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Barcelona Supercomputing Center
Centro Nacional de Supercomputación

An observational study of the extreme wildfire events of California in 2017 : quantifying the relative importance of climate and weather

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and

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Introduction

The 2017 fire season in California was the costliest on record, with 18 Billion US$ in damages, and deadliest with 43 casualties on record

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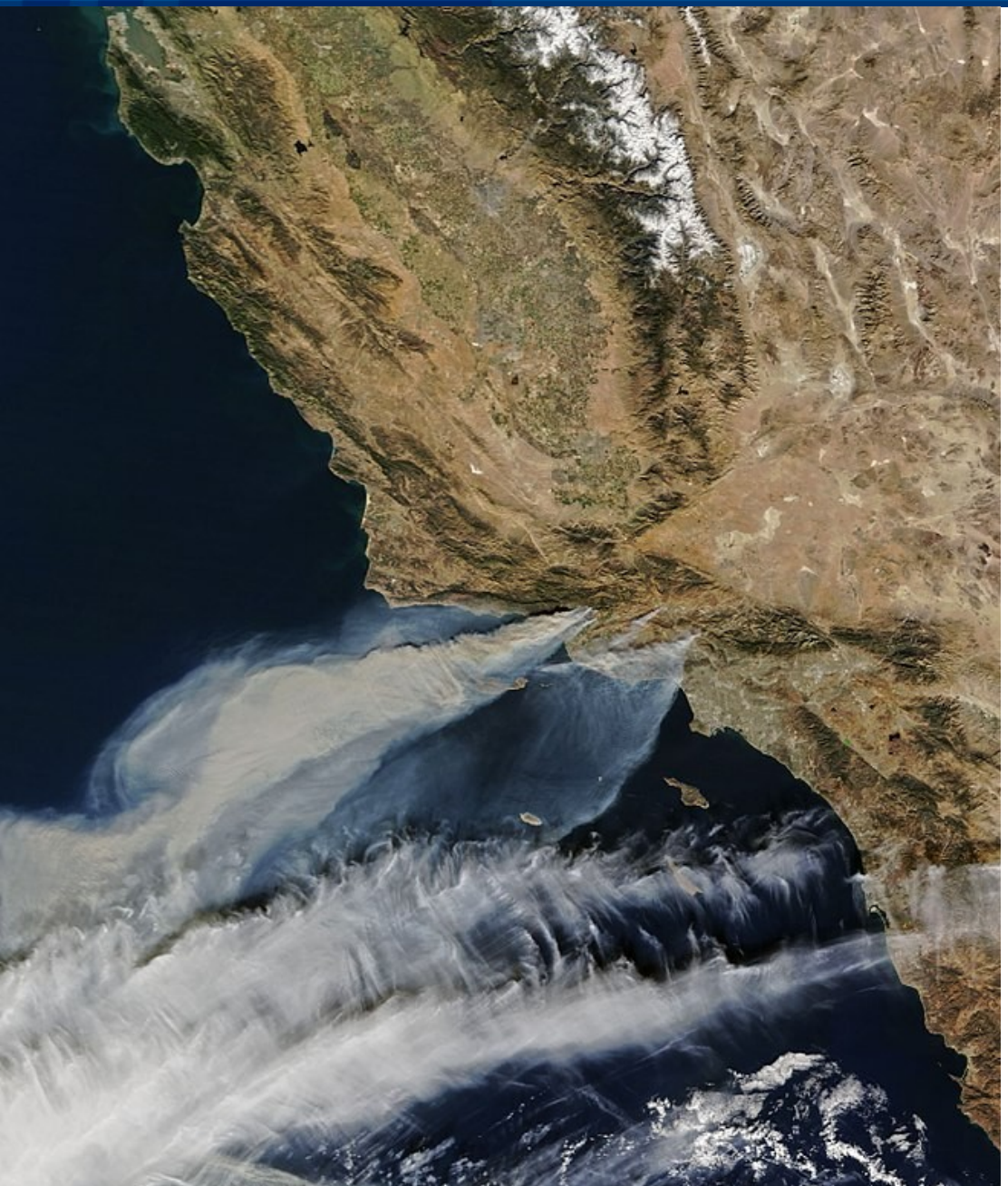
Introduction

In October, around the Napa valley in Northern California, the Tubbs fire was the most destructive in US history. Warm temperatures and strong winds are thought to be responsible for the severity of these wildfires.

Introduction



In December, Southern California was plagued by severe wildfires and the Thomas fire near Los Angeles became the largest in California history. It was thought to be fueled by sever Santa Ana winds and warmer than average temperatures.

