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# Diffuse and confined connectivity: occurrence, importance and feedbacks

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The connectivity between the area of runoff generation within a catchment and the streamflow in a creek or river during rainfall or snowmelt events is triggered through a variety of processes. The most obvious is the transfer of surface water and related sediments and solutes through the landscape. This surface connectivity is often along confined pathways (roads, ditches, gullies) and less frequent by the so-called diffuse sheet flow. Hence, only a small fraction of the landscape is contributing to the connectivity. In many regions of the world, subsurface connectivity is more relevant than surface connectivity, producing often longer and more stable connection between hillslopes or aquifers and streams. Our common understanding is that this connectivity is relative equal in space and related to the local catchment area. However, recent experimental data (detailed hillslope experiments, temperature data or discharge gauging along the stream network) show strong evidence that subsurface connectivity is frequently along confined pathways (macropores, fractures etc) and only a small fraction of the subsurface is responsible for the connection. Examples will be presented to show the relevance of surface and subsurface connectivity and its occurrence as diffuse or confined connectivity. Feedback effects along the connection are dependent on the connectivity process. For example, confined surface connectivity often results in erosion and sediment transport. Confined subsurface connectivity will reduce feedbacks along the connection since soil moisture or groundwater response will only be local. How the different kinds of connectivity will affect runoff response or other relevant hydro-geomorphic properties of catchments will be highlighted with distributed hydrological models applied at a very high spatial resolution up to 1m. The model application will also show under what conditions connectivity is relevant to make adequate prediction of streamflow, floods, sediment transport or solute transport.