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Modelling the effects of spatial patterns of infiltration, rainfall and topography on catchment hydrologic connectivity.

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This paper reports on recent work on modelling the effect of spatial patterns in rainfall and topography on the hydrologic connectivity of a catchment using the model COUP2D. Previous modelling work (Michaelides and Wilson, submitted) has shown that spatial patterns in infiltration rates affect significantly the connectivity of runoff from the hillslope to the channel. Results showed that increasing the range of spatial variation of infiltration on the hillslopes and floodplains increased the variability of catchment discharge due to changes in runoff connectivity from hillslopes to channel. Conversely, increasing the proportion of aspatial variation decreased the sensitivity of the model to variable infiltration. In this paper, we investigate the effects of spatial patterns in rainfall and topography on runoff connectivity, and examine the relative importance of each parameter. Four hypothetical rainfall patterns have been generated: (1) linear gradient increasing upstream; (2) linear gradient increasing downstream; (3) radial gradient increasing centrally; and (4) spatially random pattern. All four patterns have the same rainfall mean. Topographic patterns were generated as model inputs using the geostatistical method of stochastic simulation. These topographic patterns have a downslope and across-slope component (bi-directional variogram) in order to describe differences in connectivity resulting from features such as rills and gullies. Multiple topographic scenarios were produced by adding spatially correlated error to an initial smooth DEM. The simulated topographic patterns and generated rainfall patterns were used as inputs to the model COUP2D in conjunction with a spatially

uniform and spatially variable infiltration surface. Monte Carlo simulations involving 50 replications were run for each set of condition. Therefore, in this paper we present results comparing the relative effects of spatial patterns of infiltration, rainfall and topography on catchment connectivity.