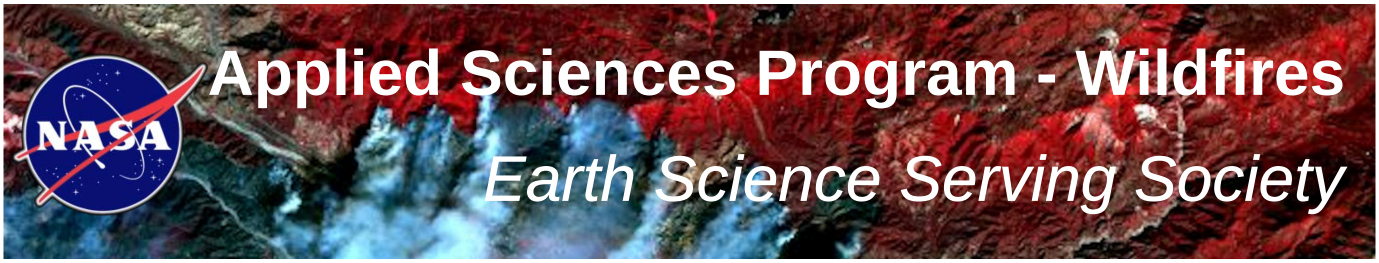
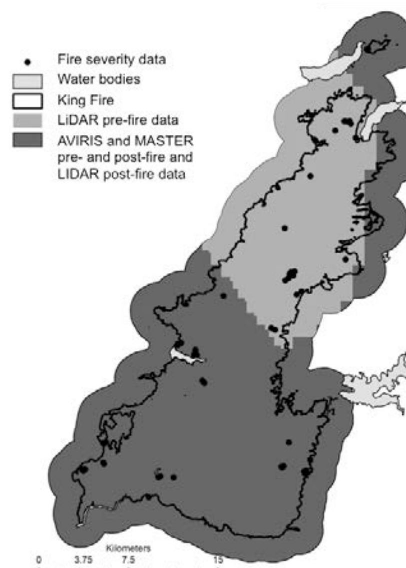
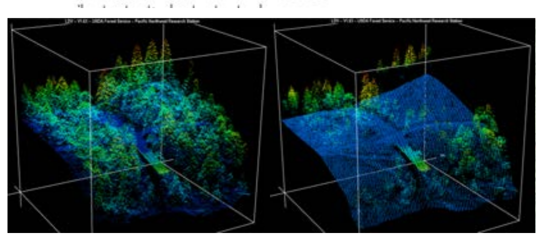



# 2014 King Megafire Rapid Response: Deconstructing megafire behavior

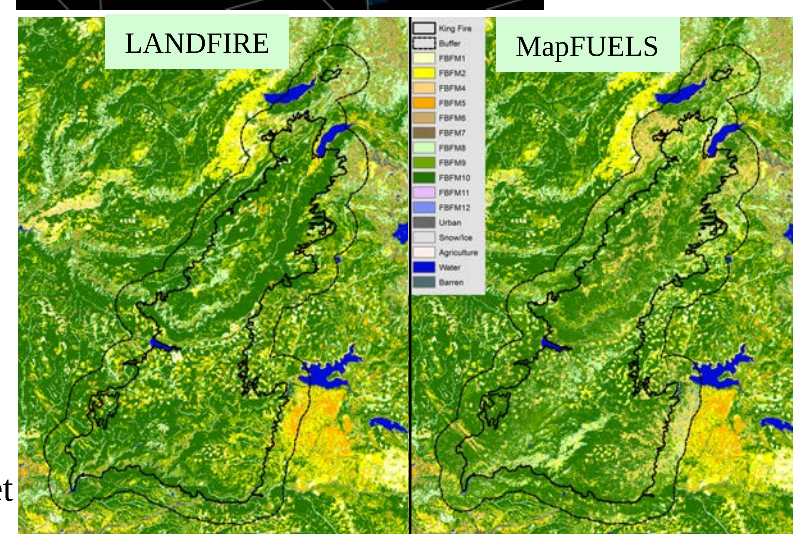
In 2014 the California King (mega-)Fire burned 97,717 ac (~39,545 ha) just outside of Lake Tahoe, California jeopardizing San Francisco's water supply and electrical grid while degrading regional air quality. Although this fire had substantial socio-economic impacts, it burned an area that had previously been surveyed using the latest remote sensing technologies, thus providing an unprecedented opportunity to deconstruct wildfire behavior using fine spatial resolution observations. The technologies used to survey before the fire were Light Detection and Ranging (LiDAR) to measure forest structure, the Airborne Visible Infrared Imaging Spectrometer (AVIRIS) that can distinguish forest composition and chemistry, and the multi-band thermal infrared imager (MASTER) that can measure land surface temperature and fire radiative power. Recognizing the opportunities that such detailed pre-fire data could provide, in a rapid response MASTER was flown during the fire to capture active fire information and and all three remote sensing technologies were flown after the fire as part of the Jet Propulsion Laboratory pre-HyspIRI airborne campaign and the Airborne Snow Observatory (ASO).




