Nat. Hazards Earth Syst. Sci. Discuss.,
doi:10.5194/nhess-2016-356-AC5, 2017

Natural Hazards and Earth System Sciences
Discussions
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Interactive comment on "Numerical rainfall simulation with different spatial and temporal evenness by using WRF multi-physics ensembles" *by* Jiyang Tian et al.

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Received and published: 18 January 2017

We thanks for the thoughtful considerations from Professor Chu. We agree with the three comments which may help to improve the paper. The explanations to the comments are showed below point-by-point:

Point 1: page 5, line 16: Mention of the interpolation from observations using the Thiessen polygon method- no reference to this method.

Reply: Two references are added in Line 16 page 5 to indicate the application and advantages of the Thiessen polygon method: "... which is calculated by the Thiessen polygon method based on the observations of the rain gauges (Sivapalan and Blöschl, 1998; Jarvis et al, 2013)."

Sivapalan M., Blöschl G., 1998. Transformation of point rainfall to areal rainfall: Intensity-duration-frequency curves. J. Hydrol. 204, 150-167.

Jarvis D., Stoeckl N., Chaiechi T., 2013. Applying econometric techniques to hydrological problems in a large basin: Quantifying the rainfall–discharge relationship in the Burdekin, Queensland, Australia. J. Hydrol. 496, 107–121.

Point 2: Adding some comments in section 5 Discussion: How the rainfall forecasts influence the flood forecasts.

Reply: The following sentences will be added in Line 16, page 11: "An efficient flood forecasting system should be able to provide not only accurate forecasts but also long enough lead times for corresponding actions to be taken. Rainfall forecasts can provide rainfall information in the future, which can be used by rainfall-runoff model to forecast the flood and extend flood forecast period. However, the peak flood, flood peak appearance time, flood process are all significantly influenced by the rainfall accumulations and the spatiotemporal distribution of the rainfall (Schellekens et al, 2011; Cane et al, 2013; Fan et al, 2015). In such cases, the accurate rainfall forecast can do great help to flood warning."

Three references are added:

Schellekens J, Weerts A H, Moore R J, Pierce C E, Hildon S. The use of MOGREPS ensemble rainfall forecasts in operational flood forecasting systems across England and Wales. Advances in Geosciences, 2011, 29, 77-84.

Cane D, Ghigo S, Rabuffetti D, Milelli M. Real-time flood forecasting coupling different postprocessing techniques of precipitation forecast ensembles with a distributed hydrological model. The case study of may 2008 flood in western Piemonte, Italy. Nat. Hazard. Earth Sys., 2013, 13(2), 211-220.

Fan F M, Collischonn W, Quiroz K J, Sorribas M V, Buarque D C, Siqueira V A. Flood forecasting on the Tocantins River using ensemble rainfall forecasts and real-time satellite rainfall estimates. J. Flood Risk Manag., 2015, 9(3), 278-288.

Point 3: page 6, line 21: "In order to compare the simulations for different storm events, the final values of the three continuous indices in both two dimensions are represented as percentages of the corresponding average observations". The equation (7)-(9) should be modified as the sentences above, in two different dimensions.

Reply: The three equations are modified as:

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2016-356, 2016.

$$RMSE = \frac{\sqrt{\frac{1}{M}\sum_{j=1}^{M}\left(P_j - Q_j\right)^2}}{\frac{1}{M}\sum_{j=1}^{M} Q_j} \times 100\% \quad (7)$$

$$MBE = \frac{\frac{1}{M}\sum_{j=1}^{M}\left(P_j - O_j\right)}{\frac{1}{M}\sum_{j=1}^{M} Q_j} \times 100\% \quad (8)$$

$$SD = \frac{\sqrt{\frac{1}{M-1}\sum_{j=1}^{M}\left(P_j - O_j - MBE\right)^2}}{\frac{1}{M}\sum_{j=1}^{M} Q_j} \times 100\% \quad (9)$$

Fig. 1. Equations

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Discussion paper