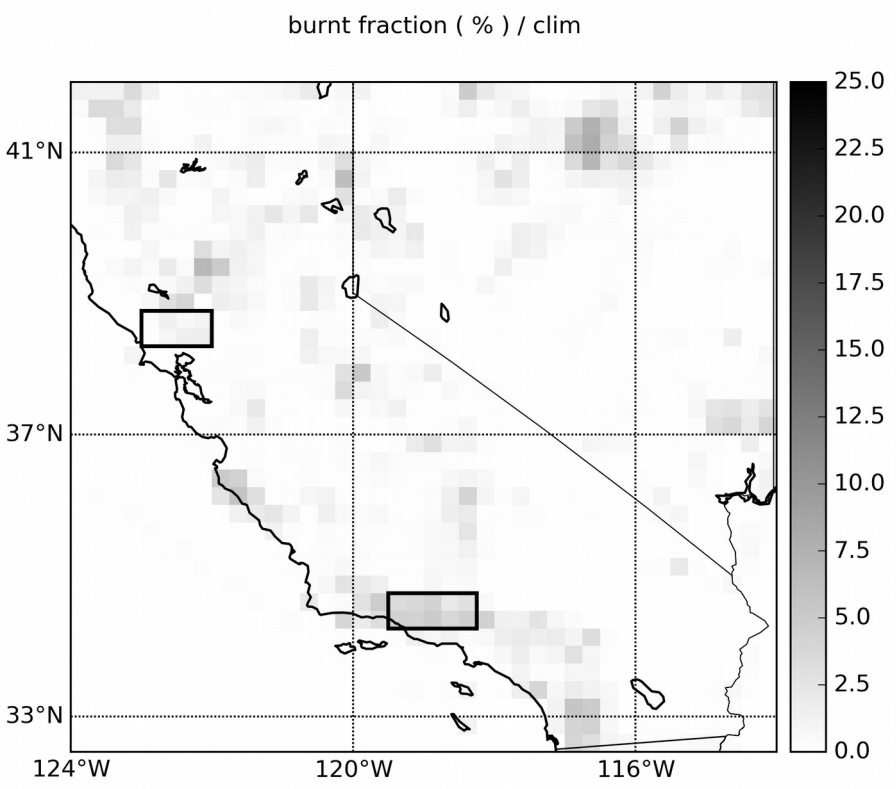
Introduction

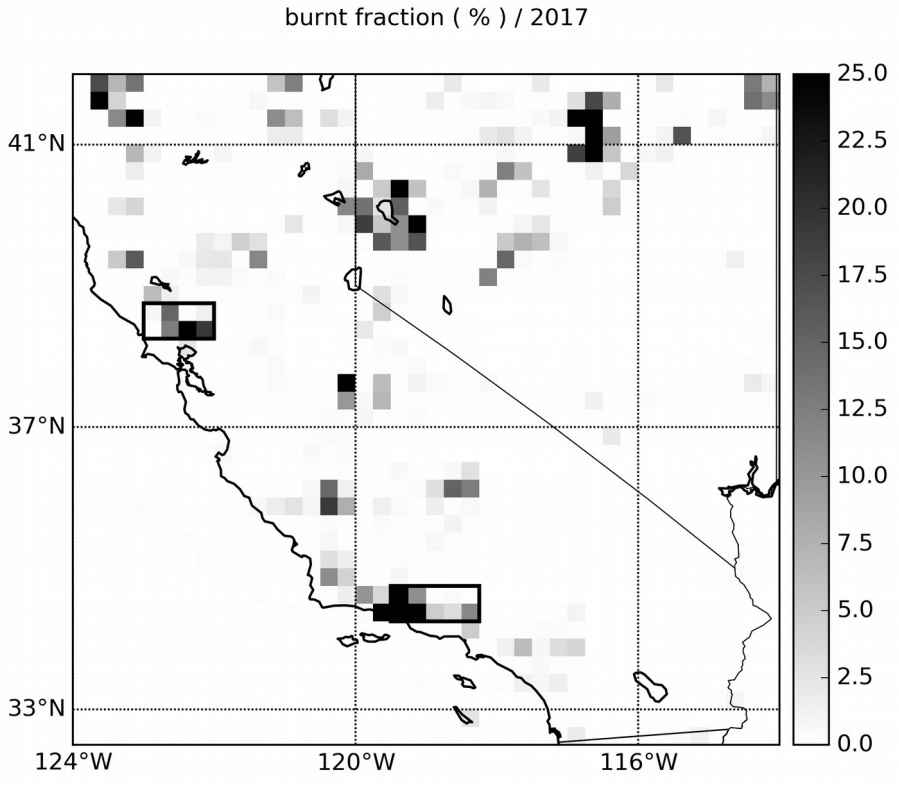
- What are the relative importance of climate (drought/heat waves) vs. weather events (dry spells, strong winds)?
- We use the Canadian Fire Weather Index to compute daily fire risk from daily observations of temperature, precipitation, wind speed and relative humidity.
- We study in which way the conditions of fall of 2017 were conductive to these extreme conditions, and if human-caused climate change could have contributed.

Results- was 2017 extreme?

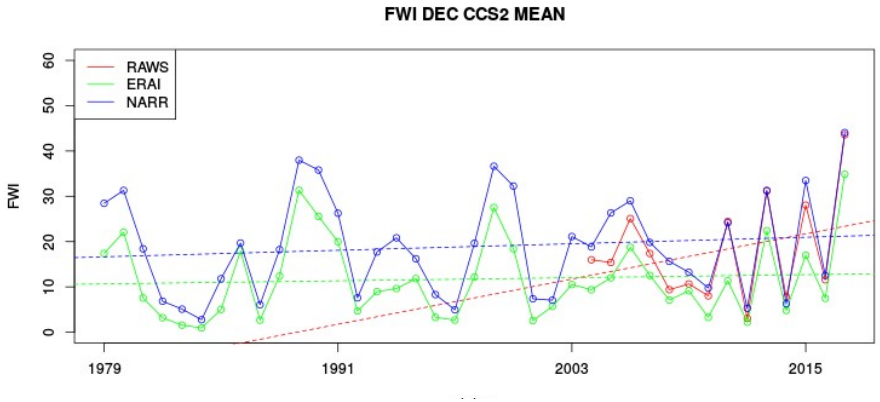
Observed burned areas in 2017 were indeed much higher than climatological averages.

