

Dry lightning sparks some of the most destructive and costly wildfires in California, study finds

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A new study has found dry lightning outbreaks are the leading cause of some of the largest wildfire outbreaks in modern California history.

Despite this, dry lightning has remained largely understudied across this region—until now.

Researchers from the School of the Environment at Washington State University, Vancouver, have developed the first long-term climatology of dry lightning—lightning which occurs with less than 2.5 mm of rainfall—in central and northern California, published today in the journal *Environmental Research: Climate*.

"Wildfires are a growing threat in California as the climate continues to warm. Unlike human-caused fires that originate in a single location, lightning outbreaks can strike multiple locations and start numerous simultaneous wildfires, creating a substantial challenge for fire response," says Dmitri Kalashnikov, a doctoral student and lead author of the paper. "This happened recently in 2020 when multiple lightning-caused fires burned nearly one million hectares across this region, and other prominent widespread lightning-caused [wildfire](#) outbreaks also occurred in 1987 and 2008."

The team utilized daily lightning counts from the National Lightning Detection Network and precipitation observations from 1987–2020 in combination with atmospheric reanalysis to characterize the climatology of dry lightning and the associated meteorological conditions during the warm season (May–October) when wildfire risk is highest.

They found that moisture and instability high in the atmosphere—above a hot, dry, lower atmosphere—were key drivers of dry lightning across all regions in central and northern California and that widespread dry lightning outbreaks can occur anytime between May–October, even in "quiet" years for lightning activity. Through categorizing the widespread dry lightning days, they were able to identify four distinct large-scale atmospheric patterns associated with the outbreaks that feature different configurations of weather systems.

Moreover, they found that nearly half (46%) of lightning that struck the ground in this time period was under dry lightning conditions. While dry lightning was more likely to occur at [higher elevations](#) (>2000 m) with activity more concentrated in July–August, this pattern reverses from summer to autumn and [lower elevations](#) are struck more frequently in September–October. During this time of the year, natural fuels are drier which is critical to wildfire outbreaks, therefore, increasing the risk.

"Understanding the meteorology of dry [lightning](#) across this region can inform forecasting of possible wildfire ignitions, helping to better constrain future risk of wildfire ignition in California and can aid fire suppression efforts, as firefighting resources can be strategically pre-positioned in at-risk areas," explains Deepti Singh, co-author of the paper.

More information: Meteorological and geographical factors associated with dry lightning in central and northern California, *Environmental Research: Climate* (2022) [DOI: 10.1088/2752-5295/ac84a0](#)

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