Wildfire in California
Wildfire Research at Berkeley Lab

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CALIFORNIA REPUBLIC

Wildfire

Ignition

Weather/climate

Fuel

Wildfire (behavior, frequency, area)

Firefighters in Lake county battle one of the numerous wildfires presently raging across California. AP PHOTO/NOAH BERGER

Management and suppression

Impacts

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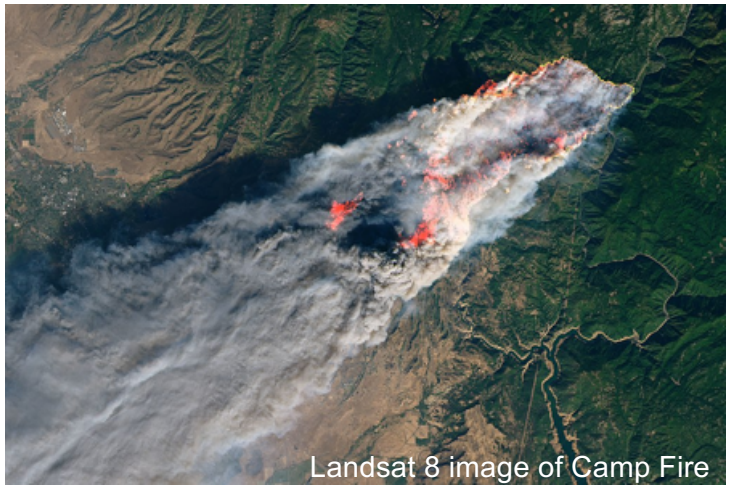
Since 1970 in the West

- Wildfire frequency +400%
- Burn area +600%

Berkeley Lab is contributing to California State knowledge and solutions about:

- Impacts on water, air, and energy
- Wildfire Prediction
- Climate Change

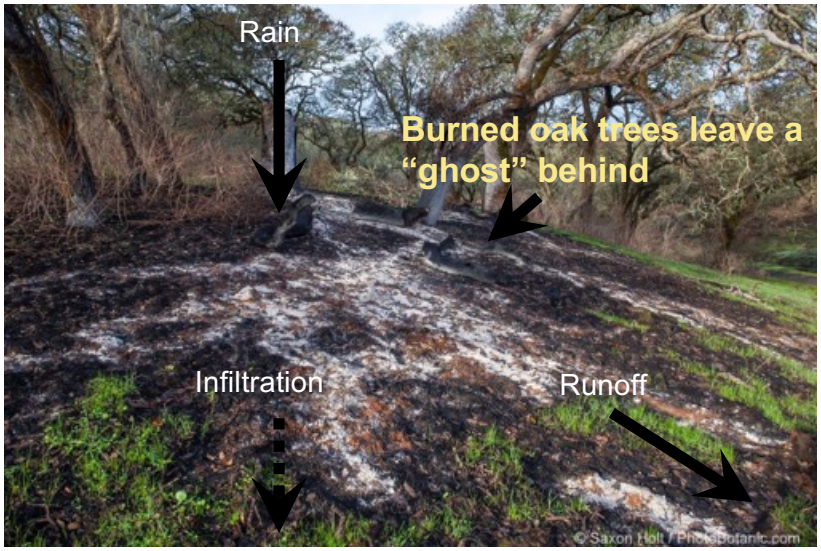


"Costliest natural disaster in 2018 in the world"

January 9, 2018
13 mm of rain fell in 5 minutes,
prompting a massive deadly mudslide

