



What causes similarity in catchments?

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One of the biggest issues in hydrology is how to handle the heterogeneity of catchment properties at different scales. But is this really such a big issue? Is this problem not merely the consequence of how we conceptualise and how we model catchments? Is there not far more similarity than we observe. Maybe we are not looking at the right things or at the right scale to see the similarity.

The identity of catchments is largely determined by: the landscape, the ecosystem living on the landscape, and the geology, in that order. Soils, which are often seen as a crucial aspect of hydrological behaviour, are far less important, as will be demonstrated. The main determinants of hydrological behaviour are: the landscape composition, the rooting depth and the phenology. These determinants are a consequence of landscape and ecosystem evolution, which, in turn, are the manifestations of entropy production.

There are striking similarities between catchments. The different runoff processes from hillslopes are linked and similar in different environments (McDonnell, 2013). Wetlands behave similarly all over the world. The key is to classify landscapes and to link the ecosystems living on them to climate. The ecosystem then is the main controller of hydrological behaviour. Besides phenology, the rooting depth is key in determining runoff behaviour. Both are strongly linked to climate and much less to soil properties.

An example is given of how rooting depth is determined by climate, and how rooting depth can be predicted without calibration, providing a strong constraints on the prediction of rainfall partitioning and catchment runoff.