This study integrates aerosol optical depth (AOD) products from NASA's Aqua and Terra satellites with data from low-cost sensors (LCS) in Reno, Nevada, to improve air quality assessments. The satellite data include 1° and 10 km resolution AOD products, retrieved using both the Deep Blue (DB) and Dark Target (DT) algorithms, as well as a 3 km product available only from DT. The LCS, from the PurpleAir network, collects temperature, humidity, pressure, particulate matter (PM), VOCs, and NOx data, providing continuous, ground-based measurements to complement and enhance remote sensing observations. Ground-truth AOD data are obtained from AERONET, allowing for validation of satellite-derived AOD and assessment of its agreement with surface level air quality conditions. By assimilating these datasets, we aim to identify key factors, such as the boundary layer, that influence the relationship between surface conditions and satellite AOD. The boundary layer will be characterized using a micro pulse lidar (MPLnet) operated by the University of Nevada, Reno. This study enhances the synergy between LCS and regional (satellite remote sensing) air quality data, particularly in cases where satellite-derived AOD is influenced by meteorology, surface land cover, topography, and aerosol transport, which can limit its accuracy in representing true surface conditions. By integrating LCS data, this work helps bridge the gap between satellite observations and ground conditions, improving the spatial resolution of air quality estimates and enhancing the applicability of satellite data for surface-level pollution monitoring.

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