Wildfire statistics: TNC 2019; NASA 2018

Fires affect water quality and water flows



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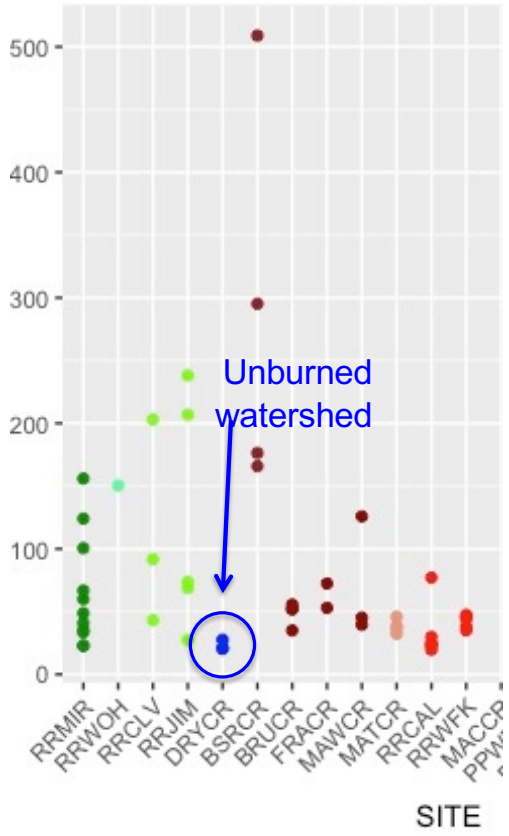
Fires affect water quality – Sonoma County Project

Funding provided by Sonoma Water

Mercury in stream sediment (ng/g)

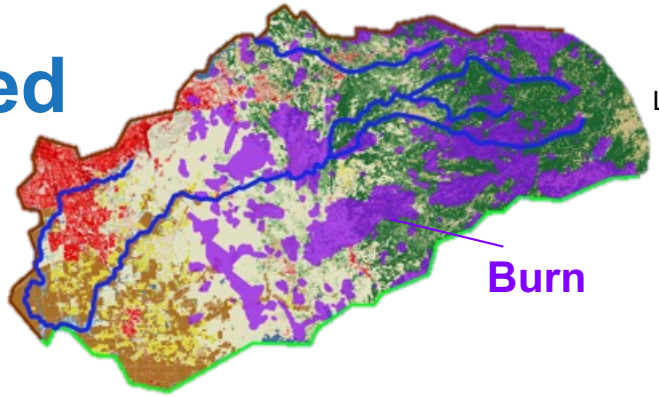


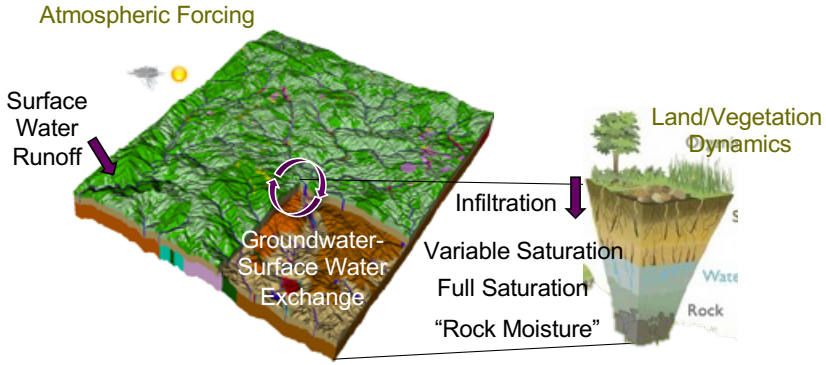
ASSOCIATED FIRE AREA

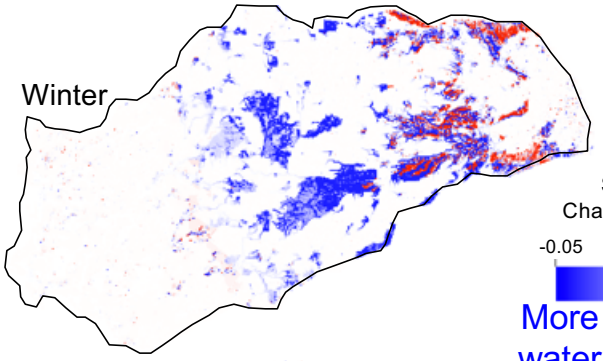
- MAIN STEM BELOW DAM
- MAIN STEM MID
- MAIN STEM WOHLER
- NO BURN
- POCKET
- PPWD CORE
- PRESSLEY
- REDWOOD
- THOMAS FIRE CORE
- TUBBS

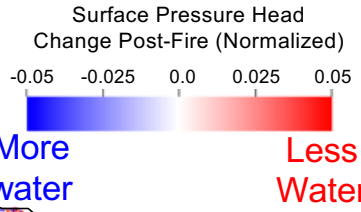
Michelle Newcomer, Jennifer Underwood, Ron Harvey, Todd Schram, Madeline Smedt, Paul Bliznik, Craig Ulrich, Don Seymour, Marcus Trotta, Jay Jasperse, Susan Hubbard

