NASA’s GEOS Composition Model Assessment of PM$_{2.5}$ During Wildfires: Inferring the Impact of PM$_{2.5}$ Exposure on Adverse Respiratory & Cardiovascular Conditions

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Figure 1: The BenMAP-CE program estimates the health impacts and economic value of air quality changes. Based upon epidemiologically derived health impact functions, health impact functions calculate the change in the number of adverse health effects within a certain population, based upon a specific age, race or gender, associated with a specific change in PM$_{2.5}$ concentration.

Figure 2: The GEOS-CF simulated PM$_{2.5}$ applied to a human health assessment model, BenMAP (The Environmental Benefits Mapping and Analysis Program, version 1.4.8), estimates the impact on adverse respiratory health conditions due to PM$_{2.5}$ exposure from wildfires.

Background Information

Table 1: A variety of respiratory-related, cardiovascular-related and morbidity epidemiological studies, as seen in the table above, were applied to BenMAP to estimate the greatest health impact estimate due to the change in PM$_{2.5}$ model concentrations during these seven severe wildfire events. The results from BenMAP showed the largest impact for the following studies: asthma exacerbation, MRAEs, and WLDs.

Table 2: The wildfire event scenario states the PM$_{2.5}$ levels during the wildfire and the background scenario evaluates the PM$_{2.5}$ levels after the wildfire. The delta is calculated by taking the average of the daily-averages PM$_{2.5}$ for the scenario and the average of the daily-averages PM$_{2.5}$ for the background. The largest delta value was calculated for the Southern California wildfires.

Future Work

- Evaluate severe air quality events across the globe (i.e. India) using the GEOS-CF model.
- Obtain the resulting health impact estimates associated with PM$_{2.5}$ due to the 2018 wildfire events in California, Washington and biomass burning events across the globe (i.e. India).
- Apply the same method from this study to other pollutants such as CO$_{2}$ and NO$_{2}$.