Unique before and after remote sensing datasets over the California King Megafire

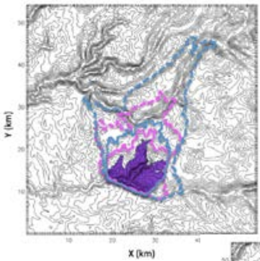


LiDAR data from pre- and post-fire show differences in forest structure.



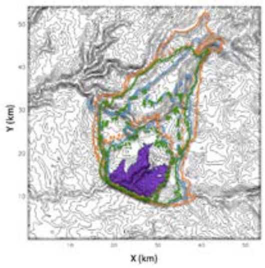

A comparison of the industry standard fuel model map (LANDFIRE) to a fuel model map produced just from the unique remote sensing observations from LiDAR and AVIRIS (MapFUELS).

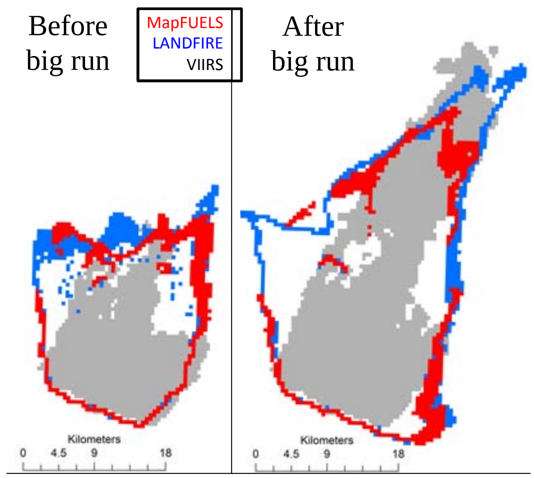
# Discovering and Demonstrating Innovative and Practical Applications of Earth Observations

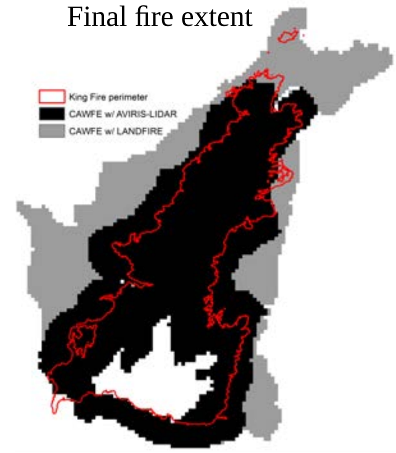


(Left) Fire spread rate with current and half fuel load and depth (i.e., fuel density)

(Right) fuel moistures over historical range from 3%, 5%, to 8%






## Analyses

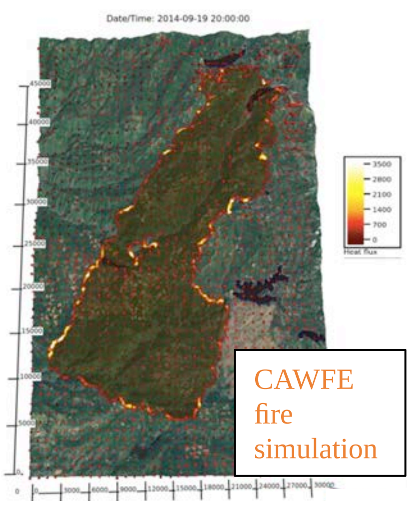
Using these datasets, fuel model maps were produced and integrated into the high resolution Coupled Atmosphere-Wildland Fire Experiment (CAWFE) fire simulation model. Fuel models represent fuel density and condition as parameters of a land cover classification dependent on fuel type and structure. Sensitivity analyses of fuel type, structure, condition and density were performed to assess different drivers of fire behavior such as fire spread rate, final extent, and instantaneous heat flux.

## Findings

Effects of fuels vary depending on the aspect of fire behavior is considered:

- Spread Rate – topography, horizontal connectivity and fuel condition
- Fire Extent – fuel type and vertical structural complexity

Contrary to previous thought about extreme fires, neither fuels nor weather are completely responsible for fire behavior and effects show compounding influences of fuels, topography and localized fire weather





## Implications

This uniquely-observed case study is an opportunity to gain insight that can inform wildfire management more generally, and suggest hypotheses that may be tested in other settings.

**For email updates, visit:**
**http://wildfire.jpl.nasa.gov**

**For access to data, visit:**
**http://dx.doi.org/10.3334/ORNLDAAC/1288**

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