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Interactive Comment

Interactive comment on "Evaluating the effect of partial contributing storage on storage–discharge function from recession analysis" *by* X. Chen and D. Wang

H. McMillan (Referee)

h.mcmillan@niwa.co.nz

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This paper introduces an interesting analysis of flow recessions, where the deviation of (Q,dQ/dt) points from a single-valued, fitted relationship is attributed to ET and used to calculate a daily ET value. By comparing this derived ET value with a remotely-sensed ET value, the proportion of the watershed contributing to the flow (i.e. connected to the outlet) can be inferred. The authors used 9 US watersheds to test their method, with particular focus on the Spoon River watershed in Illinois where additional data such as depth to water table is available. The authors conclude that in their watersheds, significant underestimation of both ET and storage occurs when using standard recession

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analysis methods.

The paper has the potential to provide a useful analysis method to determine contributing area, which could be used by other hydrologists. However, as it stands, the authors need to go a little further to provide a convincing argument that their various conclusions regarding the ratios of alpha (E/TE) and beta (S/TS) describe real effects and are not artefacts of the data uncertainty or the form of the equations used. I provide more details on these points below.

1.P5777 L17. "Eobs is not biased" This was not shown.

2.P5778 L15-19. Alpha declines during recession events. Since Eobs is approximately constant, this translates as 'E declines during recession events', i.e. measured (Q, dQ/dT) points are closer to the fitted relationship. Given that the fitted relationship is a simplification of true catchment behaviour (i.e. power law relation between storage and discharge), please could the authors comment on whether their conclusion is robust to errors caused by the simplification.

3. P5779 L15-19. DS/DTS is correlated to E/Eobs. Is this a real effect or does it follow from the form of the equations for DS, DTS and E?

4. P5779 L25. Beta value of 0.38 is incorrect

5. P5779 L22-27. Stable value of beta. The values for beta in Table 2a are calculated from an iterative formula based on Eq 11. It is possible to express the value of beta(ti) as a function of Q0, a, b, mean(alpha), initial Q, and the values {Q} and {TE}. Using the values given for these by the authors, I could show that in this case, beta (ti) was dominated by the term mean(alpha), largely because the initial storage was large compared with the derived changes in storage. So beta is stable in large part because mean(alpha) is constant. Therefore I am not yet convinced that the stable beta is a real effect rather than an artefact of the particular Q0,a,b values for this watershed. To convince the reader, I think the authors could give the general form for beta(ti) and

HESSD

10, C2589–C2591, 2013

discuss which terms dominates and to what extent are calculated beta value provides more information than the mean(alpha) term.

6. P5780 L7-10. Beta decreases with increasing depth to water table. As described above, beta is approximated by mean(alpha) = mean(E/TE). E is the vertical distance between the (Q,dQ/dt) points on Fig 2, and the fitted line. As can be seen (the graph is on log axes) this distance decreases with decreasing Q, i.e. increasing depth to water table. Hence I am unclear whether this is a real effect, or just due to the larger spread of dQ/dt at high Q values.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 5767, 2013.