

USING AN INTEGRATED SURFACE-SUBSURFACE MODEL TO SIMULATE RUNOFF FROM HETEROGENEOUS HILLSLOPES

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Summary. Traditionally, hydrologic models have treated surface and groundwater flow separately. Recently, integrated models of surface-subsurface processes are becoming more common. We use the fully integrated model Parflow to evaluate the role of heterogeneity on hillslope runoff production and baseflow. Simulations were generated with idealized, high-resolution hillslopes, which have constant slope and are with or without baseflow. Heterogeneous, correlated random fields were used to create spatial variability in hydraulic conductivity. Ensembles of multiple realizations were used to determine an average surface water outflow for a given hillslope configuration. An advantage to this technique is that we may explicitly interrogate individual realizations to perform accurate hydrograph separation between overland and subsurface flow. This technique allows determination of the contribution of variance from overland and baseflow in addition to average runoff behavior. Outflow from slopes without baseflow show typical hydrograph patterns which agree with previous studies of Hortonian runoff generation. However, baseflow cases understandably show a different surface runoff pattern from overland flow cases, with very little sensitivity to the variance of hydraulic conductivity. For these simulations, the contributions from overland runoff are shown to be a somewhat small portion of the hydrograph.

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