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Field experiment and Modeling full coupling hydrologic model with mircotopography in typical watershed

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With high human activties and landscape remodeling, the various landuse and micropography are newly added in scienctific sight. In order to quanify the solpo effect in high resolution sub-grid system, three-dimensional Richards' equations and the two-dimensional diffusion wave equations are chosen to solve the output difference between hydro-flows, The difficulty of quantitating surface water and groundwater interaction and parameterizing the microtopography with the help of multi-scale observation experiments. For three-dimensional coupling mechanism in surface-subsurface system, we design real-time observations on water flow at Hydrologic Response Units (HRU) located on various landuse and outlet in Meilin experimental watershed. The continuously observed data disclose the principle of runoff yield spatially and temporally, and show the surface runoff redistribution, unsaturated soil water dynamics, shallow groundwater response to typical rainfall-runoff events on complex microtopographic slope. A surface storage function with elevation various is embeded into diffuse wave equations to describe microtopographic effect. we improve for paramterizing microtopography in subelements and evaluate the strength of microtopography and couple length at soil-water interface impacting the hydrologic modeling. Based on observed conclusions, a full physical based distributed model system is established at Meilin watershed to quantify the hydrodynamic processes of overland flow, soil water saturation, and groundwater level and analyze dynamic exchanges among them in simulation. The relationships between the various saturation area (VSA) and runoff yield and flow confluence in each typical event are quantified statistically. With the field work and simulations, we demostrated the approach to describe complex hydrologic processes in human-interrupted watershed.

Keywords: micropography, coupling mechanism, various saturation area, surface storage