

Development of Micro Pulse Lidar Network (MPLNET) Level 3 Satellite Validation Products in advance of the EarthCARE mission

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It is important to have highly accurate and quantitative data records of aerosol and cloud properties spanning several years and geographic regions. More specifically, there is a crucial need for vertical profiles of aerosol and cloud properties in order to improve the understanding of cloud-aerosol-radiation interactions and their parameterizations in climate and numerical weather prediction models. The Earth Clouds, Aerosols and Radiation Explorer (EarthCARE) mission, scheduled to launch late Sept. to mid-Oct. 2023, can potentially extend the rich data record begun by CloudSat and Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) to multiple decades. The stated EarthCARE validation plan recognizes the contributions long-term ground-based observation networks can provide. Specifically, the Micro Pulse Lidar Network (MPLNET) and European Aerosol Research Lidar Network (EARLINET) are referenced as global or regional lidar networks that can be used to validate EarthCARE through statistical approaches.

In this presentation, we aim to perform statistical comparisons of cloud, aerosol and planetary boundary layer (PBL) properties derived from Level 3 (L3) MPLNET products to similar properties retrieved from the Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP) aboard CALIPSO as a precursor for retrievals from the Atmospheric Lidar (ATLID) instrument onboard the EarthCARE satellite. The L3 MPLNET products will be monthly diurnal statistical products for each site: hourly mean and median data arranged monthly. The MPLNET L3 products will be supplemented by development of satellite-specific MPLNET validation products (e.g. L3-EC for EarthCARE or L3-CAL for CALIPSO). The satellite-specific products will utilize the same statistical analysis as developed for L3 but will be constrained to data acquired during satellite overpasses of MPLNET sites. Based on previous comparisons between ground-based and spaceborne sensors constraining observations to within a 200-km horizontal radius of the MPLNET site and ± 2 -hour time window of the closest satellite overpass is sufficient to make correlative measurements of both aerosols and clouds. Our CALIPSO-MPLNET analysis will be used to develop a standard operating procedure to be implemented during the EarthCARE mission.