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Numerical Modelling of the Topographic Wetness Index: An Analysis at Different Scales

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ABSTRACT

A variety of landscape properties have been modeled successfully using topographic indices such as topographic wetness index (TWI), defined as ln(a/tanβ), where a is the specific upslope area and β is the surface slope. In this study, 25 m spatial resolution from digital elevation models (DEM) data were used to investigate the scale-dependency of TWI values when converting DEMs to 50 and 100 m. To investigate the impact of different spatial resolution, the two lower resolution DEMs were interpolated to the original 25 m grid size. In addition, to compare different flow-direction algorithms, a second objective was to evaluate differences in spatial patterns. Thus the values of TWI were compared in two different ways: 1) distribution functions and their statistics; and 2) cell by cell comparison of DEMs with the same spatial resolution but different flow- directions. As in previous TWI studies, the computed specific upstream is smaller, on average, at higher resolution. TWI variation decreased with increasing grid size. A cell by cell comparison of the TWI values of the 50 and 100 m DEMs showed a low correlation with the TWI based on the 25 m DEM. The results showed significant differences between different flow-diretction algorithms computed for DEMs with 25, 50 and 100 m spatial resolution.

KEYWORDS

Resolution, DEM, Grid Size, Wetness Index

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