

Fire Emissions in California: Analysis of Airborne Measurements of Trace Gases from Thirteen Fires

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Biomass burning, which includes wildfires, prescribed, and agricultural fires, is an important source of trace gases and particles, and can influence air quality on a local, regional, and global scale. With the threat of fire events increasing due to changes in land use, increasing population, and climate change, the importance of characterizing fire emissions is vital. In this work we characterize trace gas emissions from 12 wildfires and 1 prescribed fire event in California between 2013–2018, in some cases with multiple measurements performed during different burn periods of a single fire. Airborne measurements of carbon dioxide (CO₂), methane (CH₄), water vapor (H₂O), ozone (O₃), and formaldehyde (HCHO) were made by the Alpha Jet Atmospheric eXperiment (AJAX). The majority of these measurements were made as close as possible to each fire and represent fresh emissions from known fire sources. The dependence of trace gas emissions on meteorology, vegetation, and fire conditions is explored. Results presented include emission ratios (ER) of O₃, HCHO, and CH₄ for individual fires, which differ in vegetation type, burning intensity, duration, and location. Occurrences of trace gas heterogeneity observed in the plumes of several fires are investigated. Evidence of mixed urban and fire emissions sampled is also discussed.

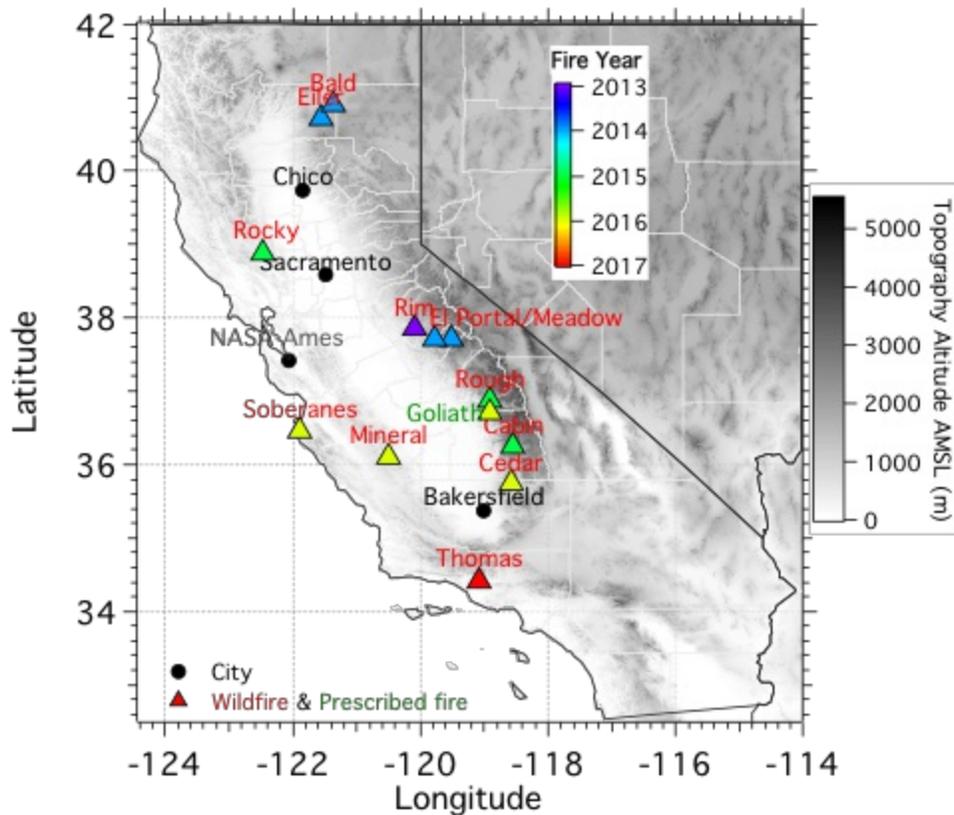


Figure 1. A topographic map of California (gray color scale) with the location of fires (triangles), measured by AJAX. The fire locations are colored by year (rainbow color scale).