Maria Rocken
Catherine Cortney

Air Pollution from 2017 Southern California Fires

General

- In December 2017, 29 wildfires ignited across Southern California, six of which became significant wildfires and lasted until January 12, 2018
- Wildfires burned over 300,000 acres and caused 230,000 people to evacuate
- Other effects included school closures, traffic disruptions, power outages, and air pollution
- The Thomas Fire was the largest California wildfire in history, burning over 280,000 acres for over a month in Santa Barbara and Ventura counties

Causes

- Alleged activities from a construction site and/or an exploded transformer first ignited the fire
- Unusually powerful and long-lasting winds called Santa Ana winds (last time these winds lasted three days was in 2007) and helped it to spread
    - Upwards of 60 miles per hour in some places
- Large amounts of dry vegetation due to an unusually dry rainy season caused fire to catch and move quickly

Health and Air Pollution Effects

- Wildfires fill the air with byproducts of combustion, which includes small particles (PM 2.5)
- This small particulate matter that is in smoke can penetrate deep into people's lungs, which creates a hazard, especially for those who already have heart or lung problems such as asthma
- There was an unusually high concentration of particles from the fires over an extended period of time
- First responders are affected by direct emissions because of close contact to the fires
- During the first week of the Thomas Fire, air quality was reported in the “hazardous” range in Santa Barbara
- Those who could not evacuate were advised to wear an N95 mask
- According to Jeffrey Pierce, a professor of atmospheric science at Colorado State University, "If this is the new norm for California . . . and people in California are being exposed to these smoke events regularly, then we would expect this to have an impact on the average lifetime of people in California,"

- Small particles from fires can be carried away by global air currents and cause smog problems in distant areas

Chemistry

- Pollutants released by wildfires include:
    - Greenhouses gases such as carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O)
    - Carbon monoxide (CO)
    - Nitrogen oxides (NOx)
    - Particulate matter (PM)
    - Hydrocarbons
- Wildfires can influence our climate both directly (through emission of greenhouse gases and aerosols) and indirectly (through secondary effects on atmospheric chemistry, like ozone (O3) formation)
- Wildfires also emit volatile and semi-volatile organic materials.

Aftermath

- Warmer and drier climates means more frequent and more intense fires, including in populated areas.
- Burned homes and structures leave behind hazardous materials from heavy metals and building materials (many containing asbestos)
    - If rains occur before clean up, these materials could flow into storm drain systems and end up in local rivers which flow to reservoirs
- Dust and debris will remain airborne for weeks or months and pose health risks

Sources:

https://www.nytimes.com/2017/12/07/us/california-fire-ventura-county.html
http://www.latimes.com/local/lanow/la-me-ln-socal-wildfires-main-20171206-story.html
http://www.latimes.com/local/lanow/la-me-fire-air-20171209-story.html
https://www.accuweather.com/en/weather-news/from-air-quality-to-mudslides-the-immediate-and-long-lasting-impacts-of-the-thomas-fires/70003894
https://www.fs.fed.us/rm/pubs_other/rmrs_2009_urbanski_s001.pdf
https://www.vcstar.com/story/news/local/2018/01/04/lawsuits-allege-southern-california-edison-negligently-started-thomas-fire/991192001/
https://www.independent.com/news/2017/dec/22/thomas-fire-had-two-origins/
https://earthobservatory.nasa.gov/Features/ContributionPollution/
https://www.esrl.noaa.gov/csd/factsheets/csdWildfiresFIREX.pdf
https://www.cnn.com/2017/10/28/us/california-wildfire-cleanup/index.html