Erosional transport of organic matter after the Rim Fire, Yosemite National Park

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Erosion is a major global force in redistribution of soil and soil organic matter (SOM), and when combined with fire, it can cause major alterations to soil carbon (C) properties and long-term stabilization. The production of pyrogenic carbon (PyC) and its erosion post-fire are critical processes for the long-term C budget within a soil; however, relatively little is known about the erosion of PyC. The Rim Fire burned over 250,000 acres in 2013 in Stanislaus National Forest and Yosemite National Park, California. Immediately after the fire, sediment traps were established along a hillslope in seven replicates of three treatment group combinations of slope steepness and burn severity (high severity burn, high slope; high severity burn, moderate slope; and moderate severity burn, high slope). Sediment was collected from the fences after every major precipitation event post-fire through the spring of 2015. In the initial sampling period, the highest sediment transport corresponded with the largest rainfall events. Sediments and source soils for the eroded material were analyzed for total C, nitrogen (N) and their stable isotopes. A subset of soils and sediments was analyzed via ^{13}C Cross-Polarization Magic Angle Spinning Nuclear Magnetic Resonance spectroscopy to investigate differences in SOM properties between the eroded and source material. Enrichment ratios for sediment were calculated by comparing concentrations of C, N, and PyC in eroded sediment with concentrations in source soils. The moderate severity burn sediments were enriched in bulk C and N, while high intensity burn sediments were enriched in PyC. This suggests that char produced under higher temperature is likely more susceptible to erosional transport compared to low-temperature char. The erosion of PyC is a critical controlling process for SOM dynamics in eroding landscapes.