

Climate and anthropogenic influence on organic carbon mobilization and export from watersheds

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Rivers transfer vast quantities of organic carbon from land to ocean each year, forming a key component of the global carbon cycle. This carbon is derived from diverse sources and may follow myriad pathways during its mobilization and export from river basins. The importance of different pathways varies from one basin to another, reflecting specific properties of the catchment. Superimposed on natural processes, pervasive anthropogenic perturbation of watersheds further complicates assessment of background controls and human influence on carbon export. Deconvolution of factors modulating the flux, residence times and composition of organic carbon that is exported by different fluvial systems constitutes an important challenge that bears upon both informed interpretation of downstream sedimentary sequences recording past dynamics of terrestrial ecosystems, as well as prediction of ecosystem and biogeochemical responses to future environmental change.

This presentation will seek to explore organic carbon dynamics within watersheds on spatial scales ranging from small alpine catchments to large river basins, and on temporal scales varying from spanning individual hydrological events (hours) to those encompassing variability over millenia. A combination of molecular and isotopic tracers is used to constrain organic matter sources and provenance, as well as pathways and timescales of transport. Focus is placed on particulate organic matter export, elucidation of fates of biospheric versus petrogenic organic carbon, and the role of mineral associations in delivery and fate of organic matter moving through river basins. These investigations, which span a broad range of watersheds, highlight the complex processes and dynamics associated with organic carbon export, with climate and anthropogenic forcing exerting marked influence on signals that are exported from watersheds and sequestered in the sedimentary record.