

Simulate hydrology-soil-vegetation interactions at watershed scale in changing climate

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Hydrology, soil and vegetation are core elements in water-carbon cycle. Their dynamic interactions affect, and are affected by, environment and climate. For a watershed, poor land management practices usually result in soil and vegetation degradation, which inevitably alters natural hydrology. On the other hand, the altered hydrology will elevate soil erosion by wind and water, which in turn deteriorates vegetation degradation. Such interactions will become more sophisticated in changing climate because this can further worsen the already-altered hydrology. With this regard, our understanding is very limited partially because the existing hydrologic models were designed for other purposes and because we are lacking of algorithms that can be used to predict the dynamic interactions for interested management scenarios. The ultimate goal of this research is to identify hydrologic alterations that would trigger soil and/or vegetation degradation with climate change as an additional factor. The specific objectives are to: 1) develop a physically-based ecohydrologic model that can be used to quantitatively evaluate such interactions; 2) examine how and to what extent natural hydrology have been altered; 3) examine the physicochemical mechanisms of topsoil erosion resulting from alterations to natural hydrology; and 4) perceive threshold conditions for soil and land degradation to incept. These objectives are achieved by conducting field experiments, developing algorithms that link hydrologic processes with soil properties and vegetation characteristics, and formulating and verifying a variety of scientific hypotheses. In this presentation, we will introduce our past and ongoing research efforts that aim to advance our understanding of the dynamics.

Biography

Xixi Wang, P.E., is an Associate Professor in the Civil and Environmental Engineering Department at Old Dominion University. He received his Ph.D. degree from Iowa State University in Ames of USA and M.S. and B.S. degrees from Tsinghua University in Beijing of China. He has published more than 35 papers in high-quality journals, edited one book, written two book chapters, and extensively presented in national/international conferences. He serves one journal as the editor-in-chief, two journals as an associate editor, and many journals as a referee.

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