Burns Obscured- How Rapid Wildfire Growth Conducive Weather Conditions Affect the Timing of our Observations

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Rapid-growth wildfires disproportionately contribute to loss of life and destruction of property. Since periods of rapid growth are often associated with severe weather conditions, further improving our understanding of fire-associated weather is crucial if we are to mitigate future destruction.

In recent years, individual-fire-growth datasets (Fire Events Delineation, FIRED; Fire Events Data Suite, FEDS) have been derived from satellite data (MODIS and VIIRS). Such datasets provide 1-2 daily measurements of the new area burned by each documented individual wildfire. Studies comparing these fire-growth datasets to meteorology have found that rapid increases in detected burned area are closely associated with periods of dry, windy conditions.

However, inherent in these datasets are various sources of uncertainty. With measurements of any particular fire occurring only once or twice daily, failure to correctly detect and log new burned area can lead to a fire's growth being associated with

asynchronously incorrect meteorological conditions. Clouds and smoke are a particularly pervasive source of uncertainty, with cloud/smoke induced temporal misattribution of new burned area creating major implications for fire weather research.

Here, we investigate if, when, and how clouds and smoke degrade our ability to soundly interpret meteorological influence on periods of rapid wildfire growth. We do so by comparing eight years of daily aerosol optical thickness and cloud optical thickness from VIIRS to the FIRED and FEDS fire growth datasets for California wildfires. Additionally, we consider and describe cases when the meteorological factors that contribute to rapid wildfire growth might improve the ability to observe that fire growth. We describe our results for fires of various growth rates, fires of various types (plume and wind driven), and fires recorded by different measurement techniques (active fires from VIIRS, changes in vegetation from MODIS). We also consider the effects of location and seasonality.