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# Improved understanding of solute concentration-discharge dynamics through state-of-the-art antecedent moisture content (AMC) monitoring and analysis

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The relationship between solute/sediment concentration and discharge (c-Q) can be neither understood nor predicted without full understanding of the antecedent moisture content (AMC). Many preceding studies have ignored this variable in part because of the problems associated with accurate and full documentation of AMC. This study presents new insights into the control of AMC on c-Q made possible through work on the uniquely well-instrumented 'NorthWyke Farm Platform' which was commissioned in April 2011 as a UK national capability for collaborative research, training and knowledge exchange in agro-environmental sciences for agricultural productivity and ecosystem responses to different management practices. The Farm Platform was designed into 15 hydrological units based on a predicted 50-year flood event, each with H-flume at catchment outlet. 9.2 km of French drains were installed at 800mm soil depth with perforated plastic drainage pipe installed to collect surface and near surface flow from the catchments. Each flume receives flow from 2 branches of each French drain system and discharges via concrete piping and a sampling pit. Where required the catchment is protected from groundwater seepage and surface runoff ingress from adjacent catchment with open ditches and sealed pipes. Discharge is measured at each flume with an ISCO bubbler flowmeter, and concentrations of Total Organic Carbon (TOC), Ammonium ($NH_4$-N), Nitrate ($NO_3$-N), Dissolved Oxygen (DO), total Phosphorus, chloride, pH and turbidity are monitored at 15 minutes intervals. In addition, rainfall, soil temperature and soil moisture are monitored at the same timestep. This study analyses discharge and soil moisture data alongside TOC, $NO_3$-N and $PO_4$-P at 15 min intervals in rain events between November 28 and December 13, 2011. Soil moisture exhibited moderately strong relationships with TOC and $NO_3$ ($r \geq -0.38$; $p \leq 0.05$), but a weak one with $PO_4$. Discharge, on the other hand, exhibited a weak ($r \leq 0.08$; $p > 0.05$) with all the ions. These results suggest that the behaviour of these ions is not explained by discharge alone. Analysis is in progress to determine the influence of soil moisture on hysteresis loops of these ions, as well as their contribution, with other end members to runoff in this study.