Geophysical Research Abstracts,
Vol. 11, EGU2009-12780, 2009
EGU General Assembly 2009

Characterising emergent behaviour in catchment surface runoff using connectivity

K. Michaelides (1) and A. Chappell (2)

(1) University of Bristol, School of Geographical Sciences, Bristol, United Kingdom (katerina.michaelides@bristol.ac.uk), (2) CSIRO Land and Water, GPO Box 1666, Canberra, ACT 2601, Australia (ges309@yahoo.co.uk)

In this paper we present an analysis of surface flow connectivity as affected by the interactions between a number of spatially-varying catchment hydrological properties. Through the use of numerical modelling and geostatistics, we analyse the relative effects of the different spatial structures in both external hydrological drivers (rainfall) and internal catchment properties (topography, soil infiltration rates) on surface flow patterns and their spatio-temporal changes. Different catchment properties and drivers typically have different correlation lengths in their spatial structures and little is known about the way in which these different spatial structures interact and affect emergent runoff characteristics. We use the geostatistical connectivity function to quantify the emergent characteristics of surface runoff and to identify thresholds that can be associated with the drivers or the properties of the hydrological system and their interactions. The connectivity function provides the probability that any two points separated by a specified distance are connected and hence enables mapping of the points and their likelihood in being connected to a specific location. The connectivity function, therefore, characterises the more subtle differences in the data fields associated with increasing connectivity and spatial organization and can be used to interpret transitions and thresholds in flow processes. Characterising changes in connectivity through time and space removes the individual hillslope complexities and allows the focus on the emergent hydrological behaviour, a property which is actually comparable between vastly contrasting locations and across different time and space scales.