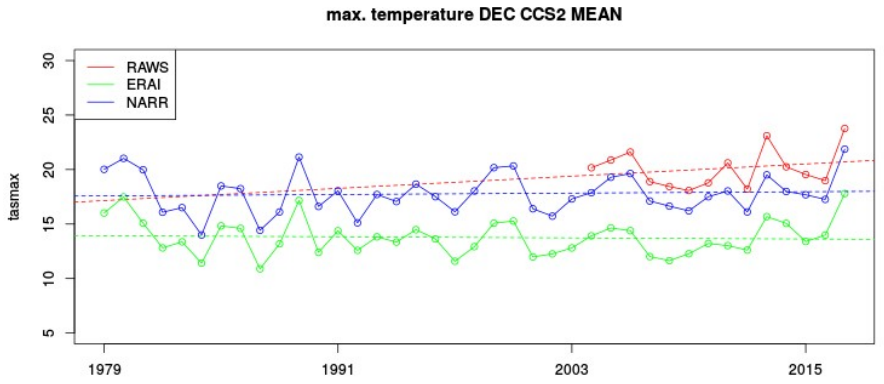
In fact many areas had not been previously burned in the entire MODIS observation period (2000-2017).

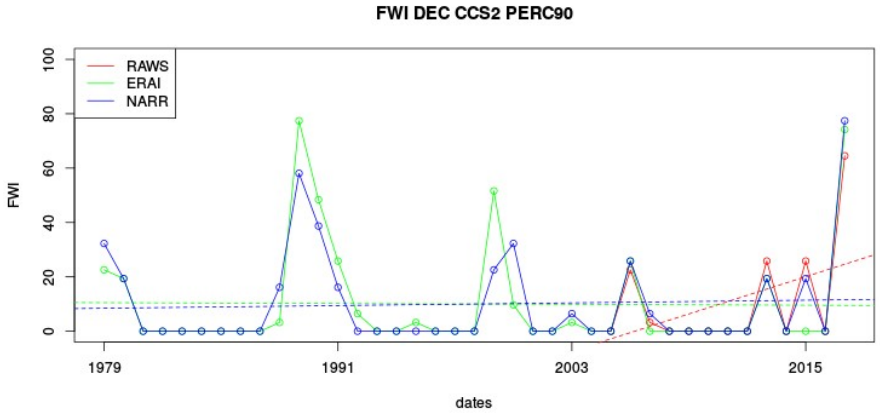


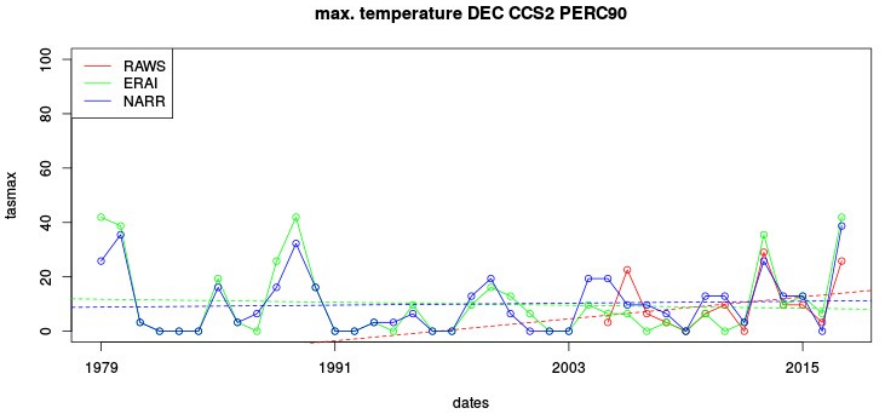


Results- was 2017 extreme?





