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Factors controlling variability of event runoff characteristics in small agricultural catchment

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The space time variability of flood events in agricultural landscape is controlled by complex interactions between atmospheric, soil and land use characteristics. The main objective of this study is to investigate the factors controlling spatial and temporal variability of event runoff coefficient (Rc) and recesstion time constant (Tc) in Hydroloigcal Open Air Laboratory (HOAL), Petzenkirchen, Austria. HOAL is a small agricultural catchment (66ha) where runoff is measured in four different runoff generation systems, i.e. wetland, tile drainage, natural drainage systems and the main outlet. The analysis is based on 57 runoff events identified in the period 2013 to 2015. The event runoff characteristics are estimated by using methodology proposed by Merz et al. (2006). Results show that event runoff coefficients in HOAL are generally small. The largest event runoff coefficients are observed in the tile drainage systems (average Rc equals 0.09), in the wetland and natural systems is the average runoff coefficient 0.03 and 0.05 respectively. The mean Tc is the largest (6.7 hour) for the main outlet as it is associated with multiple sources and flow paths. Both Rc and Tc have a clear seasonal signal characterized by smaller values in summer and larger values in winter. The exception is observed in the wetlands, which have very small seasonal dynamics of Rc and Tc. The factors controlling the spatial and temporal variability of event runoff characteristics are identified and evaluated by using three stochastic regression algorithms, i.e. Random forest; Gradient Boost Decision Tree and Support vector machine. The results show that Support vector machine algorithm has better prediction performance compared to the other two types of methods. The most important factor explaining the temporal variability of Rc and Tc is the duration of precipitation and magnitude of precipitation peak. While antecedent soil moisture has some impact only for estimation of Rc dynamics in natural drainage systems, the areal coverage of pipes is an important factor for estimation of Rc in the tile drainage systems.