias-corrected WRF QPFs, result in significant improvement of the flood forecasts for all of the three lead times for the three studied flood events, when compared to the corresponding hydrologic model forecasts based on the original WRF QPFs. The comparison results are provided both in terms of graphs as well as by tables of several statistics. Based on the provided statistics, their flood forecasts by the proposed coupled atmospheric-hydrologic modeling are quite satisfactory. In fact, for all of their flood forecasts the Nash-Sutcliffe coefficient is above 55%, a satisfactory performance result.

The study also explores the calibration of their hydrologic model's parameters based on rain gauge - flood discharge observations versus the bias-corrected WRF QPF - flood discharge observations. Their comparison results, based on simulated flood forecasts and statistical measures, show that re-calibration of the hydrologic model's parameters by bias-corrected WRF QPF - flood discharge observations improve the forecasts when compared to the performance of the hydrologic model that is calibrated by the rain gauge - flood discharge observations.

While, the paper is technically sound, its English could benefit from editing. I have spent substantial time on the editing of the paper, and am providing the manuscript which contains the suggested editorial revisions, in the attachment.

There are some issues that the authors could address in the revised version of the paper: 1) While the authors are providing a description of the WRF atmospheric model,

it would help the reader to have a brief explanation on how WRF QPFs are obtained. That is, it would help the reader to know what global forecast data are used for the regional forecasts of the WRF model, and to see the model's nested domains over the modeled watershed. 2) From Table 2 it is interesting to note that the Nash-Sutcliffe (N-S) coefficient is the lowest for the 24 hr lead-time flood forecasts for the event 20120101 when compared to the other two events, but is the highest for the 48 hr and 72 hr lead-time forecasts when compared to the other two events. What is the reason for this anomaly? An explanation would be helpful. 3) In Equation (1) Fi seems to be the fraction of the watershed area covered by WRF grid i. Please clarify the definition of Fi . 4) It would benefit the readers who are unfamiliar with the Liuxihe model, to have a more detailed description of the model than the one provided in the present manuscript.

In summary, this study is a valuable contribution to hydrology on the forecasting of floods by a physically-based distributed hydrology model that is coupled to a numerical atmospheric model with satisfactory performance results and new insights. As such, it is acceptable for publication after the recommended revisions are performed by the authors.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/hess-2016-512/hess-2016-512-RC1-supplement.pdf

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