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Hydrology and Earth System Sciences Discussions

Interactive comment on "Sensitivity of point scale runoff predictions to rainfall resolution" *by* A. J. Hearman and C. Hinz

Anonymous Referee #3

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General Comments

This paper investigates the effects of using rainfall at various time resolutions on the prediction of runoff from both infiltration excess and saturation excess mechanisms, with particular attention given to the triggering of hydrologic thresholds affecting these mechanisms. The results of the paper are potentially useful. However, there are errors in the model equations (listed below) that the authors need to correct and particularly check to see if they affect the results of the paper. For these reasons I recommend a thorough revision of the paper before considering its publication.

Specific Comments

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Page 3522, there are errors in equations (3) and (4):

The error in equation (3) might be a parenthesis problem in the second condition. Also the "if" condition statements seem to be erroneous (i.e. the correct statement seems to be "if $w_{soil} < \theta_{fc} z_{soil}$").
The rationale behind the use of equation (3) and the interpretation of the drainage coefficient need to be explained properly. This is very important since the drainage coefficient plays a key role on the results and conclusions of the paper.

The error in equation (4) is more complex and can be easily identified by checking the units. Here the terms in the equations should be in mm/hr. The "if" condition is also incorrect ("$w_{soil}(t) + p_{soil}(t) > \theta_{sat}$") since all these quantities have different units. Probably the soil depth should appear in equation (4).

Note: It is very important to verify that these errors are not embedded into the code, otherwise they might affect the results and conclusions of the paper.

Page 3523, lines 27-28 state:
"This duration was long enough to investigate 6 cascades of rainfall resolutions ..."
Even though the use of random cascades has been mentioned in the introduction, the methodology is explained after this paragraph. So this statement is out of context. It would be better to put it later in this section (i.e., after the first paragraph of the following page).

Page 3524, equation (7):
$\mu(\tau, i)$ has not been properly defined.

Page 3524, the explanation given for the random cascade model needs to be improved. For example, lines 19 to 21 state: "Figure 2 shows an example of a log-log plot of the α parameters of the beta distributions as a function of time resolution following a power law" It is unclear what the "α parameters" are, and what the "beta" distributions are. A power law is given in equation (8) which is expressed in terms of $a(t)$, a_o and H that

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are never defined (Figure 2 has a similar problem).

Page 3525, lines 13-14, infiltration excess, saturation excess, deep drainage and runoff seem to be in mm/h not mm as stated in line 14

Minor errors:

Page 3530, line 3: “To quantify this we can look at plots of the way the mean maximum intensities, the frequency infiltration excess is triggered and the time infiltration excess is active change with changes in average rainfall intensity scaled against the infiltration threshold of the soil, k* (Figure 7).” This sentence is confusing.

Page 3531, line 8: “These differences in dynamics means.” Should be: These differences in dynamics mean.

Page 3538, line 8: “Total runoff sensitivity for these soils scale”. Should be: Total runoff sensitivity for these soils scales.

Page 3548: Caption of Figure 9: the text is very confusing.

Page 3542: Table 1. What is "$\theta_{sat}r$" ?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 3517, 2006.