Developing proxies for wildfire in modern and ancient environments

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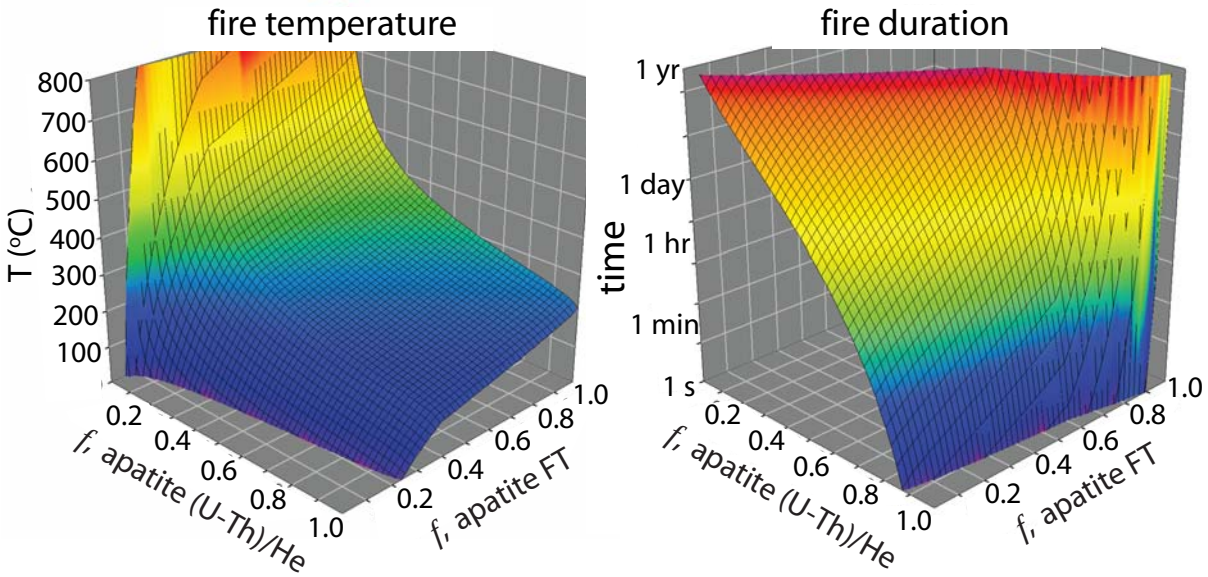
Wildfire produces characteristic mineralogic, geochemical, and geochronologic signatures in soils and exposed bedrock that can be used to trace the influence of fire across modern landscapes, trace detrital grains in sedimentary systems, and understand the frequency and severity of paleowildfire in the geologic record. Our work has focused on developing wildfire proxies using thermochronology of apatite crystals, mineralogic transformations (particularly in Fe-oxides), and mobilization and volatilization of elements in soils by fire.



Above: Short duration heating events characteristic of wildfire produce a diagnostic signature in apatite crystals, making (U-Th)/He ages are older than fission-track (FT) ages. The contrasting kinetics of age-resetting in both systems allows one to invert coupled fractional resetting extents (*f*) to solve for the T and t of an equivalent square-pulse heating event.

Right: Apatite He-FT ages for crystals from exposed bedrock (colored symbols) and detrital chips on soil (black). Red and black dashed lines denote age resetting trajectories for varying temperature and duration of wildfires.