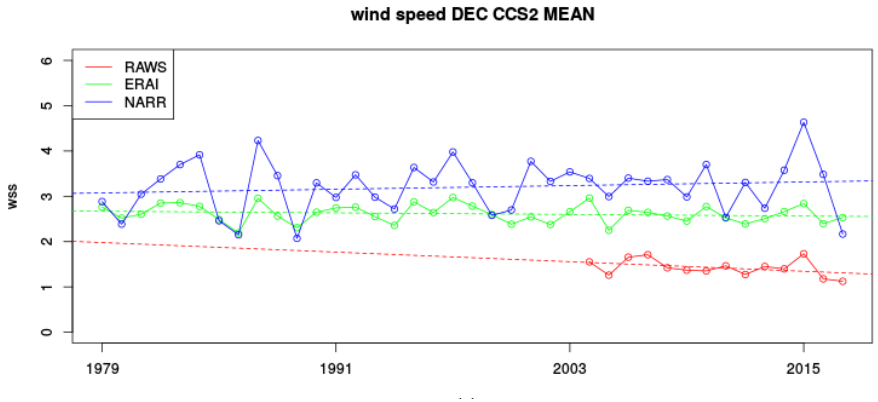


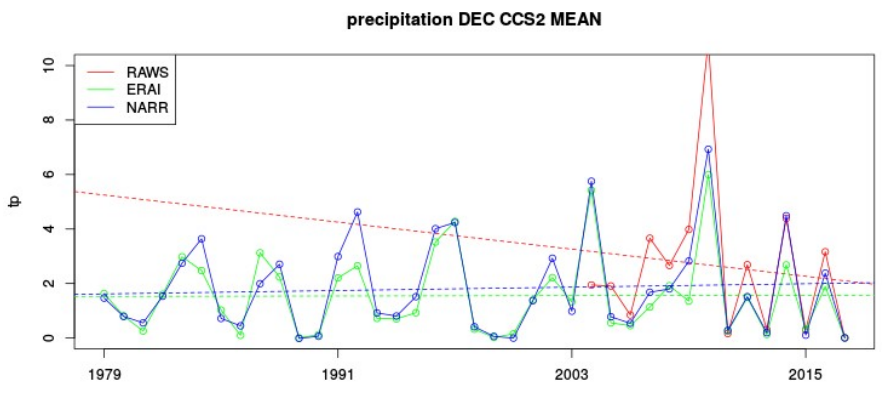


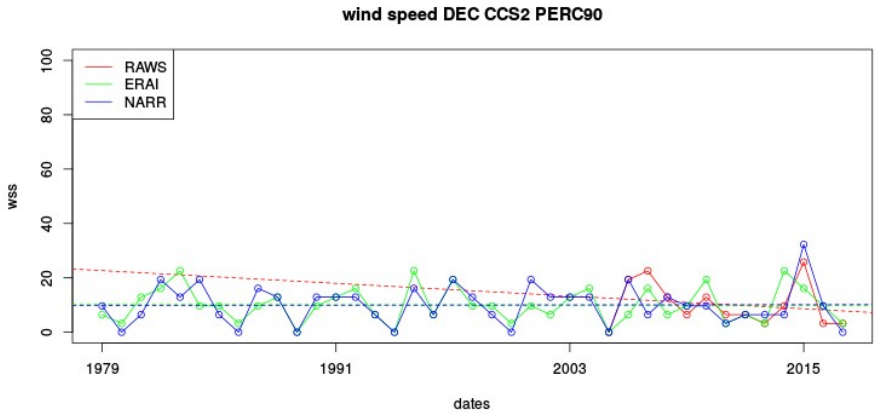
In December/2017 station and reanalysis data show that monthly-mean FWI was much higher than average and 80% of days were above the 90th percentile.

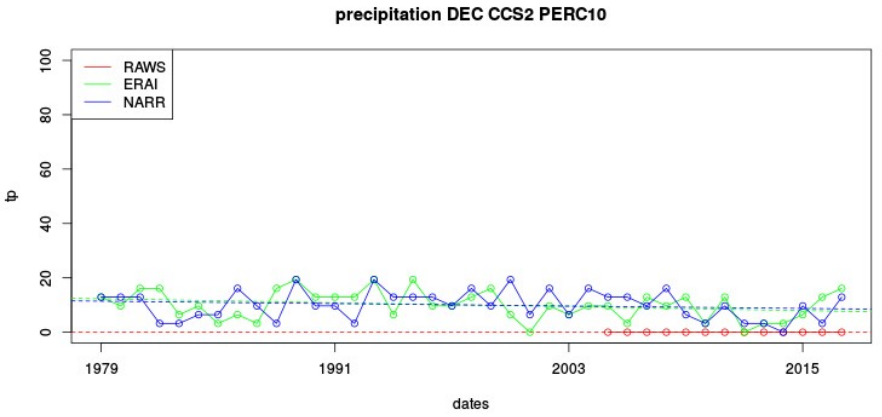
Maximum temperature was also above-average, and a linear trend of 0.05 C/year was detected, which is equivalent to 5C/century. The warming trend could be partially responsible for these extreme conditions (more work is needed).

Results- was 2017 extreme?









Despite news reports and statements that Santa Ana winds were exceptionally strong in Decembre/2017 we did not find such evidence in the station data.
In fact there were fewer strong wind events, but timing may be a factor.

Precipitation was below-average and which helped create dryer than average conditions.

Results – FWI in December 2017

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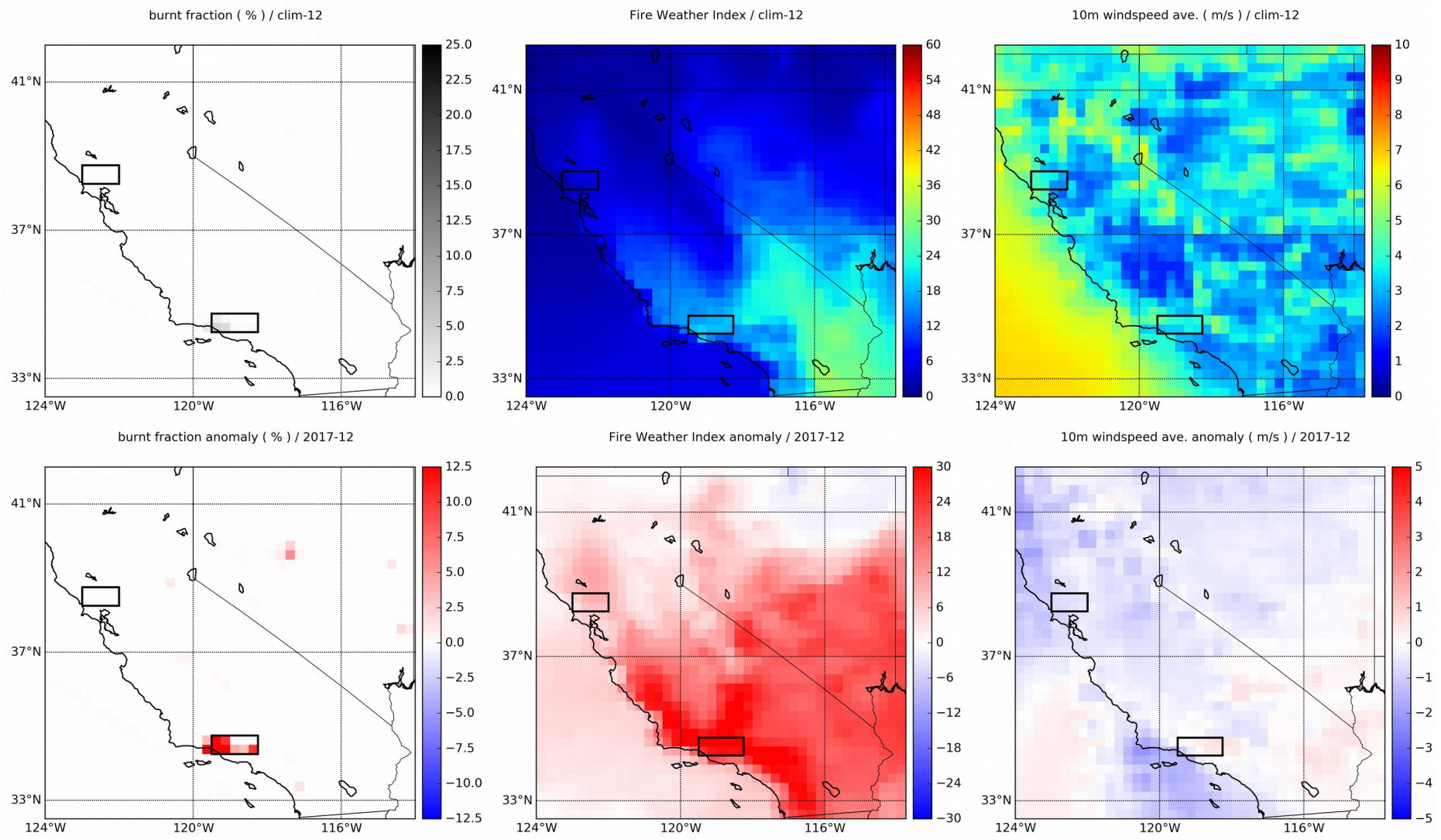
Anomalous burned area in Southern California associated with widespread anomalous FWI, but wind anomalies were not important.



