

Aerosol Optical Depth (AOD) is a crucial parameter for understanding atmospheric aerosol distribution and their impact on climate and air quality. With the growing number of Earth observation satellites, there is an abundance of AOD products derived from various sensors onboard both geostationary and low-orbit satellites. The availability of multiple datasets provides an opportunity to harness the strengths of each sensor and create comprehensive and accurate AOD datasets for climate and air quality studies at different temporal and spatial scales.

Our NASA aerosol MEaSURES project has made significant strides in recent years by undertaking the ambitious task of developing an open-source package tailored for fusing AOD products from different sources. The package is based on OOP (Object-Oriented Programming) design and is implemented in Python modules. Generic interfaces enable easy inclusion of large and heterogeneous data. The package may be utilized to produce harmonized AOD datasets with enhanced spatial and temporal coverage. The latest version of the package is able to process and integrate the dark-target AOD data from six different sensors: AHI Himawari-8, ABI GOES-West, ABI GOES-East, MODIS AQUA, MODIS TERRA, and VIIRS SNPP. Rigorous validation and intercomparison studies have been performed to assess the accuracy and reliability of the fused AOD product against ground-based measurements and reference datasets.

The open-source nature of the developed package ensures transparency, reproducibility, and community engagement. The research community and stakeholders can access, contribute to, and further improve the fusion methodology, making it adaptable to other studies, or expanding it to include new satellite data as they become available.

In this poster presentation, we will introduce the accomplishments and challenges faced during the development of the open-source package for AOD data fusion, and demonstrate the advantages of combining AOD products from the six aforementioned satellite sensors. The presentation aims to foster discussions, collaborations, and future directions in integrating Earth observation and remote sensing data, which may contribute to a better understanding of atmospheric aerosols and their impacts on our environment.