

Some thoughts on building, evaluating and constraining hydrologic models from catchment to continental scales

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We increasingly build and apply hydrologic models that simulate systems beyond the catchment scale. Such models run at regional, national or even continental scales. They therefore offer opportunities for new scientific insights, for example by enabling comparative hydrology or connectivity studies, and for water management, where we might better understand changes to water resources from larger scale activities like agriculture or from hazards such as droughts. However, these models also require us to rethink how we build and evaluate them given that some of the unsolved problems from the catchment scale have not gone away.

So what role should such models play in scientific advancement in hydrology? What problems do we still have to resolve before they can fulfill their role? What opportunities for solving these problems are there, but have not yet been utilized? I will provide some thoughts on these issues in the context of the IAHS Panta Rhei initiative and the scientific challenges it has set out for hydrology (Montanari et al., 2013, Hydrological Sciences Journal; McMillan et al., 2016, Hydrological Sciences Journal).