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Hydrology and Earth System Sciences Discussions

Interactive comment on "Scale effects on runoff generation in meso-scale and large-scale sub-basins in the Luanhe River Basin" *by* P. Feng and J. Z. Li

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First of all, I would like to thank the referees for their carefull work and usefull suggestions. I have tried to take advantage of their advice to improve the revised version of the article. In the following pages I will try to describe how I tackled certain issues raised by the referees. For an easier comprehension, the comments of the referees are also reported.

R 1, The claim is that there is a clear decrease in RO coefficient with increasing watershed size. The exponentially(?) declining curve suggests that as well. But looking at the dataset, one could also simply see two points on the right with more or less the

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Interactive Discussion

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same RO coeff and four points on the left without any structure. So the empirical basis is not sufficiently strong, except perhaps for distinguishing between the two largest and the four smallest.

We fitted the mean runoff coefficients of the six sub-basins by exponetial curve and found it is of higher precision than other curves. The main aim of this figure is to claim that the runoff coefficient is non-linear and there is an exception for Laoniuhe basin.

R 1, So something must happen within the channel network (wetlands?) or there is something with the temporal dynamics of the routing of the peakflows (or yet something else, of course). Suggestion for further work: Perhaps the most interesting lead is the spatial variability in rainfall, but this would need to be worked out rigorously. Where did the rain fall? How would that route to, and between, outlets?

For this suggestion, we considered where the rainfall is. We considered the locations of the rain gages in the basin. Where the rain falls and how it routed to the outlet are noted in the revised paper. A hydrological model was established and in this model, we described how to consider the rainfall input and how runoff generated and routed to the outlet.

R 1, How were the 12 (14) events selected?

We changed the 12(14) events to runoff events greater than the flood of 2-year return period. All these data can illustrate the runoff coefficient trend for the six sub-basins.

R 1, The reference to spatial variability as possible cause does not explain a REDUCTION in runoff coefficient in larger watersheds/slopes

Actually, the spatial variability is larger in large sub-basins in Luanhe river basin. And some small floods are produced by local rainstorms.

R 1, Number/name basins in figures as well (there are only a few points)

The names of the sub-basins are noted along the rivers.

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R 1, Response time variations are treated under spatial variability but these should fall under temporal dynamics.

We compared the response time variations to illustrate the larger basins has longer response time, and there is more opportunity to infiltrate.

R 2, The scale issue must be treated rigorously from the physical, mathematical and/or statistical point of view.

We have added some contents, for example, established a model considering land use and land cover. This means we treated this scale issue by physical and mathematical method.

R 3, it needs deeper investigations to provide a meaningful contribution to the state of the art and for the development of a physically-based hydrological models and parameter estimation on different scales. For example more attention should be dedicated to the analysis of different components of runoff generation (surface runoff, subsurface runoff and base flow).

We have added some contents considering different components of runoff generation8212;surface runoff, fast sub-surface runoff, slow sub-surface runoff and base flow. And a physically-based hydrological model taking land use types into account was established. The model can reproduce the runoff coefficient of the selected events.

R 3, therefore 12/14 events and six basins analysed are poorly representative for this kind of analysis. Further analysis about the influence that the main physical factors play on the runoff generation are required; for instance it would be interesting to better investigate what may happen for different soil type or for different vegetation cover type.

In this study, we re-selected runoff events and the floods greater than 2-year return period during 1956 2002 were selected. We classified the land use types and got the area of each type in the basin and the controlled area of each rain gage. This is an input to the established hydrological model.

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Interactive Comment

R 3, Page 1516, line 4, the authors should explain the reason of the use of the precipitation amounts in the preceding 7 days and initial flow".

We have note the reference in the text.

R 3, therefore for a more objective evaluation, a larger number of events should be investigated.

We added many flood events in the revised paper.

R 3, at page 1514, section 2.1, lines 9-10, is written that the rainstorms are characterized by short duration and high intensity. What is the correct sentence?

The large floods in the history often caused by rainfall of long duration and high intensity. And we changed it in the paper.

R 3, there are also some technical comments, and we revised them according to the referee.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 1511, 2008.