1.178 Global Modeling Assessment of PM2.5 During Wildfires: Inferring the Impact of PM2.5 Exposure on Adverse Respiratory & Cardiovascular Conditions .

Early Career Scientist

Presenting Author:
Emily Saunders, Science Systems and Applications, Inc.(SSAI) / NASA Global Modeling & Assimilation Office (GMAO), Greenbelt, MD, U.S.A., emily.saunders@nasa.gov

Co-Authors:
Christoph A. Keller, Universities Space Research Association/GESTAR/ NASA Global Modeling & Assimilation Office (GMAO), Greenbelt, MD, U.S.A.
Katherine Emma Knowland, Universities Space Research Association/GESTAR/ NASA Global Modeling & Assimilation Office (GMAO), Greenbelt, MD, U.S.A.
Steven Pawson, NASA Global Modeling & Assimilation Office (GMAO), Greenbelt, MD, U.S.A.

Abstract:

Exposure to fine particulate matter ($PM_{2.5}$) can aggravate pre-existing respiratory and cardiovascular conditions. When $PM_{2.5}$ is inhaled it can cause damage to the lungs such as reduced lung function and shortness of breath. After being inhaled $PM_{2.5}$ can enter the bloodstream and cause harm to the heart. One major natural source of $PM_{2.5}$ exposure is from wildfire smoke. The particulates within the smoke from the wildfires can spread from the initial source region, potentially impacting communities both near and far. During and after wildfire events, $PM_{2.5}$ levels can exceed the WHO air quality guidelines (10 [endif]--> annual mean; 25 [endif]--> daily mean), becoming hazardous to an individual’s health.

Global models can be used to simulate the emission and transport of these particulates and subsequently they can be valuable to air quality forecasting in highly polluted areas. The NASA Goddard Earth Observing System (GEOS) version 5 Composition Forecast (GEOS-CF) system has been used to produce near-real time air quality forecasts of atmospheric composition at a high global resolution of 25 km. The GEOS-CF system utilizes the GEOS weather forecast model coupled with GEOS-Chem (version 11) chemistry module to provide analyses and forecasts of various toxic air pollutants, including $PM_{2.5}$. The GEOS-CF simulated high levels of $PM_{2.5}$ (40 [endif]--> to 250 [endif]-->), exceeding the WHO guidelines, during multiple recent regional and global wildfire seasons, including the 2017 Seattle, WA and Los Angeles, CA wildfire seasons, and biomass burning events in India. Furthermore, the GEOS-CF simulated $PM_{2.5}$ applied to a human health assessment model, BenMAP (The Environmental Benefits Mapping and Analysis Program, version 1.3), estimates the impact on adverse respiratory health conditions due to $PM_{2.5}$ exposure from wildfires. The GEOS-CF predicted $PM_{2.5}$ during the wildfire season with the corresponding BenMAP results provides an assessment of the human health impact of $PM_{2.5}$ exposure.