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Spatial variations in the surface hydrology of boulder mantled arid slopes; evidence of a self-regulating earth surface system?

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A series of detailed experiments have been conducted examining surface hydrology and sediment transportation during simulated high intensity storm events on the boulder mantled slopes of the eastern Badia Desert basalt plateau, Jordan. This remote suite of Quaternary and late Tertiary lava flows forms an undisturbed unit, with flow ages ranging from 8.9 million to 100,000 years, providing the ideal environment to examine long-term landscape and surface evolution. The hydrology of boulder mantled slopes in arid environments is poorly understood, perhaps impeded by the hostile and inaccessible nature of the terrain. Overland flow and hydraulic processes have been suggested to be critical controls on the removal and transfer of sediments on coarse clastic and rock fragment mantled slopes and has been widely addressed. Very little work has been undertaken to identify these processes and relationships on boulder mantled surfaces, a paucity which this research is aimed to address.

The results from a series of rainfall simulation experiments is presented, the interpretation of which suggests homeostatic relationship between surface form and process activity. This stems from a detailed analysis of the links between the spatial heterogeneity in process action and its relationship to an equally variable boulder surface character. The subtleties of this environment required the development of new and innovative measures of surface character, in particular focusing on deriving ‘appropriate’ measures of the surface form to which surface process and variation can be com-

pared. The combined analysis of measures of the surface form and process suggests a self-regulatory long-term evolution of these slopes. The results have implications for both our understanding of the evolution of this landscape type in Jordan and beyond, but can also can applied to our wider understanding of susceptibility to the processes of accelerated erosion and desertification on what appear to be homeostatic surfaces.