Results – FWI in December 2017

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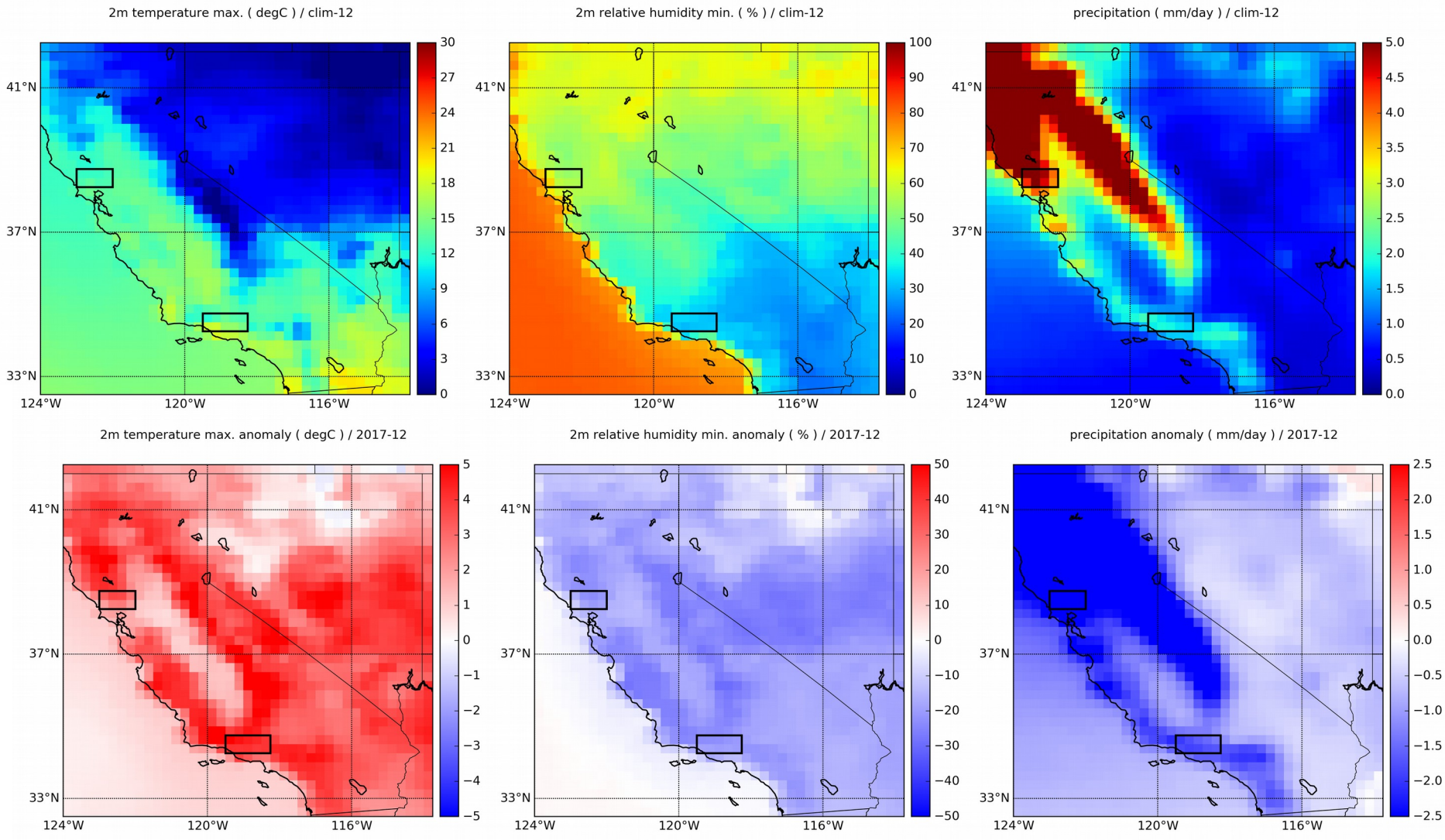
However, extreme anomalies in temperature, relative humidity and precipitation were widespread. These long-lasting anomalies are identified as playing a key role.



