Wildfire thermochronology

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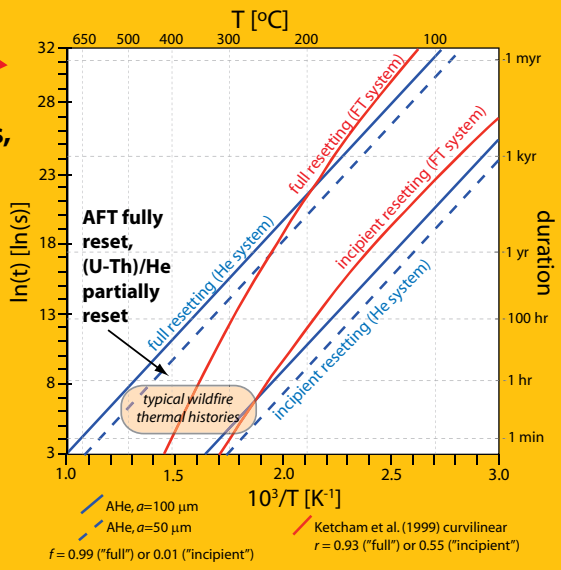
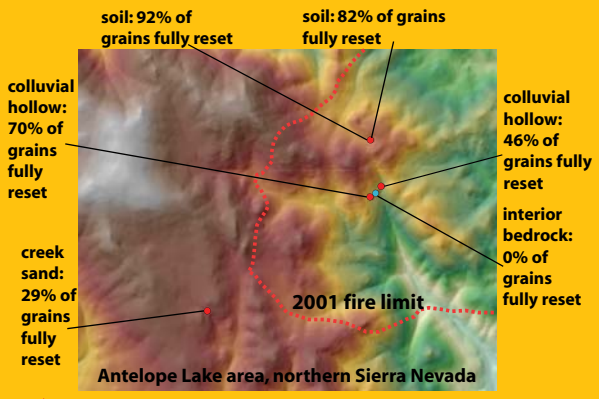
Thermochronology is typically used to infer timing and rates of cooling due to erosion or tectonic exhumation. In this project we focus instead on resetting of the (U-Th)/He and fission-track thermochronometric systems by wildfire. Shallow soils and exposed bedrock experience thermal histories involving temperatures of c. 300-600 °C for minutes or tens of minutes in typical wildfires.

For wildfire events, a kinetic inversion occurs, in which fission-track ages reset faster than (U-Th)/He ages. This leads to a diagnostic signature of short-duration, high-T events in detrital and exposed bedrock samples that can be used to trace wildfire through the landscape.





Most apatite grains in soils are completely reset for the fission-track system and partially reset for the He system. Samples in colluvial hollows and creeks have abundant but fewer reset grains. Rivers have very few.

The proportion of wildfire-reset grains decreases systematically with basin area. This reflects the fact that most apatite in river sand comes from landslides in a few high-slope areas. Fluvial apatite is therefore highly spatially fractionated with respect to its distribution in the landscape.