

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

Anonymous Referee #2

Received and published: 13 September 2005

General comments:

The research in the paper correlates TWI values, calculated with two methods (one originally developed by Quinn and the other by Tarboton), to several measured variables (plant species richness, soil pH, groundwater level, soil moisture, and a wetness metric) at two boreal forest sites. For each of the two methods, the authors adjust several parameters that affected the computed TWI values.

The results show which TWI computation methods and parameters yield the highest correlation with individual measured variables and groups of measured variables at each of the two sites. There is no clear “best” TWI method, but some patterns are identified.

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This research is a significant scientific contribution. Previous studies relating TWI to measured field variables are few and far between. TWI is an important terrain metric because of (1) its compact representation of how gravity affects the redistribution of moisture and water flow within hill slopes, and (2) its importance to the watershed model TOPMODEL. A better understanding of how TWI affects hydrological (soil moisture and ground-water flow), chemical (pH), and biological (plant species richness) variables is important, and this paper provides pertinent information to this goal.

Some specific suggestions for improving the presentation of the research are described below. 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.

Specific comments:

- 1) Does the paper address relevant scientific questions within the scope of HESS? Yes.
- 2) Does the paper present novel concepts, ideas, tools, or data? The paper provides a novel test of existing concepts.
- 3) Are substantial conclusions reached? The demonstration of the relations between TWI and measured variables is significant.
- 4) Are the scientific methods and assumptions valid and clearly outlined? Yes.
- 5) Are the results sufficient to support the interpretations and conclusions? Yes.
- 6) Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes.
- 7) Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes.

8) Does the title clearly reflect the contents of the paper? Yes.

9) Does the abstract provide a concise and complete summary? Yes.

10) Is the overall presentation well structured and clear? Yes.

11) Is the language fluent and precise? Yes.

12) Are mathematical formulae, symbols, abbreviations, and units correctly defined and used?

The explanation of the combined “degree of wetness” does not appear to be correct. The paper states that soil moisture and groundwater level are the dependent and predictor variables, respectively. This would not be the case if groundwater level is being predicted from soil-moisture content as stated in the paper.

13) Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?

The resolution of the DEM should be stated early in the paper.

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

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

14) Are the number and quality of references appropriate? Yes.

15) Is the amount and quality of supplementary material appropriate? Yes.

Interactive comment on Hydrology and Earth System Sciences Discussions, 2, 1807, 2005.

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