

## **Geomorphic tipping points: convenient metaphor or fundamental landscape property?**

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In 2000 Malcolm Gladwell published a book that has done much to publicise Tipping Points in society but also in academia. His arguments, re-expressed in a geomorphic sense, have three core elements: (1) a “Law of the Few”, where rapid change results from the effects of a relatively restricted number of critical elements, ones that are able to rapidly connect systems together, that are particularly sensitive to an external force, of that are spatially organised in a particular way; (2) a “Stickiness” where an element of the landscape is able to assimilate characteristics which make it progressively more applicable to the “Law of the Few”; and (3), given (1) and (2) a history and a geography that means that the same force can have dramatically different effects, according to where and when it occurs. Expressed in this way, it is not clear that Tipping Points bring much to our understanding in geomorphology that existing concepts (e.g. landscape sensitivity and recovery; cusp-catastrophe theory; non-linear dynamics systems) do not already provide. It may also be all too easy to describe change in geomorphology as involving a Tipping Point: we know that geomorphic processes often involve a non-linear response above a certain critical threshold; we know that landscapes can, after Denys Brunsden, be thought of as involving long periods of boredom (“stability”) interspersed with brief moments of terror (“change”); but these are not, after Gladwell, sufficient for the term Tipping Point to apply. Following from these issues, this talk will address three themes. First, it will question, through reference to specific examples, notably in high Alpine systems, the extent to which the Tipping Point analogy is truly a property of the world in which we live. Second, it will explore how ‘tipping points’ become assigned metaphorically, sometimes evolving to the point that they themselves gain agency, that is, shaping the way we interpret landscape rather than vice versa. Third, I will think through what this understanding means for geomorphology in a tipping point world arguing that if it indeed holds, it presents profound challenges for data collection and modelling that we do not fully appreciate, and will require very different kinds of analyses to those that we normally are accustomed to.