

Aerosol Properties and Distributions for Earth System Science from Ground-Based Networks: What We've Accomplished and What We Need to Accomplish

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NASA's ground-based remotely sensed measurements have played a significant role in developing Earth System Science world-wide. Particularly notable are two networks AERosol RObotic NETwork (AERONET) and Micro Pulse Lidar Network (MPLNET) for their unique measurements and retrievals, continuous and long term records, and pioneering public domain database. AERONET is a federated network of sun and sky scanning spectral radiometers designed to automatically measure spectral total column aerosol optical depth, as well as radiometric and microphysical properties. The program provides a long-term, continuous and readily accessible public domain database for aerosol research and characterization, validation of satellite retrievals, and synergism with other databases. The network imposes standardization of instruments, calibration, processing and distribution. Because the network is a federation of national and international partners, AERONET has grown over the last 15 years to be globally distributed at over 400 sites in diverse aerosol regimes ranging from marine, desert, biomass burning, and volcanic aerosols. The project has imposed standards on sun photometry that allows quantitative and near real-time assessment and intercomparison of widely disparate regions on the Earth; thus AERONET data have provided the means to modify the algorithms and models used to retrieve aerosol properties of satellites and global transport models. Analysis of AERONET data provides aerosol climatologies, trend analysis over 15 years, and fundamental properties of aerosol types and mixtures. NASA's MPLNET program is also a federated network of Micro Pulse Lidar systems designed to measure aerosol and cloud vertical structure continuously, day and night, over long time periods required to contribute to climate change studies and provide ground validation for models and satellite sensors in the NASA Earth Observing System (EOS). At present, there are eighteen permanent sites worldwide. Numerous temporary sites have been deployed in support of various field campaigns since the start of MPLNET in 2000. Most MPLNET sites are co-located with AERONET to provide both column and vertically resolved aerosol and cloud data. Accomplishments include development of MPL standards, operational protocols, and data processing techniques required to produce high quality data from a global lidar network. MPLNET has produced over 40 peer reviewed publications and numerous conference proceedings across a wide range of science interests, from blowing snow heights at the South Pole to aerosol properties in the tropics.