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A collision of classification and theory: Moving beyond the variable source area concept.

Through the Theme 1 activity of PUB, the experimental hydrology community has grouped many forms of subsurface stormflow, infiltration excess overland flow and saturation excess overland flow from various climate and geological environments around the world. While classification attempts have been made, none have yet supplanted variable source area theory as a unifying concept. Notwithstanding, variable source area theory is not without its shortcomings: it does not include infiltration excess overland flow nor does it represent the importance of storage and its influence on subsurface mixing and water residence time. Perhaps more problematic is its inability to address multi-scale runoff process—below or above the headwaters for which it was originally proposed. Here I summarize my PUB Decade efforts to intercompare across many environments and scales runoff generation mechanisms. When comparing individual runoff process, each have at their core, patterns of detention storage, transmission losses downslope and threshold-like connectivity—unifying features that appear at scales from square meters to square kilometers. I offer a storage-excess concept as a way to unify these findings and perhaps point a way forward beyond variable source area theory. I illustrate this with examples from field sites in Saskatchewan, New Zealand, Oregon, Georgia and South Carolina.