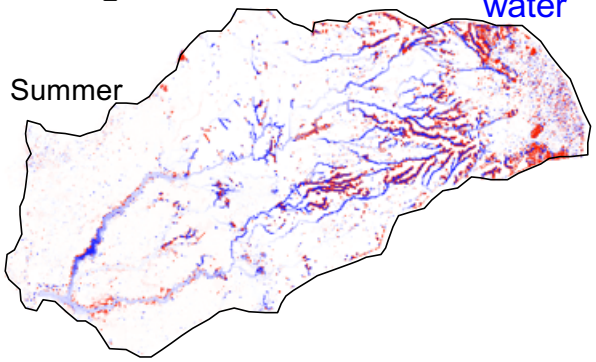
Wildfires change watershed yields and stability



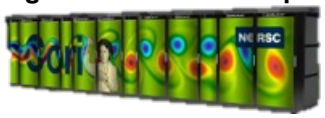








High Performance Computing



Maina and Siirila-Woodburn
Hydrological Process Journal 2020

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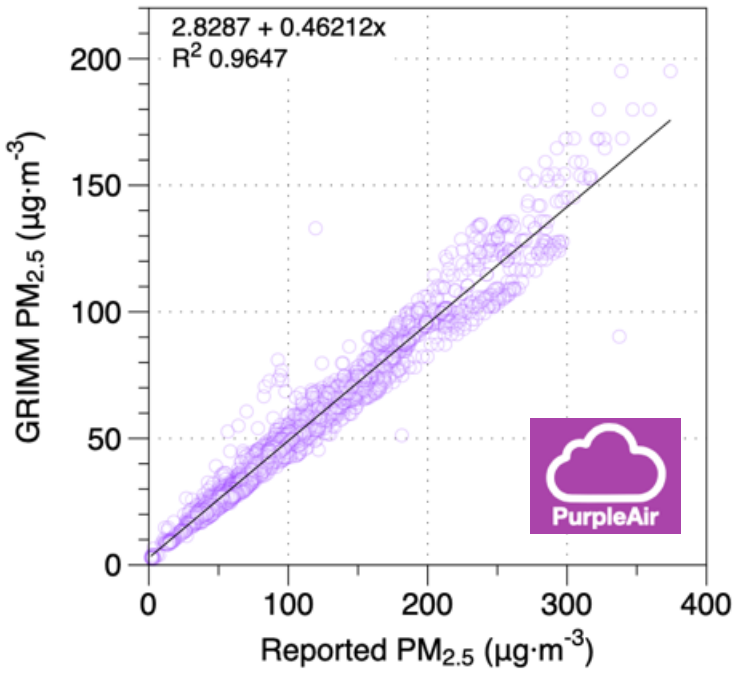
Wildfires threaten air quality, indoors and outdoors

September 9, 2020
California and Oregon wildfires

A view of the San Francisco Bay Area from Berkeley Lab during the 2018 Camp fire (left) and three weeks prior.

With adjustment, lower-cost air quality monitors can provide accurate risk information about wildfire smoke



- LBNL tested four lower-cost monitors during the Camp Fire in 2018
- Adjustment factor for outdoor Purple Air monitors increased accuracy of measured air quality index from 14% to 84%.
- Berkeley Lab and EPA independently found similar adjustment. EPA factor now included on Purple Air map.

Wildfire Smoke Adjustment Factors for Low-Cost and Professional $PM_{2.5}$ Monitors with Optical Sensors

by William W. Delp and Brett C. Singer *

Indoor Environment Group and Residential Building Systems Group, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA

* Author to whom correspondence should be addressed.

Sensors **2020**, *20*(13), 3683; https://doi.org/10.3390/s20133683

ELICHENS

Wildfire damage to transmission & distribution

Current ~ $1.77B/y
Mid-Century ~ $2.8B/y

Cost including infrastructure and service interruptions.

