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Elemental and isotopic composition of River water during a flood event in agricultural watershed: Insight of sources and pathways of water and terrestrial derived matter

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Flood event in agricultural watershed represents 64% of water discharge but up to 71% of dissolved organic carbon and 94 of total suspended matter export. It therefore constitutes a key period to assess change in surface water contamination and quality. While during base flow conditions most of river discharge is supported by groundwater input, during storm period surface and subsurface runoffs contribute to river flow. Integration of water pathway complexity and spatial heterogeneity of contaminant inputs in the watershed need to be assessed by biogeochemical proxy measured at watershed outlet in the main river channel. Objective of the study is to improve our comprehension of water, terrestrial matter, contaminant sources and fate in agricultural watershed. To decipher these sources we measured several isotopic proxies (^{13}C, ^{15}N,^{18}O, D) in several matrixes (bulk, particular and dissolved fractions) within the water column of the Save River, draining a typical agricultural watershed of south-western of France.

We sampled the Save river during may 2010 spring flood event in order to characterize the fluxes of water and particulate and dissolved matters. Intensive sampling strategy allowed us to sample at high-resolution the change in elemental and isotopic composition of several environmental matrix. ^{18}O and D have been measured to trace the water origin and pathway (quick surface flow (SF), delayed subsurface flow (SSF) and groundwater flow (GF)) during the flood event. Source of terrestrial matter is explored trough ^{13}C, ^{15}N isotopic analysis along with total C and N elemental analysis. Preliminary results show a specific isotopic response depending on hydraulic flow considered. Elemental and isotopic composition remains constant during base flow conditions, however they fluctuate a lot during the flood event. C/N_{POC} ratios vary from 6 to 4 % from base flow to peak flow respectively. $\delta^{18}O$ values vary from -7.5‰ to -10‰. $\delta^{13}C_{DIC}$ vary from -12‰ to -10‰. C/N_{POC} variation may be explained by an increasing contribution of terrestrial derived organic matter washed by surface and subsurface runoffs. Decrease in $\delta^{18}O$ values betray a change in water reservoir supply to total river flow and indicate a greater contribution of upper watershed precipitation (higher altitude) at lower temperature. Finally $\delta^{13}C_{DIC}$ increase may be associated with an increasing leaching of soil carbonate during the storm event. Ongoing analyses of river sample include deuterium (dD), $^{13}C_{POC}$, $^{13}C_{DOC}$ d^{15}N and specific biomarker analysis (lignin biomarkers). These complementary analyses will improve our comprehension of terrestrial matter transfer and source. These informations will be compared to several contaminants dynamics in order to understand their fate in agricultural watershed during flood event.