Connectivity as a dynamic modelling variable

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One of the potential uses for connectivity is to provide a variable that simplifies and up-scales modelling of land surface evolution. We propose such a measure, and show how it can be used to provide a dynamic model for the evolution of a simple surface. On a near-planar surface, average catchment area is equal to distance from the divide, increasing linearly downslope. For a strictly planar surface the coefficient of variation of area is zero, but this increases, over time and downslope, as erosion generates an increasingly integrated network of small channels. We show how reasonable local erosion laws lead to an explicit integrated law in terms of the coefficient of variation of drainage area. This leads to expressions for the rates of further integration to provide an up-scaled model for evolution of the entire slope through a series of storm events. This simplified model is compared with more detailed evolution models to assess the validity of this approach.