Fire, carbon, and climate change in California's high elevation forests

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Abstract:
Recent changes in high elevation forests worldwide indicate that forest structure and long-term ecosystem stability are threatened, with implications for carbon sequestration and ecosystem refugia. Biomass and disturbance models have high uncertainty in high elevation forests, where landscapes are more heterogeneous across short distances and data are more limited than in lower elevations. Anecdotally, subalpine tree mortality after fire is generally low in the first year, with substantial increases in mortality in the five years following. Delayed mortality and compounded disturbances may lead to an underestimation of mortality from disturbances. Given the increasing area and frequency of fires over the last decades, changes in high elevation forest fire regimes and their impacts on biomass are unclear. In this project I analyze temporal patterns of tree mortality using Bayesian machine learning methods with high resolution imagery. I expect the timing of mortality in the several years following fire to vary between drought and non-drought post-fire conditions, and locations, with implications for long-term carbon storage projections and management. California's high elevations are assumed to be stable carbon sinks due to relatively low levels of disturbance, however the severity of disturbances may be underestimated using current methods. Enhanced measurements of post-fire mortality will impact assessment of changing biomass stocks, which is essential for understanding current and projected trends in carbon sequestration.