@INPROCEEDINGS{Kerins2021-xb,
 title   = "Increased {DOC} concentrations and earlier stream flow
              generation in response to warming in a high elevation mountain
              watershed in Colorado",
 author   = "Kerins, Devon and Zhi, Wei and Sullivan, Pamela and Williams,
              Kenneth and Brown, Wendy and Dong, Wenming and Carroll, Rosemary
              and Kirchner, James and Li, Li",
 abstract = "Highelevation mountain watersheds are undergoing rapid warming
              and declining snow fractions worldwide, causing earlier and
              quicker snowmelt. Understanding how this hydrologic shift
              affects subsurface flow paths, biogeochemical reactions, and
              solute export has been challenging due to the entanglement of
              hydrological and biogeochemical processes. Coal Creek, a
              high-elevation catchment (2,700 3,700 m, 53 km2) in Colorado, is
              experiencing a higher rate of warming than surrounding low-lying
              areas. This warming corresponds with dynamic and increased
              responses from biogenic solutes and dissolved organic carbon
              (DOC), whereas the behavior of geogenic solutes and dissolved
              inorganic carbon (DIC) has remained relatively unchanged. DOC
              has experienced the largest concentration increase (>3x), with
              annual average flow weighted concentrations positively
              correlated to average annual temperature. This suggests
              temperature is the main driver of increasing DOC levels.
              Although DOC and DIC response to warming is influenced by many
              drivers, the relative contribution of each remains unknown. DOC
              and DIC were analyzed to incorporate both carbon component
              products of soil respiration (DOC and CO2) and to represent high
              solute concentrations transported by shallow (DOC) versus deep
              (DIC) subsurface flow. The contrasting behavior of these carbon
              solutes indicates climate change and warming are driving changes
              in organic matter decomposition and soil respiration. Modeling
              results from the process-based model HBV-BioRT show increased
              temperatures cause earlier snowmelt and streamflow generation
              and lower peak discharge. As stream flow generation occurs
              earlier, so do DOC flushing and DIC dilution events.
              Additionally, post-snowmelt periods show greater DOC production
              and concentrations under warming scenarios. Results indicated
              increased production of DOC in post-snowmelt periods. DOC is
              then flushed out by earlier snowmelt partitioned through the
              shallow soil zone. Most process-based studies lack a
              watershed-scale understanding of carbon transformation and flow
              path alterations. This work demonstrates complex hydrologic and
              biogeochemical coupling at the watershed scale to illustrate how
              water flow paths and chemistry are responding to a changing
              climate in highelevation mountain watersheds.",
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  year     = 2021
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