Conclusions

- Although the Santa Ana winds were important for fire spread as they fueled the flames, they were not stronger nor more frequent than other years.
- The anomalous warm and dry conditions which persisted for months were key factors in creating the extreme conditions.
- A long-term trend in temperature was detected, further work is require to quantify its relative importance and the likelihood that climate change will favor these conditions in the future.
- Future work : Seasonal prediction of fire risk by predicting frequency of days which extreme FWI a few months ahead, can make authorities aware of extreme conditions and prepare ahead of time. Combined with reliable short-term forecasts this could prevent loss of property and life, such as happened in California and Portugal in 2017.

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Thank you!

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Thank you!

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See my poster tomorrow - Session BG4.2
Interactions between fire, the Earth system and humans across time and space

Hall A #455

Results – FWI in December 2017

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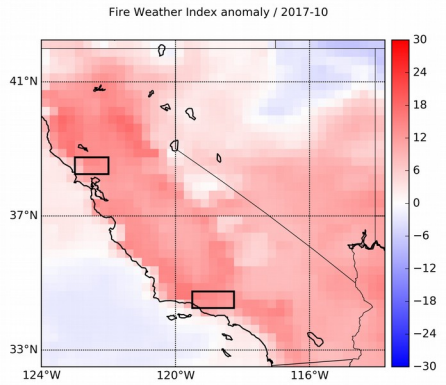
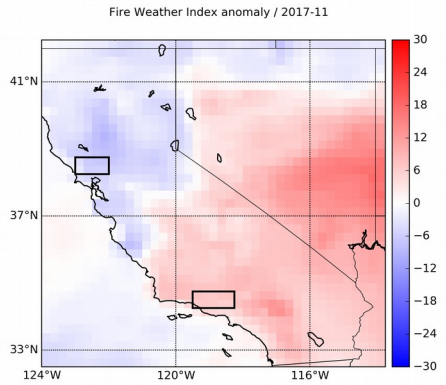
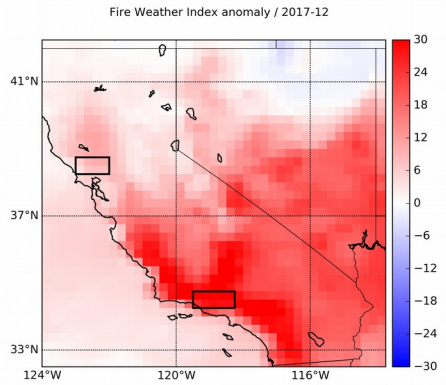
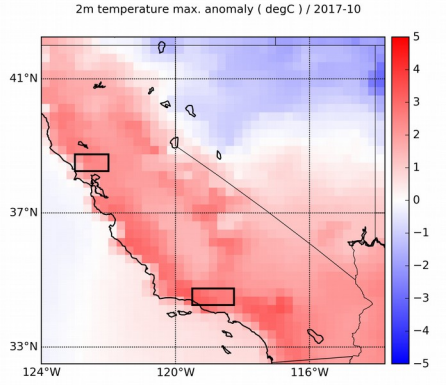
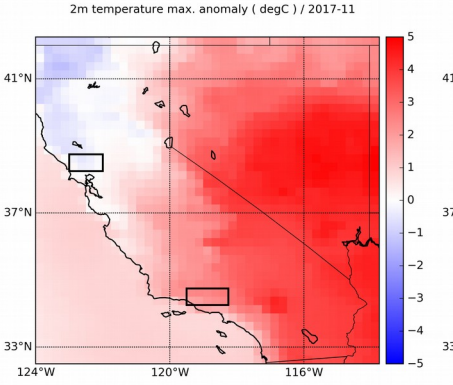
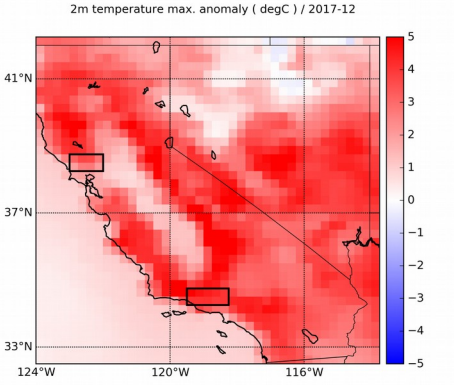
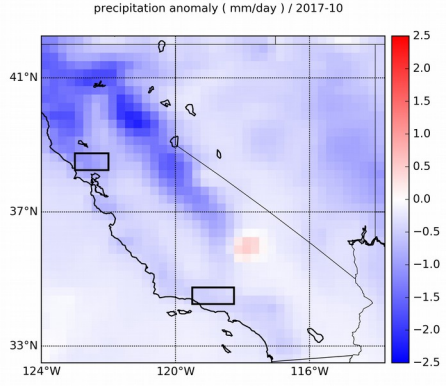
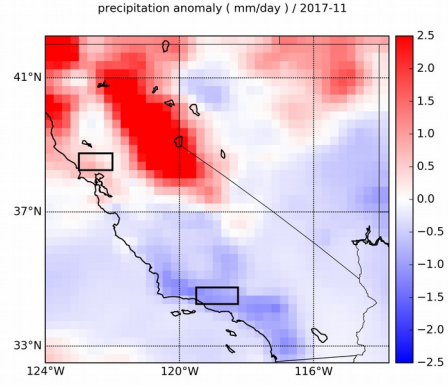
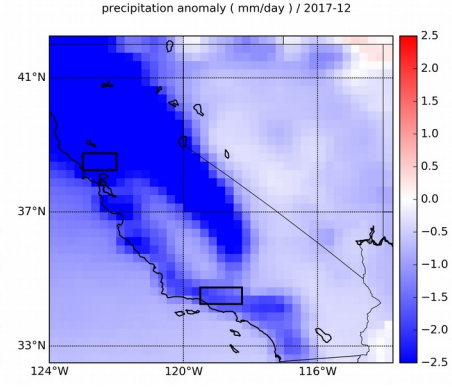
	October	November	December
FWI			
Temperature			
Precipitation			

