



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711
OFFICE OF AIR QUALITY PLANNING AND STANDARDS**

**Technical Note - Participation in the Unified Ceilometer Network
August 30, 2021**

The purpose of this technical note is to introduce the Unified Ceilometer Network (UCN) and to inform monitoring agencies that participation in the UCN will satisfy the requirement to measure and report hourly averaged mixing layer height at PAMS sites as required under 40 CFR part 58.

BACKGROUND

The PAMS monitoring requirements promulgated in 2015 call for monitoring agencies to measure and report hourly averaged mixing height at PAMS sites. Most agencies are using ceilometers to make the mixing height measurement due to their low cost and ease of operation.

Since the promulgation of the PAMS requirements, EPA has noted the value of the full backscatter vertical profile measured by ceilometers. The backscatter data from ceilometers can not only be useful in estimating mixing height but can also be used for other air quality purposes such as air quality forecasting and the evaluation of smoke impacts from wildfires. Furthermore, the backscatter profiles allow for better visualization of atmospheric mixing processes valuable to air quality evaluations.

INTRODUCING THE UNIFIED CEILOMETER NETWORK

Due to the value of the full backscatter profile, EPA in conjunction with the University of Maryland, Baltimore County (UMBC) and NASA, developed a new data system for the collection, storage, and retrieval of ceilometer data called the Unified Ceilometer Network (UCN).

The UCN is an open network designed to automatically retrieve and store ceilometer profile backscatter from participating ceilometers. A number of options are available for data collection based on the IT requirements of the partner monitoring agency.

One major advantage of the UCN is that it allows consistency in the mixing layer height retrievals. The UCN provides centralized processing of aerosol backscatter profiles through the use of a common (peer-reviewed) algorithm to derive aerosol layers heights with a classification scheme to identify mixing heights, nocturnal stable layers, and residual layers. The UCN also includes internal quality assurance checks with explicit treatment of clouds and precipitation to minimize incorrect identification of aerosol layer heights and associated mixing heights. Because of the central data processing, common application of an algorithm, and QA checks, the UCN system alleviates much of the burden on monitoring agencies regarding the derivation of hourly mixing layer heights by a ceilometer. Finally, by storing the full aerosol backscatter

profile data, improvements to the algorithm can be applied to archived data and reflect the most recent mixing layer height algorithms.

In addition to archived backscatter data, the UCN provides near-real time display of current backscatter conditions. Air quality forecasters will be able to use the backscatter data from the multiple sites in the UCN to improve air quality forecasts, and all air quality agencies will have data access for other uses such as model evaluation and exceptional event analysis.

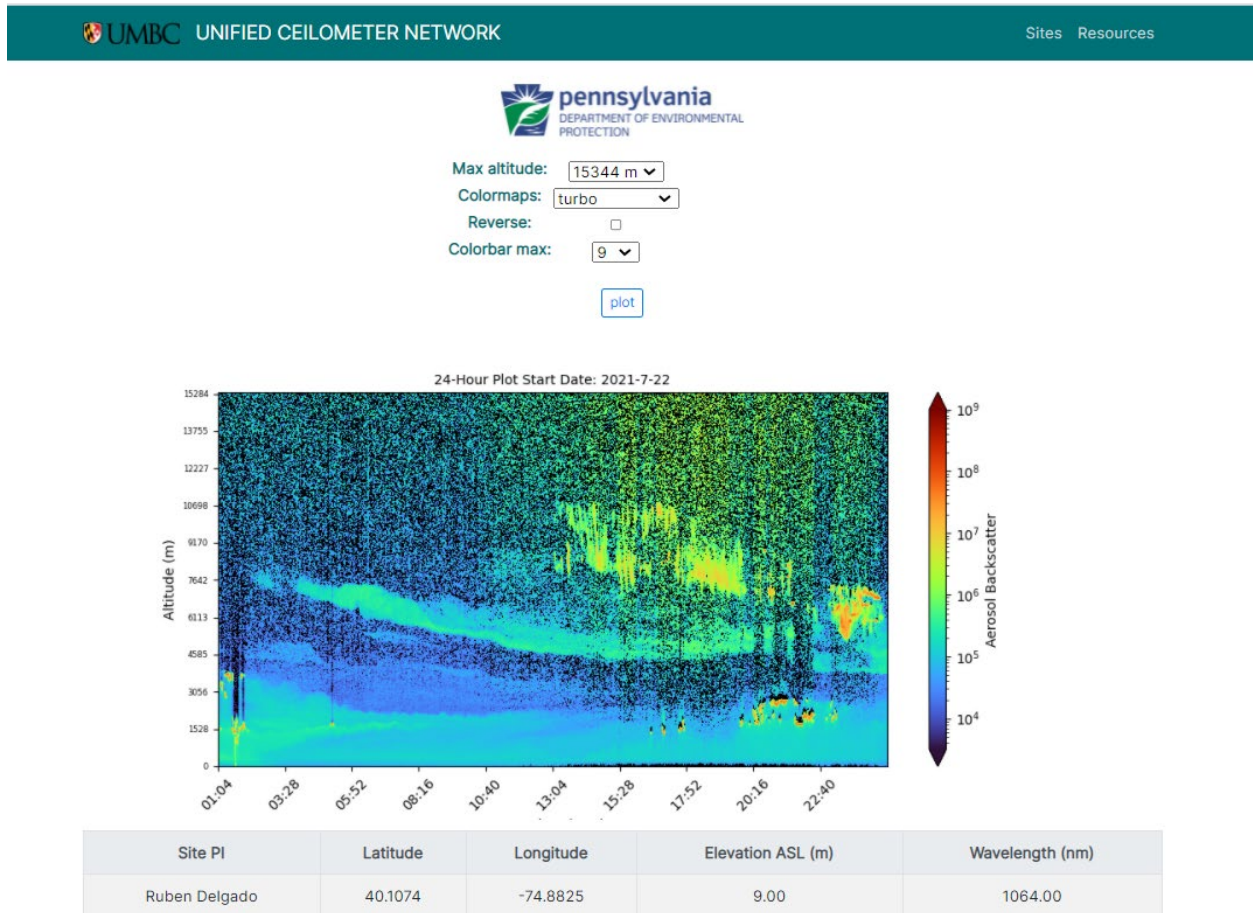


Figure 1. Near-real time visualization webpage for UCN. