



Water flow paths in a forested catchment of the East Asian monsoon region

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The climate of South Korea is strongly influenced by the East Asian summer monsoon. It is hypothesized that the high precipitation regime of the summer monsoon causes significant changes in the hydrological behaviour of forested catchments, namely in water quantity, quality and flow paths. We conducted high frequency hydrometric, isotopic, hydrochemical and meteorological measurements in a forested catchment before, during and after the 2013 summer monsoon season. The catchment is located within the Lake Soyang watershed, where recent trends of increasing eutrophication, sediment load and organic carbon load have been observed. We studied the temporal variability of catchment runoff and the spatial and temporal variability of water flow paths in relation with the hydrological conditions of the hillslope, toeslope and riparian elements of the catchment. For the summer monsoon season, the runoff coefficient approximated 68%. During this period, for the 16 monitored individual storm events ranging between 13 mm and 126 mm in precipitation, the runoff coefficient greatly varied and a threshold relationship with soil moisture was observed. Analyses of hysteresis loops of catchment runoff also revealed threshold relationships with precipitation and soil moisture, as water flow paths were activated or not in different parts of the catchment. The variation of the electrical conductivity of catchment runoff through the summer monsoon also revealed the occurrence of threshold relationships. A principal component analysis (PCA) and an end-member mixing analysis (EMMA) were performed in order to quantify the contribution of the different landscape elements to catchment runoff. The combination of the hydrometric, isotopic and hydrochemical approaches allowed us to test our hypothesis and to shed light on the threshold relationships observed at the catchment. The findings of this study could be useful for the estimation of the water balance of the Lake Soyang watershed as well as for the management of Lake Soyang.