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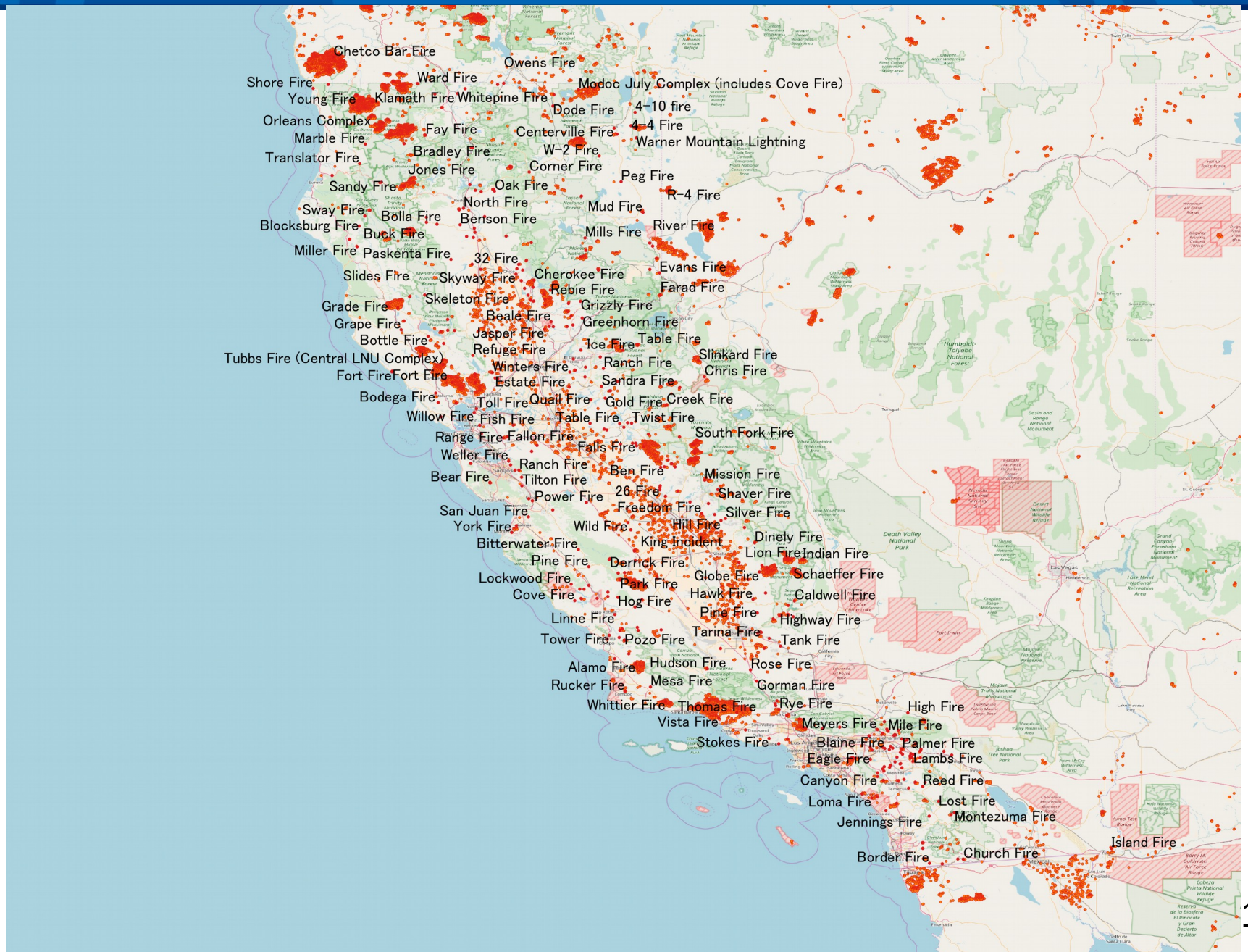
- This works aims to study the important meteorological and climactic factors responsible for the extreme widlfire season of 2017 in California, using the Canadian Fire Weather Index computed from daily values of maximum temperature, minimum relative humidity, wind speed and precipitation computed from RAWS weather stations and ERA-Interim and NARR reanalyses.


