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

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The recent extreme wildfire events that occurred during the fall of 2017 in Northern and Southern California made world headlines due to their environmental and economic impacts as well as dramatic and catastrophic images. According to the National Centers for Environmental Information (NCEI), the 2017 fall wildfires in California and the Western U.S. generated financial losses estimated at $18 billion, making the 2017 fire season the most destructive in U.S. history. The factors thought to create such dramatic wildfires at the Wildland-Urban Interface (WUI) in California are numerous: a wetter than average winter of 2016 allowed for vegetation to grow abundantly, followed by the warmest summer in recorded history, which dried the excessive fuel, culminating to hot, dry and windy events known as Santa Ana winds in the South and Diablo winds in the North, which allowed for rapid and uncontrolled fire spread.

We will present an observational study of the extreme wildfire events of 2017 in California. Our goal is to better understand the relative importance of climate and weather in creating the conditions which lead to extreme wildfire events such as those of 2017. The study relies on well known fire danger indices such as the Canadian Fire Weather Index (FWI) and McArthur Forest Fire Danger Index (FFDI). These indices have the advantage of being easy to compute and rely on easily obtainable data sources (daily values of temperature, precipitation, relative humidity and wind data), as well as accounting for the influence of wind magnitude and near-surface relative humidity, which are so important for wildfire activity during the peak fire season of California. These fire danger indices are better suited than simpler drought indices such as the Keetch-Byram Drought Index (KBDI), which rely solely on daily temperature and precipitation.

As daily data sources we use the ERA-Interim re-analysis, a global gridded product covering an extensive period, and burned area is obtained through the MCD64 global burned area product. This allows the study of the temporal and spatial evolution of fire danger, compared to observed burned area, focussing on extreme events such as those of 2017. The various components of the FWI allow to separate the different physical controls of fire intensity and spread (e.g. initial spread index (ISI), which is a function of wind) and understand the relative importance of seasonal climate and weather events.