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Future climate change drives increases in Western US wildfires and summertime organic carbon aerosol concentrations

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Forest fire area burned in the western US has increased in recent decades driven by increasing temperatures. Future climate change is likely to further impact wildfires with consequent effects on air quality. We use output from a general circulation model (GCM) combined with area burned regressions to predict how area burned will change between present day and 2050. We use a chemical transport model (CTM) to predict how this will impact aerosol concentrations.

We analyse wildfires and aerosol observations from the IMPROVE network for 1989 to 2004 and use the GEOS-chem CTM to simulate aerosol concentrations. Interannual variability in wildfires drives the observed interannual variability in organic carbon (OC) aerosol concentrations. We estimate that the observed increase in wildfires in the mid 1980s caused summertime OC concentrations over the western US to increase by 20%.

Stepwise linear regression is used to determine the best relationships between observed area burned, meteorological variables and drought indices from the Canadian Fire Weather Index Model. Best predictors typically include mean summer temperature and mean drought code. In forest ecosystems our regressions explain 50-60% of the variance in annual area burned. Between 2000 and 2050 increases in temperature, as predicted by the GISS GCM, increase annual area burned by 30-55%. These increased emissions increase summertime OC aerosol concentrations by 25% over cur-

rent concentrations. Our results show that the predicted increase in future wild fires will have important consequences for western US air quality and visibility.