# High frequency monitoring of pesticides in runoff water to improve understanding of their transport and environmental impacts



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| Mots-clés | Concentration peak [6], Hysteresis [7], Runoff [8], Suspended matter [9], toxicity [10] |
| Résumé en anglais | Rainfall-induced peaks in pesticide concentrations can occur rapidly. Low frequency sampling may therefore largely underestimate maximum pesticide concentrations and fluxes. Detailed storm-based sampling of pesticide concentrations in runoff water to better predict pesticide sources, transport pathways and toxicity within the headwater catchments is lacking. High frequency monitoring (2 min) of seven pesticides (Dimetomorph, Fluopicolide, Glyphosate, Iprovalicarb, Tebuconazole, Tetraconazole and Triadimenol) and one degradation product (AMPA) were assessed for 20 runoff events from 2009 to 2012 at the outlet of a vineyard catchment in the Layon catchment in France. The maximum pesticide concentrations were 387 μg L− 1. Samples from all of the runoff events exceeded the legal limit of 0.1 μg L− 1 for at least one pesticide (European directive 2013/39/EC). High resolution sampling used to detect the peak pesticide levels revealed that Toxic Units (TU) for algae, invertebrates and fish often exceeded the European Uniform principles (25%). The point and average (time or discharge-weighted) concentrations indicated up to a 30- or 4-fold underestimation of the TU obtained when measuring the maximum concentrations, respectively. This highlights the important role of sampling methods for assessing peak exposure. High resolution sampling combined with concentration-discharge hysteresis analyses revealed that clockwise responses were predominant (52%), indicating that Hortonian runoff is the prevailing surface runoff trigger mechanism in the study catchment. The hysteresis patterns for suspended solids and pesticides were highly dynamic and storm- and chemical-dependent. Intense rainfall events induced stronger C-Q hysteresis (magnitude). This study provides new insights into the complexity of pesticide dynamics in runoff water and highlights the ability of hysteresis analysis to improve understanding of pesticide supply and transport. |

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