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Role of erosional redistribution following wildfires in determining fate of pyrogenic carbon in the soil system

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Fire, erosion, and soil carbon (C) dynamics overlap in space and time. Increased rates of erosion typically follow wildfires, and fire-altered or pyrogenic C (PyC, also referred to as black carbon) is redistributed vertically within soil profiles and laterally to lower landform positions along hillslopes, changing its C sequestration trajectory. However, we currently lack sufficient understanding on how and why the interaction of fire and erosional distribution of soil materials control persistence of bulk soil organic matter (SOM) and PyC in dynamic landscapes. In this talk, we present results from wildfires that occurred in the Sierra Nevada Mountains (USA) to demonstrate how the composition (based on stable isotope composition of 13C and 15N, and NMR analysis of OM composition) and magnitude of pyrogenic carbon redistributed by soil erosion varies considerably depending on fire severity and geomorphology of the landscape. Our findings also show that PyC is preferentially transported by erosion in high severity burn slopes, compared to areas affected by low and medium severity fires. Findings of this study are critical for better integration of biogeochemical and geomorphological approaches to derive improved representation of mechanisms that regulate SOM persistence in dynamic landscapes that routinely experience more than one perturbation.