Poster #170

Hydrologic and Geomorphic Controls on Floodplain Erosion and Carbon Dynamics in a Mountainous Headwater Catchment
SBR Early Career Award

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A discrepancy between organic carbon (OC) inputs to inland waters and outputs, including delivery of OC to the oceans and off gassing to the atmosphere, has altered the perception that rivers act solely as conduits for OC. To explain this carbon deficit, studies have suggested that rivers are a net sink of OC within the geosphere. Beyond simply storing OC, rivers act as bioreactors with hotspots that facilitate the decomposition and mineralization of OC along floodplains. Both the storage and processing of carbon is tightly coupled to the physical and hydrological dynamics of river systems. River migration and flooding serve to transfer OC and sediment to and from the floodplain while seasonal and interannual variations in river hydrology control hyporheic and soil moisture conditions of the floodplain. The complex stratigraphy and microtopography of floodplains leads to strong heterogeneity in the storage and biogeochemical processing of OC in river corridors. Here we present data from a detailed study of the coupled, hydrogeomoprphic dynamics and carbon cycling of the East River, Crested Butte, CO. We examine river dynamics and carbon cycling at yearly to decadal time scales using 60 years of aerial imagery, high-resolution aerial lidar data, ground surveys, extensive soil carbon sampling, surface water sampling, C:N elemental analysis, fourier transform ion cyclotron mass spectrometry, and nuclear magnetic resonance. Preliminary results suggests that (1) channel erosion and related OC flux is driven by the the duration and rate of decline of the annual hydrograph peak in snowmelt dominated systems; (2) on a yearly basis the net flux of sediment is from the floodplain to the channel, necessitating widespread overbank deposition from less frequent floods to balance fluxes to and from the floodplain; (3) seasonal downstream changes in particulate OC concentrations in the river suggest that the floodplain alternates between a source to a sink for OC to the river; (4) OC content across the floodplain varies with soil depth, distance from the channel, and is much higher in abandoned channels; (5) the OC in abandoned channels is also more decomposed compared to OC in other portions of the floodplain; (6) the decomposition of OC stored in the floodplain increases with distance downstream.