Hydrology and Earth System Sciences Discussions

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Comment

Interactive comment on "Explicitation of an important scale dependence in TOPMODEL using a dimensionless topographic index" *by* A. Ducharne

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This manuscript raises an important issue namely the unit of the widely used topographic wetness index ln(a/tanb) which can be somewhat confusing. A paper clarifying the unit of TWI could be of value. However, I have to say that I am not convinced that this manuscript reduces the confusion.

The TWI has (in most applications) the unit [ln(m)]. This is a somewhat 'strange' unit and can be forgotten to be stated explicitly, but I do not see any fundamental problems of having a log-unit. Using the number of pixels, n, instead of the area makes the index look dimensionless but of course the values of the 'dimensionless topographic index'

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(Eq 17) totally depend on the DEM resolution, because n depends on how large one pixel is. In this way, the new index actually seems to be more dependent on DEM resolution than the original formulation. So, while the new index formulation might highlight the unit issue, it does not really solve the problem and I am afraid the new formulation in the end might be more confusing than helping.

The fact that TWI is dependent on the resolution of the DEM is well-known (see the studies referred to by the author, or for a recent study Sørensen and Seibert (2007)). This is mainly due to the more smoothed DEM for coarser resolutions, which influences the values of both slopes and accumulated area. I don't see that the new index resolves this issue at all.

Minor comment: In the new index formulation the area per unit contour length is approximated by a=A/C, i.e. it is assumed that the contour length always is the length of a grid cell. Obviously this is a crude simplification and there are more advanced methods to estimate the contour line length (see, for instance, the work by Paul Quinn).

Sørensen, R. and Seibert, J., 2007. Effects of DEM resolution on the calculation of topographical indices: TWI and its components, Journal of Hydrology, 347: 79-89

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