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Toward a synergistic use of GEO-LEO satellite observations, atmospheric measurements, and models for air quality research and applications

Mian Chin[a*], Huisheng Bian[a,b], Alex Coy[c], Qian Tan[d,e], Tianle Yuan[a,b], Hongbin Yu[a], and Gao Chen[f]

[a] *NASA Goddard Space Flight Center, Greenbelt, MD, U.S.A.*
[b] *University of Maryland at Baltimore County, Baltimore, MD, U.S.A.*
c Montgomery Blair Hight School, Silver Spring, MD, U.S.A. (now at Cornell University, Ithaca, NY, U.S.A.)
d Bay Area Environmental Research Institute, Petaluma, CA, U.S.A.
e NASA Ames Research Center, Moffett Field, CA, U.S.A.
f NASA Langley Reseach Center, Hampton, VA, U.S.A.

***Corresponding author e-mail**: mian.chin@nasa.gov

In this study, we explore how to use data from remote-sensing of aerosols and related fields from both low earth orbiting (LEO) and geostationary (GEO) satellites for air quality research and applications. Using results from the atmospheric chemistry and transport model together with measurements from ground-based networks, we will address the following questions:

1) What are key factors modulating the relationship between column aerosol optical depth (AOD) and surface PM2.5 over different spatial and temporal scales, including aerosol vertical distributions, composition/size, and meteorological conditions?
2) What are the most scientifically robust and logistically feasible ways to convert satellite observations of aerosols to surface PM2.5 for air quality applications?

We will use the simulation of AOD and PM2.5 from the NASA GEOS/GOCART model and the meteorological fields from the MERRA-2 reanalysis to analyze the relationship between AOD and PM2.5 on different time scales and in different aerosol regimes/environment to identify the most important factors that should be included in converting column AOD to surface PM2.5. We will test these parameters with observations from co-located AOD and PM2.5 measurements to verify the results. At the end, we will recommend the practical use of the GEO-LEO satellite data for air quality study.

Keywords: air quality, remote sensing of aerosol