Based on analysis of 587 fires

Larry Dale , Michael Carnall, Max Wei, LBNL
Gary Fitts, Greenware Technologies
Sarah Lewis McDonald, Envision Geo


Fires started by energy grid

12 out of 17
fires in the Oct. 2017 fire siege started by PG&E infrastructure

CAL FIRE NEWS RELEASE
California Department of Forestry and Fire Protection

CONTACT: Michael Mohler
Deputy Director
Phone: (619) 933-2357
Calfire.dutypio@fire.ca.gov

RELEASE DATE: June 8, 2018

https://calfire.ca.gov/communications/downloads/newsreleases/2018/2017_WildfireSiege_Cause.pdf

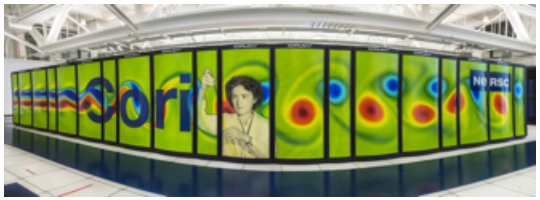
Predicting Wildfire in California

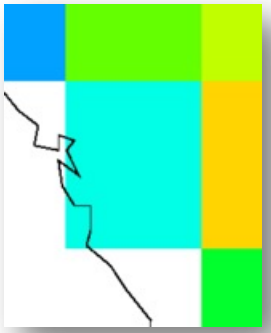
Ignition

Weather and climate

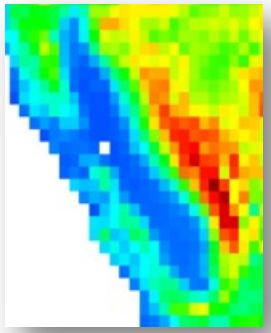
Vegetation and fuel

Climate Change and Mitigation

