Green-Ampt *vs*. Curve Number: How different physiographic characteristics of the watersheds call for different approaches in modeling

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Abstract. Haw Watershed (1300 sq. mi.) is located in the piedmont region of North Carolina draining into B. Everett Jordan Lake in west of Raleigh and south of Durham. Major Land uses in this watershed are comprised of more than 50% forest, 21% urban/suburban and 25% agriculture, of which a large portion is pasture. Different hydrologic behaviors are observed in this watershed based on the land use composition and size of the sub-watersheds. Highly urbanized sub-watersheds show flashier hydrographs and instantaneous hydrologic responses. This is also the case with smaller sub-watersheds with relatively lower percentage of urban areas. SWAT has been widely used in the literature for hydrologic simulation on daily basis using SCS CN. However, it has not been used as frequently using the sub-daily routines. In this regard there are numbers of studies in the literature which have used coarse time scale data like daily precipitation with methods like SCS CN for small watersheds with high percentage of low-pervious areas reporting satisfying results in the matter of model efficiency measures like Nash-Sutcliffe or R-squared. This is while the more important concern should be to check and analyze the internal processes leading to those results. In this study, the watershed is divided into several sub-watersheds to compare the performance of SCS CN and GA methods on different land uses at different spatial scales. The results suggest better performance of GA compared to SCS CN for smaller and highly urbanized sub-watersheds although GA predominance is not very significant for the latter. Also, the better performance of GA in simulating the peak flows and flashy behavior of the hydrographs is notable. GA did not show a significant improvement simulating the excess rainfall for larger sub-watersheds. This study is an attempt to determine how different physiographic characteristics of watersheds calls for adaption of the methods used in order to have more robust and internally justifiable simulations.