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Effects of horizontal hydraulic conductivity distributions on groundwater flow

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Catchment descriptors are used to quantify and summarise catchment properties, representing the characteristics of a catchment.[ASMMR1] It is meaningful to study how catchment descriptors relate to the integrated catchment dynamic, e.g. groundwater flow. Hydraulic conductivity (K) is a critical catchment descriptor and driving force for groundwater flow. It is well known that hydraulic conductivity is highly variable in space. Some studies have considered the impact of gradual decrease in hydraulic conductivity with depth on groundwater flow, but few considering the spatial variation in horizontal hydraulic conductivity. The purpose of this study was to investigate the effect of horizontal hydraulic conductivity on groundwater flow with an integrated hydrology model using virtual experiments.

We study the variability of catchment-scale groundwater flow patterns for virtual catchments with identical average and/or dominant hydraulic conductivities, but different horizontal distributions. The results show that the variation in horizontal hydraulic conductivity influences the formation and development of regional flow patterns. We further study the implications of the variation in horizontal hydraulic conductivity for patterns and rates of recharge and discharge, as well as for the groundwater flux.