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Overland flow generation and headwater catchment response

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The lack of a unified theory for headwater runoff generation is limited by the dichotomy between infiltration excess and saturation excess mechanisms. Although partial area concepts may be applicable to both regimes, the increase in overland flow discharge with slope length and gradient, and the spatial pattern and connectivity of saturated areas, not all of them contributing to stormflow, depends strongly on which of the two mechanisms is active. It is also clear that, at many sites, there is switching between infiltration excess and saturation excess regimes, which may occur seasonally, though commonly with considerable variations from year to year, or may reflect event history, tending towards infiltration excess for larger events and vice-versa. Both of these runoff regimes give a highly non-linear relationship between rainfall and runoff, and it is vital to incorporate this into an understanding of overall catchment response.