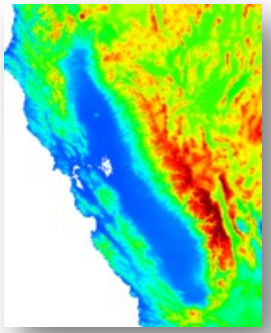




2006
~200km

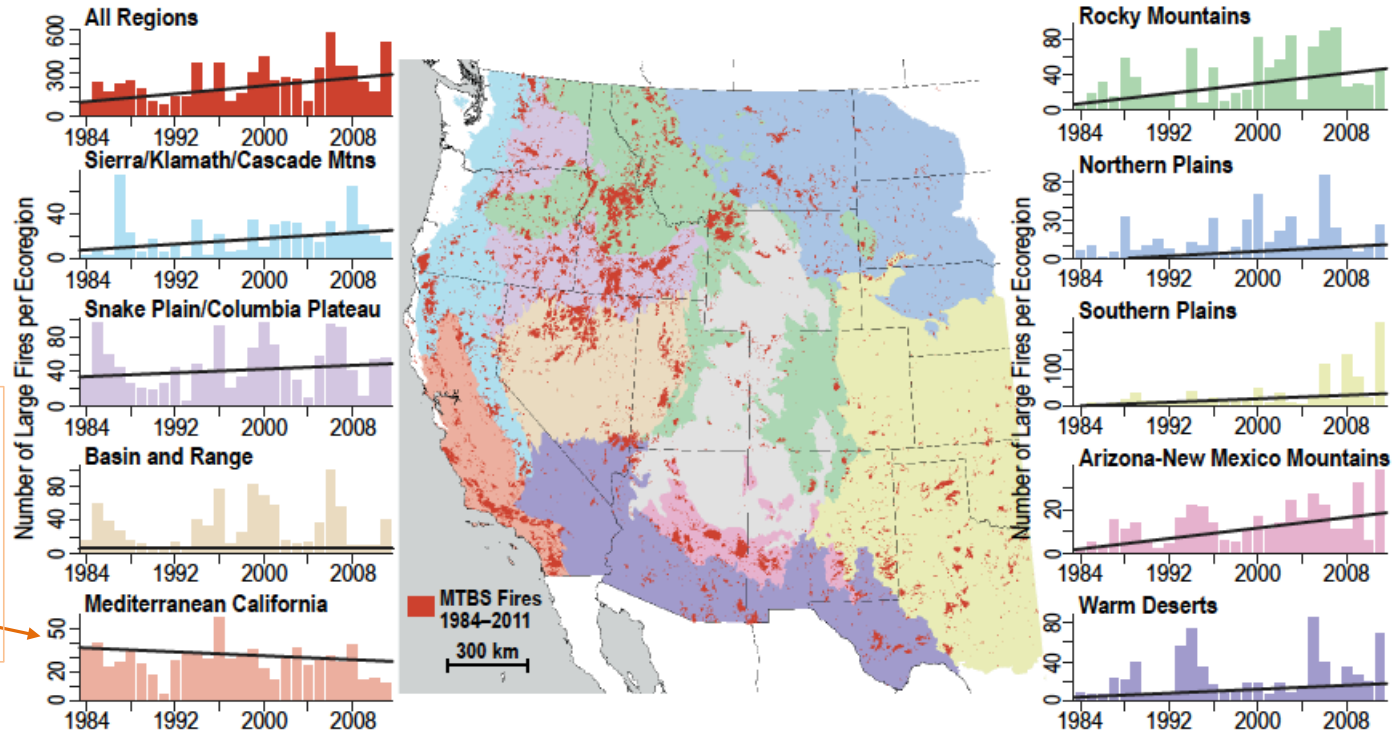


2012
~25km



2022
~1km

Has climate change increased the risk of California fires? YES.



In California, no change in number of >1000 acre fires because of increased CalFire suppression.

There is increase in the number of and damage from much larger fires

Figure 8.3 4th US National Climate Assessment, Chapter 8 (Wehner et al)

Michael Wehner (LBNL), Federico Castillo, Nery Lopez, J. Keith Gilless (UCB)

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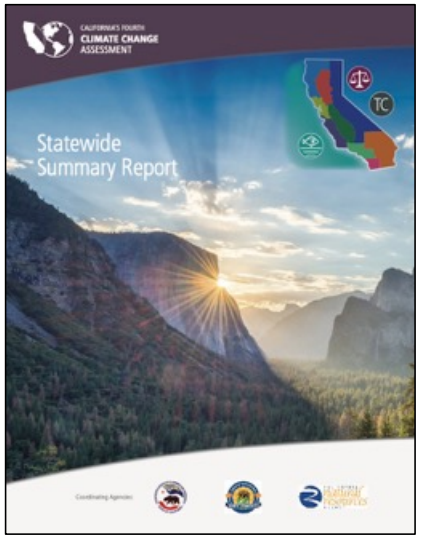
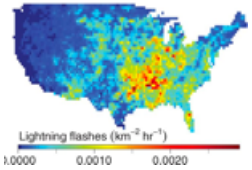
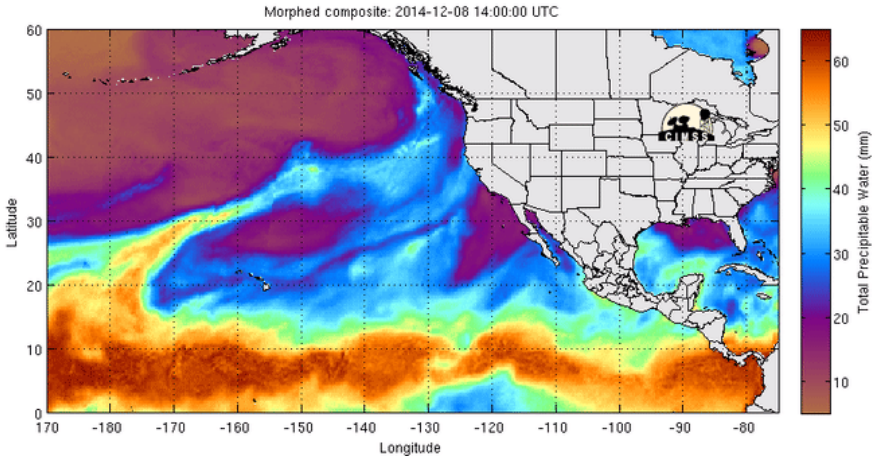
Lightning strikes projected to increase ~50% by 2100 due to climate change

