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Event-based analysis of nitrate flushing from forested catchment using high-frequency in-stream monitoring data

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In the small, forested Kuzlovec stream catchment near Ljubljana, Slovenia, nitrate flushing data were monitored in years 2018 and 2019. The amount of exported nitrates, determined based on the nitrate concentration in the stream, depends on hydrometeorological and biogeochemical conditions in the catchment. Therefore, various measuring equipment was installed in the catchment: tipping buckets for measuring precipitation amount and rainfall rates, pressure sensors in the stream for evaluation of water level and consequently of stream discharge, soil moisture sensors in three depths, a multiparameter probe for measuring the physical and chemical properties of water, including concentration of nitrates, etc. Moreover, occasionally, some discrete measurements were performed: discharge measurements using a dilution method, leaf area index measurements for determination of vegetation conditions using a plant canopy analyser, determination of soil properties including nitrate content in different soil horizons, etc.

Data, which were obtained using in-situ equipment for continuous measurements, were collected or recalculated to a 20-min time step. Due to geological properties and steep slope of the terrain, the catchment is very responsive to rainfall events. This is reflected in a short time of concentration, meaning that both flood peak and nitrate concentration peak occur shortly after the rainfall event. However, concentration of nitrates in stream and consequently the amount of flushed nitrates vary on event basis. This paper presents results of analysis of different events which occurred during the monitoring in order to identify hydrometeorological and seasonal conditions on nitrate flushing.

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