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Topographic signatures of spatially-limited storm morphologies revealed from numerical landscape evolution modelling

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Landscape evolution models typically forsake realistic spatial and temporal patterns of rainfall, assuming spatially uniform rainfall input and steady-state runoff conditions. The implications of this assumption are explored, using extensions made to the CHILD numerical landscape evolution model. A variety of rainfall distribution patterns are tested – from isolated intense storm cells associated with convective precipitation, to more extensive rainfall patterns associated with frontal or stratiform types of precipitation.

Several topographic metrics are used to quantify the imprint left by variations in dominant storm shape and size, including the channel steepness (k_{sn}) and chi (χ) gradient indices. All else being equal, resultant landscape topography is shown to be sensitive to the dominant storm morphology and storm cell positioning at the range and catchment scales.