Evaluating environmental predictors of western U.S. wildfires

February 11 2021, by Terri Cook

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As the western United States becomes hotter and drier, wildfires in the region are becoming more frequent and severe. In addition to causing acute, local impacts on people and property, the fires can adversely affect the respiratory health of the millions of people who inhale tiny smoke particles that drift downwind. But understanding what drives wildfire activity from year to year across this diverse region and how

these factors could change in the future has been difficult to ascertain.

Now Brey et al. report results from a series of statistical analyses examining which environmental variables are likely to be the best predictors of future wildfire burn area, a metric that is proportional to the air quality impacts of smoke. The team first used Lasso regression to determine which combinations of environmental conditions best explained the variability in burn areas listed in the Monitoring Trends in Burn Severity database, which includes data for western U.S. wildfires larger than 404 hectares (1,000 acres) that occurred between 1984 and 2016. The researchers then used results from Phase 5 of the Coupled Model Intercomparison Project (CMIP5) to estimate how future wildfire activity could change in various ecoregions on the basis of these objectively selected environmental variables.

The results indicate that factors related to aridity and flammability, including relative humidity, precipitation, wind speed, and root zone soil moisture, can explain the historical variability in burn area as well as, or better than, vapor pressure deficit (VPD). But because VPD, a measure of aridity, is generally considered the most important determinant of future wildlife activity, the team also found that using these other variables to predict future burn area yielded less certain results.

Collectively, the new findings indicate that predictions of wildfire activity in the western United States are very sensitive to which environmental predictors are used to control the burn area. The study results highlight the dominant role that aridity plays in these forecasts, the authors say, and emphasize the importance of carefully selecting the environmental variables used to drive future change in climate models.

More information: Steven J. Brey et al. Past Variance and Future Projections of the Environmental Conditions Driving Western U.S. Summertime Wildfire Burn Area, *Earth's Future* (2020). DOI:

10.1029/2020EF001645

Darren L. Ficklin et al. Historic and projected changes in vapor pressure deficit suggest a continental-scale drying of the United States atmosphere, *Journal of Geophysical Research: Atmospheres* (2017). DOI: 10.1002/2016JD025855