Geophysical Research Abstracts
Vol. 20, EGU2018-2706, 2018
EGU General Assembly 2018

Investigating critical rainfall and catchment scales for explaining hydrological response based on modelling and field observations in Little Sugar Creek, Charlotte (USA).

Elena Cristiano (1), Marie-claire ten Veldhuis (1), Daniel B. Wright (2), James A. Smith (3), and Nick van de Giesen (1)

(1) Department of Water Management, Delft University of Technology, Postbox 5048, 2600 GA, Delft, The Netherlands, (2) Civil and Environmental Engineering, University of Wisconsin-Madison, 2205 Engineering Hall, 1415 Engineering Drive, Madison, WI 53706, United States of America, (3) Department of Civil and Environmental Engineering, Princeton University, Princeton, New Jersey, USA

The hydrological response in urban areas is generally fast due to the high degree of imperviousness, and it is particularly sensitive to rainfall variability in space and time. For this reason, it is important to have a proper characterization of spatial and temporal rainfall variability. In this work, we aim to investigate the effects of rainfall and catchment scales on hydrological response sensitivity in urban areas. We classified storm core dimensions using cluster identification above selected thresholds, and we used this characterization to investigate the influence of rainfall variability on the hydrological response over the Charlotte, North Carolina metropolitan area in the south-eastern United States. The watershed of Little Sugar Creek (111 km^2) was studied using GSSHA, a physics-based distributed hydrologic modelling system. Twenty-five rainfall events were chosen from a 15-year (2001 – 2015) high-resolution (15 min, 1 km^2) radar data set, obtained from the National Weather Service (NWS) Next-Generation Radar network (NEXRAD). Rainfall events were aggregated in space (3 km^2, 5km^2 and 10km^2) and time (30 min and 1 h) to obtain different rainfall resolution combinations to use as input for the hydrologic model. Three dimensionless parameters, introduced in a previous synthetic study, were used to investigate the interactions between rainfall and catchment scale and rainfall resolution required to obtain a chosen level of model accuracy. The applicability of these parameters to different scales and local data is investigated in this study. First results showed that cluster identification can be used to characterize rainfall spatial variability.