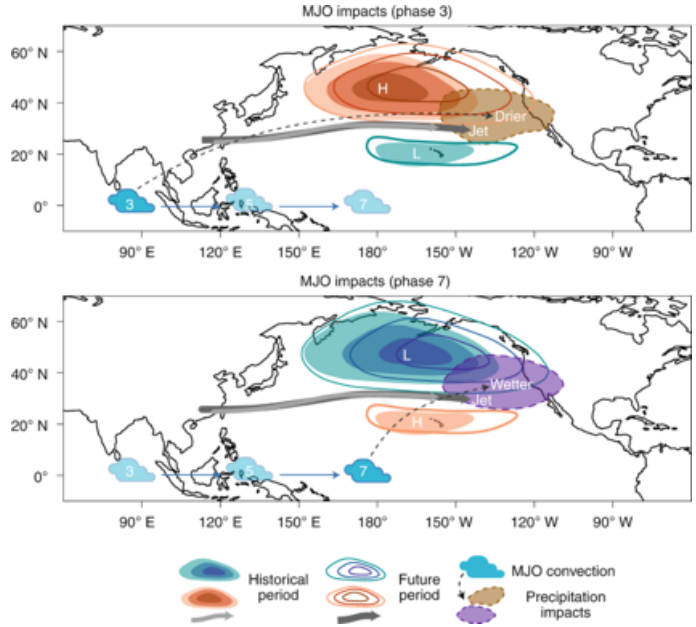


David Romps, et al. Projected increase in lightning strikes in the United States due to global warming, Science 2014
Follow up papers in 2016. 2018



The Madden-Julian Oscillation
Tropical Storm King and the *Pineapple Express*

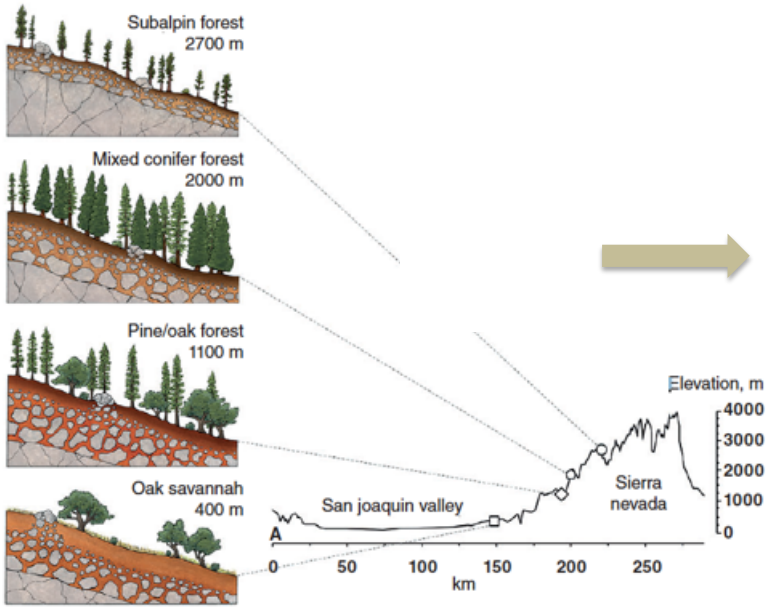


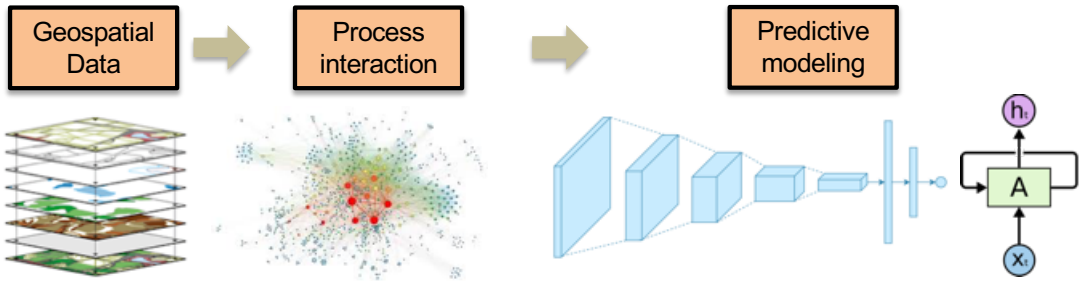


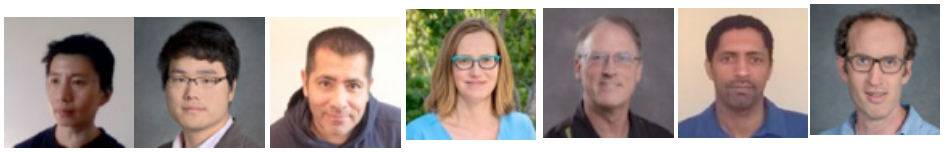
- Climate change will increase the extremes between rainfall and drought in California.
- Wet months would become wetter and dry months would become drier (which favors wildfires).

