

Causes, characteristics, and consequences of California's extreme wildfire events

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Abstract

Introduction

Increasing frequency of large fires in western U.S. (Dennison et al. 2014) Increasing frequency of extreme fire conditions in California (Goss et al. 2020). Increasing severity of fires in western US (Parks and Abatzoglou 2020). Increasing area burned (Abatzoglou and Williams 2016, Williams et al. 2019) Burned area is fundamentally limited way of characterizing wildfires, particularly extreme wildfire events (Kolden 2020).

Clear link between fire activity and climate change, and a proposed link to extreme events.

Important to understand extreme wildfire events, as they are likely to be societally impactful [Balch et al. (2018); Iglesias et al., 2021].

Some efforts exist, but still focus on size (Joseph et al. 2019).

Challenge of defining “extreme wildfire events,” but can be done by considering fire behavior within the context of fire’s controllability, but decoupled from the societal impact (Tedim et al. 2018).

Then we can further characterize drivers of these extremes, and under what conditions they can lead to disasters (Bowman et al. 2017).

Interactions between drivers can be especially important (Balch et al. 2018). Notion of homogenization of conditions in space/time leading to more extreme behavior (continuous fuels, longer duration hot drought)

Consideration of positive feedback-driven events as its own category.

Fuel, topography, weather and their spatiotemporal nexus to describe different “taxa” of extreme wildfire events.

Methods

FIRE dataset daily fire perimeters (Balch et al. 2020). 2000 fire events in California between 2001 and 2020. Spatial join with FRAP (<https://frap.fire.ca.gov/frap-projects/fire-perimeters/>) and MTBS (Eidenshink et al. 2007).

MODIS active fire product (MCD14ML) (Giglio et al. 2016).

Fire radiative power (FRP) to fireline intensity on a 4x daily timestep, then classification of that day based on Tedim et al. (2018).

Classes 5, 6, and 7 considered “extreme wildfire events.”

Fire radiative power to fire radiative energy (FRE) by integrating through time course of each event.

Total fuel, fuel heterogeneity Max wind speed from nearby RAWS station VPD from ERA-5 or Gridmet (Abatzoglou 2013). Wind alignment (Abatzoglou 2013) with slope (National Elevation Dataset) Historic aridity from CWD? (Flint et al. 2013)

Results

Discussion

Wildfire disasters versus extreme wildfire events.

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Author contributions

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Conceptualization: ; Data curation: ; Formal analysis: ; Funding acquisition: ; Investigation: ; Methodology: ; Project administration: ; Resources: ; Software: ; Supervision: ; Validation: ; Visualization: ; Writing – original draft: ; Writing – review and editing:

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