Chetco Bar Fire
Owens Fire
Shore Fire
Ward Fire
Modoc July Complex (includes Cove Fire)
Young Fire
Klamath Fire
Whitepine Fire
Dode Fire
4-10 fire
Orleans Complex
4-4 Fire
Fay Fire
Centerville Fire
Marble Fire
Warner Mountain Lightning
Bradley Fire
W-2 Fire
Translator Fire
Corner Fire
Jones Fire
Peg Fire
Sandy Fire
Oak Fire
R-4 Fire
North Fire
Sway Fire
Mud Fire
Bolla Fire
Benson Fire
Blocksburg Fire
River Fire
Buck Fire
Mills Fire
Miller Fire
Paskenta Fire
32 Fire
Evans Fire
Slides Fire
Skyway Fire
Cherokee Fire
Farad Fire
Rebie Fire
Skeleton Fire
Grizzly Fire
Grade Fire
Beale Fire
Greenhorn Fire
Grape Fire
Jasper Fire
Table Fire
Bottle Fire
Ice Fire
Refuge Fire
Slinkard Fire
Tubbs Fire (Central LNU Complex)
Ranch Fire
Winters Fire
Chris Fire
Fort Fire
Estate Fire
Sandra Fire
Fort Fire
Bodega Fire
Quail Fire
Gold Fire
Creek Fire
Toll Fire
Willow Fire
Fish Fire
Table Fire
Twist Fire
South Fork Fire
Range Fire
Fallon Fire
Falls Fire
Weller Fire
Ranch Fire
Ben Fire
Mission Fire
Bear Fire
Tilton Fire
26 Fire
Shaver Fire
Power Fire
Freedom Fire
Silver Fire
San Juan Fire
Hill Fire
York Fire
Wild Fire
Dinely Fire
King Incident
Bitterwater Fire
Lion Fire
Indian Fire
Pine Fire
Derrick Fire
Schaeffer Fire
Globe Fire
Lockwood Fire
Park Fire
Caldwell Fire
Hawk Fire
Cove Fire
Hog Fire
Pine Fire
Highway Fire
Linne Fire
Tarina Fire
Tower Fire
Pozo Fire
Tank Fire
Alamo Fire
Hudson Fire
Rose Fire
Rucker Fire
Mesa Fire
Gorman Fire
Whittier Fire
Thomas Fire
Rye Fire
High Fire
Vista Fire
Meyers Fire
Mile Fire
Stokes Fire
Blaine Fire
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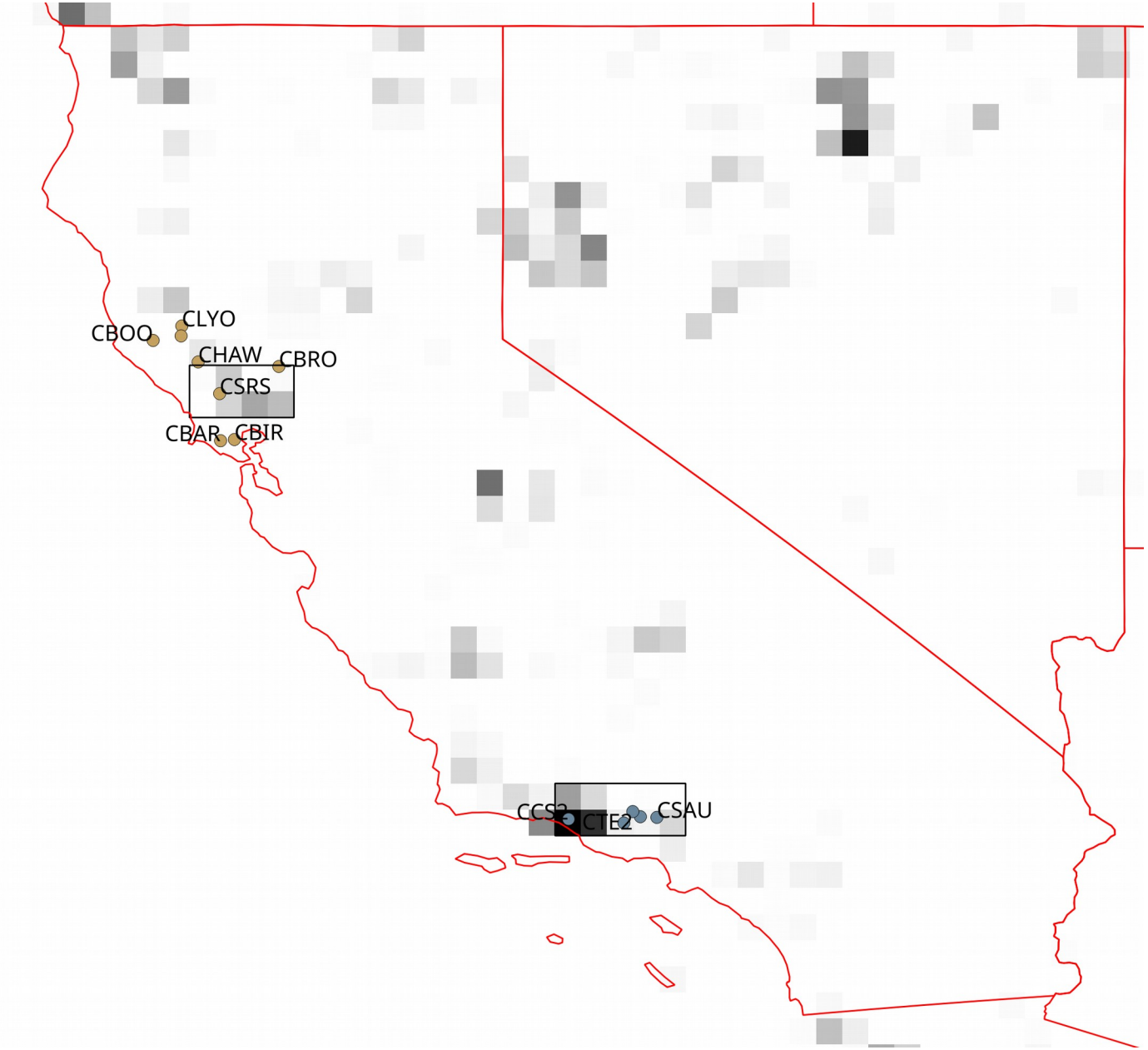
Jennings Fire
Island Fire
Border Fire
Church Fire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