Zhou, W et al. Amplified Madden–Julian oscillation impacts in the Pacific–North America region. Nature Climate Change (2020).

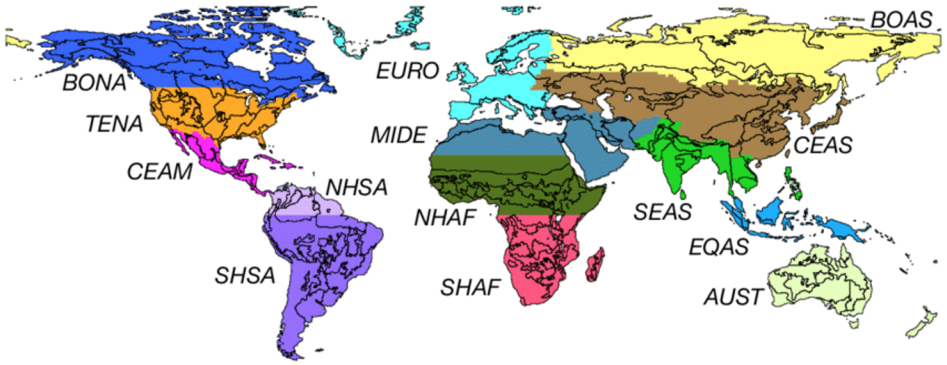
Predicting future vegetation and its interaction with wildfire intensity, severity, and extent

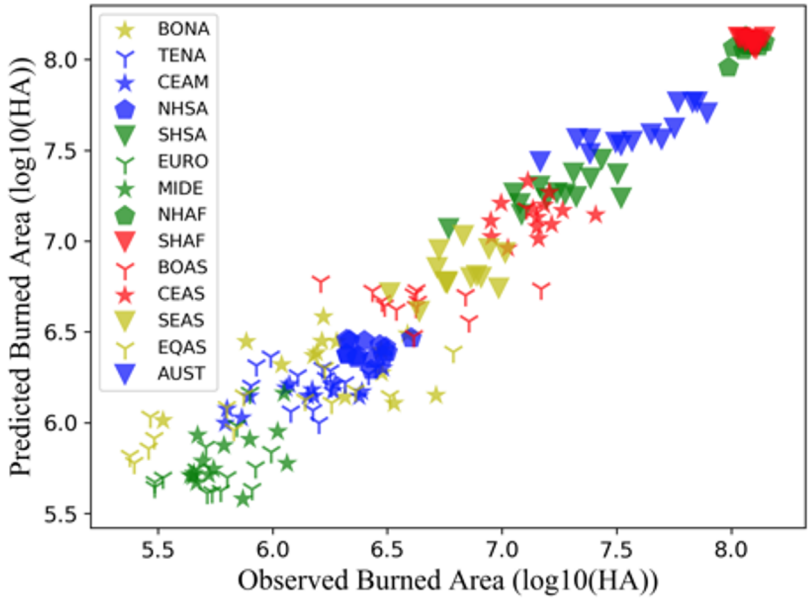






Machine Learning can create smart, efficient ways to predict fire risk and burned area





Global wildfire surrogate model in DOE Earth system model.
Hybrid of ML and process understanding of wildfire.

Zhu & Riley in prep.

Forest management to reduce fuel load releases CO_2 in short term but lowers wildfire emissions in long term

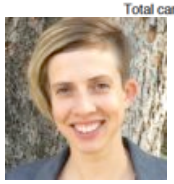
CALAND:
California
Natural and
Working Lands
Carbon Model


The Mercury News

NEWS › ENVIRONMENT › News

Newsom announces plan to conserve 30% of California's land and coastal waters

Executive order is designed to increase protection of nature to offset climate change



Alan Di Vittorio & Maegen Simmonds (2019) CALAND v3 Draft Technical Documentation.

Berkeley Lab is a trusted partner that provides evidence-based information to local, state, and federal entities, which they use to assess wildfire risks and protect our health, environment, and economy.

Thank you

Thank You

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