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Hydrology and Earth System Sciences Discussions

Interactive comment on "On the calculation of the topographic wetness index: evaluation of different methods based on field observations" *by* R. Sørensen et al.

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We thank Referee #2 for the valuable comments. We agree with most comments and will consider these in the revision of this manuscript. Here, we'd like to take the opportunity of the discussion forum to reflect on some of the comments.

"A general suggestion is that the authors provide more conceptual (explanation) discussion in the introduction and in the discussion section about the connections between terrain, soil moisture, ground-water flow, pH, and plant species richness. This could lead to a more insightful explanation about why one TWI approach might be better suited for one variable compared to another."

The conceptual ideas behind expecting relationships between topography and our

measured variables have been discussed in other papers by us (Zinko et al., 2005) and others. We will add a few more references in the introduction, such as Sariyildiz et al., 2005; Band et al., 1993; Florinsky et al., 2004; Whelan and Gandolfi, 2002.

We deliberately did not include any speculations about the physical reason why different calculation methods or parameters performed better in the discussion because we did not find the results clear enough to proof such speculations. However, in the HESSD discussion forum one might be allowed to be a little more speculative on the different processes that are involved in the spatial variability of soil moisture, ground water depth, soil pH and species richness of vascular plants. E.g., higher values for d in the downslope index (i.e., an integration of the slope over a larger scale) gave better results for the correlation with soil pH and species richness, whereas the local slope worked better for soil moisture.

One might argue that this could be because soil pH and species richness depend more on long-term lateral flow processes that redistribute weathering products within the catchment.

In contrast the soil moisture at the surface reflects current conditions and is more sensitive to local topographical features.

“The description of tables 1 and 3 is unclear. What is meant by the “distribution of the best 10%”? I expected to see a range, percentiles, or a frequency distribution.”

Tables 1&3 actually give the frequency distributions. Please note that we here present results for calculation method options (i.e., ‘parameters’ with only two possible values). As both options were tested equally often in all cases, the deviation from a 50-50 distribution indicates how important a certain choice is.

For clarification we will change the table text to Ĕ Table 1. Distribution of the best 10 % of all tested calculation methods (using different measured variables) for flow distribution and slope distance respectively. Note that there were only two options for

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each of these two parameters. As both options were tested equally often in all cases, the deviation from a 50-50 distribution indicates how important a certain choice is. The highest Spearman's rank correlation coefficients, rs, which were obtained with a certain method, are given in brackets.

Table 3. Distribution of the best 10 % of all tested calculation methods (using different groups of measured variables) for flow distribution and slope distance respectively. Note that there were only two options for each of these two parameters. As both options were tested equally often in all cases, the deviation from a 50-50 distribution indicates how important a certain choice is. The mean of the difference between the very best correlation coefficient for each measured parameter and the group wise best correlation coefficient are given in brackets.

"Figures 3 and 4 have too much information in them. A simpler format would be easier to understand."

We suggest that using colours in the diagrams might help to make them easier to understand (see colorized figures on: http://web.telia.com/~u18513692/Sorensen_etal_HESSD_fig3_4_color.pdf).

Additional references:

T. Sariyildiz, J.M. Anderson, M. Kucuk; Effects of tree species and topography on soil chemistry, litter quality, and decomposition in Northeast Turkey, Soil Biology & Biochemistry 37 (2005) 1695-1706.

L. E. Band, P. Patterson, R Nemani, S.W. Running; Forest ecosystem processes at the watershed scale: incorporating hillslope scale, Agricultural and Forest Meteorology, 63 (1993) 93-126.

I.V. Florinsky, S. McMahon, D.L. Burton; Topographic control of soil microbial activity: a case study of denitrifiers, Geoderma 119 (2004) 33-53.

M.J. Whelan, C. Gandolfi; Modelling of spatial controls on denitrification at the land-

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