

EGU2020-11097

<https://doi.org/10.5194/egusphere-egu2020-11097>

EGU General Assembly 2020

© Author(s) 2020. This work is distributed under the Creative Commons Attribution 4.0 License.



Comparing Wildfire GOES-based Stereo-Plume Heights, Winds, and Aerosol Property from 3D-Wind and MAGARA Algorithms to CMAQ simulations: A 2018 Camp Fire Study

Marief Friberg^{1,2}, Yufei Zou³, James Limbacher^{1,4}, Dong Wu¹, James Carr⁵, and Susan O'Neill⁶

¹NASA GSFC / USRA, United States of America (marief.d.friberg@nasa.gov)

²Universities Space Research Association, Columbia, MD 21046, USA

³Pacific Northwest National Laboratory, Richland, WA 99352, USA

⁴Science Systems and Applications, Inc., Lanham, MD 20706, USA

⁵Carr Astronautics, Greenbelt, MD 20770, USA

⁶U.S. Fire Service, Seattle, WA 98103, USA

Science Question: How can we use two new geostationary satellite-based algorithms to constrain wildfire plume modeling simulations?

Method: Our approach is twofold. Combining NASA's legacy MODIS products with the GOES Advanced Baseline Imager imagery, the state-of-the-art 3D-Wind algorithm, we first compare satellite-based detected wildfire plume injection heights with CMAQ, a chemical transport model. The validated GOES-MODIS 3D-Wind algorithm provides plume dynamics data with < 200 m vertical resolution for plume height and < 0.5 m/s for plume speed. Secondly, we compare aerosol type observations from the novel Multi-Angle Geostationary Aerosol Research Algorithm (MAGARA) to constrain modeled smoke hotspots and dispersion patterns of aerosols. Consistently modeled meteorology and extensive satellite coverage combine to produce more accurate plume injection heights and dispersion patterns, especially in areas where ground measurements are limited or absent. We compare the results of the two novel algorithms, 3D-Wind and MAGARA, to the 2018 Camp Fire event CMAQ runs.

Impact: Geostationary satellite wildfire plume-attribute products provide spatiotemporal context and can decrease errors in plume characterization.

Why It Matters: According to the EPA, wildland fires contributed approximately 30 percent of directly emitted fine particulate matter, linked to premature death from heart and lung disease. By capturing the dynamic wildfire plume dispersion, height, and winds, we can determine if fire plumes stay within or shoot above the planetary boundary layer and constrain modeling results. Improved accuracy, coverage, and characterization of plume injection height data increase the effectiveness of management methods that reduce and estimate smoke exposure.