

Interactive comment on “Hillslope characteristics as controls of subsurface flow variability” by S. Bachmair and M. Weiler

Anonymous Referee #2

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The paper attempts to use hillslope and vegetation characteristics as explanatory predictors of variability in shallow water table dynamics. Three topographically similar catchment plots are examined, with differing vegetation cover. Extensive measurements of water tables are made in transects across the three slopes, and a number of water table response variables are identified. Hillslope characteristics are then tested to ascertain to what extent they can explain water table variability over a number of time scales, using partial correlation methods and a regression tree approach.

Generally, the paper is clearly structured, and the opening sections are well written. However, the results and discussion sections would benefit from the inclusion of a reference table for all predictors and response variables used, as their frequent re-

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explanation makes it difficult to read in parts. The paper addresses relevant questions to hillslope hydrology, and the results are interesting. However, I have some points which I think should be addressed:

1. Line 25, pg. 6906. I am not sure I understand how the explained variance, as produced by the random forest analysis can produce negative results? Does the author mean zero values here, or actual negative values?
2. I do not have a clear understanding of the chosen water table response variables. I understand AREA_NORM to be a fraction of the area underneath each well that is saturated. Is this correct? INDEX_ACTI is the fraction of time which the water table is active, as defined as being above 2cm in height. However, in the field methods it is suggested that all measurements below 13cm height are unreliable and discounted? If this is the case, how can this be reliably quantified? For INDEX_150 why is 150cm chosen as the threshold? Again, can this be reliably quantified given the issue with measurements in the lower 13cm of the wells? For the deeper wells I can see this wouldn't be an issue, but if it is for the shallower wells, then may that not add structured errors to the data?
3. There is not much discussion on how the three main response variables differ in their explainability for each slope. Were the two additional response variables for the event scale response mentioned after the introduction? Perhaps these could be drawn together in the discussion?
4. A more extensive examination at the event scale might be beneficial. How are the five chosen events representative of all the events?
5. Does the relative proximity of the grassland slope to the valley region and stream change the water table behavior in comparison to the forested slopes?
6. Are snow melt or overland flows significant contributors to run-off generation at this site? If so, one would imagine that their influence would differ between the plots?

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Would this influence the results?

7. A figure illustrating what is meant by SLUG_LOW and SLUG_HIGH and how it is calculated might be useful, particularly as SLUG_LOW was identified as one of the highest scoring predictors.

Detailed comments 1. Pg. 6895, line 4: opening bracket missing. 2. Pg. 6898, line 25: Unusual use of colons here. 3. Pg. 6906, line 27: Unusual use of colons again. 4. Pg. 6909, line 1-3: Sentence here is unclear. 5. Pg. 6909, line 4: 'stick out' is a little colloquial. 6. Pg. 6912, line 24: Colon use. 7. Pg. 6913, line 1: Sentence unclear.

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