Geophysical Research Abstracts
Vol. 14, EGU2012-3521, 2012
EGU General Assembly 2012

Do Not Only Connect

M.J. Kirkby
University of Leeds, Geography, Leeds, United Kingdom (m.j.kirkby@leeds.ac.uk, 0044 113 3436758)

Although the concept of connectivity has been increasingly canvassed in the last 10 years, there have been relatively few, and sometimes contradictory operational definitions. Connectivity can be reasonably associated with water flow, sediment transport and ecological habitats, and either generally or along specific pathways, for example in hyporheic exchanges, and inherits a legacy from concepts such as contributing area and hydraulic routing.
Here we focus on a single mode, for overland flow, but there remain a bewildering range of operational definitions. Connectivity between two points A and B, on a flow line, can be described as a nominal variable (presence or absence of connection), as a scalar (time delay or breakthrough volume), or as increasingly complex vectors (hydrograph at B for given input at A), even at steady state for a conservative system. Detailed descriptions of dynamic connectivity between adjacent points across an area form one critical ingredient of fine scale process-based models, such as CRUM or MAHLERAN. In this way, connectivity provides a valuable way of conceptualizing the local persistence and continuity of overland flow, particularly in semi-arid areas with short bursts of rainfall and patchy surface properties. For time-spans over which the soils and topography can respond, the division between structural and functional connectivity is also valuable; structure providing a necessary pre-condition for functional connection, and function a necessary condition for change in structure.
Beyond the strictly local scale, we would like to collapse the detail of overland flow connectivity into summary index variables, providing one or a few parameters that, for example, scale the response of a hillslope or small catchment to storm rainfall. Candidate indices include average travel times from runoff generating cells, average residence times and contributing areas, all potentially time-varying in response to catchment condition and storm rainfall. However, no magic bullet has yet emerged to summarize the complexity of catchment response.