



Transport of dissolved organic matter from the hillslope to the stream: using fluorescence spectroscopy to identify changing sources during snowmelt

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In natural waters, dissolved organic matter (DOM) is ubiquitous and is comprised of compounds derived from the degradation of both plant and microbial precursor materials. DOM transport is a key biogeochemical link across the terrestrial-aquatic interface in headwater catchments, and therefore is intimately linked with the hydrologic connectivity of the catchment to the stream. The snowmelt period is typically a period of rapid transport of pulses of DOM from hillslopes in mountain catchments, and yet important transformations occur within the water soluble pool of organic matter at the interfaces between the hillslope with the hyporheic zone, and with the stream itself. Studies evaluating the mobility of specific chemical classes of DOM have indicated that diverse transformations that occur reflect both sorption and microbial uptake. Recent results from a study of a semi-arid montane catchment studied as part of the Boulder Creek Critical Zone observatory will be highlighted. In this study, DOM quality was monitored using fluorescence spectroscopy on a daily basis within the shallow soil (10 – 25 cm depth) and the stream during snowmelt and was compared to approximately bi-monthly groundwater samples (~18 m depth). In the stream a transition occurred during snowmelt from fluorescent DOM (FDOM) being dominated by protein-like material to FDOM being dominated by more humic-like material. The FDOM in the interstitial water of the shallow soils and the groundwater did not change in character. Thus, the stream transition is indicative of an engagement of DOM originating from shallow soils during snowmelt. This study identifies a humic-like fluorophore in the soil and the stream that is typically seen only in extracted water soluble organic matter from soil. These results indicate that shifts in hydrologic connectivity of different watershed units to the stream are a major control on DOM export from the watershed.