Hydrologically driven changes in soil solution DOM molecular composition during storm events

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In headwater catchments, storm events are responsible for exportation of the major part of dissolved organic matter (DOM) during the hydrological year. During these storm events, peak discharge at the outlet is accompanied with an increase of DOM concentration, implying the mobilization of additional DOM sources which could have different composition than DOM exported during base-flow. Molecular analysis performed on sample coming from the outlet of the Kervidy-Naizin catchment, an agricultural headwater catchment located in France (Critical Zone Observatory AgrHyS) revealed a modification in the distribution of lignin compounds during storm events. One hypothesis proposed to explain the production of less degraded DOM was subsurface and surface erosion due to changes in hydrological conditions in soils during storm-flow conditions. This hypothesis was investigated during storm events by sampling with high frequency (i) soil solution and surface runoff in riparian soils, (ii) stream water at the outlet of the catchment. DOM molecular composition was analyzed by THM-GC-MS. During storm events, soil solution and surface runoff DOM molecular composition were similar with less degraded and more hydrophobic compounds. Moreover, distribution of lignin and fatty acids markers were modified to get closer to soil organic matter distribution. These molecular modifications are also recorded in stream water samples as DOM mainly came from soil solution and surface runoff. Changes of molecular composition in soil solutions appear to be hydrologically driven as they are recorded when water-table begins to rise in the slope. Moreover, highest increase of water-table level correspond to the more intense molecular modifications. During storm events, the observed modifications of stream water DOM molecular composition are comfirmed to be due to changes of soil DOM molecular composition and contribution of surface runoff. Modifications of DOM composition in soil solutions are hydrologically driven and could result from subsurface erosion in macroporosity due to increase of water velocity.