In-situ Optical Sensors Reveal Dissolved Organic Carbon Export Dynamics in Sleepers River Research Watershed, Vermont, USA

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River systems serve as net exporters of dissolved organic carbon (DOC) from land to the ocean, providing an energy source to aquatic ecosystems and influencing the transport of organic bound pollutants. DOC-discharge relationships indicate hydrology is a strong driver of DOC export from watersheds [1]. Optical properties of stream water can be used as proxies for DOC concentration to provide higher temporal resolution of DOC dynamics to improve estimates of net DOC export and further our understanding of ecological and geochemical processes [2]. We deployed multiparameter water quality probes (Eureka Manta), fluorometers (Turner Designs Cyclops), and spectrophotometers (s::can spectro lyser) in a forested headwater catchment in the Sleepers River Research Watershed in Vermont. We coupled the 15-minute interval sensor record with field sampling and laboratory analysis for DOC, excitation-emission fluorescence matrices, and major ions. We found that continuous specific conductivity and in-situ absorbance at 254nm were strong predictors of calcium and DOC, respectively. High resolution separation of the storm hydrograph into groundwater and event water components was completed using a 2 end-member mixing model. Using this approach, we observed a large storm event that exported 2 kg C ha-1, which was consistent with other recorded event export fluxes during large storms in the New England region. We conclude that continuous in-situ observations of stream water optical properties may be combined with other continuous hydrologic tracers such as specific conductivity to separate hydrograph components, thus improving our understanding of DOC sources and ability to predict DOC export.

[1] Raymond, Saiers & Sobczak (2016), *Ecology* 97(1), 5-16.
[2] Ruhala & Zarnetske (2017), *Sci Total Environ* 575, 713-723.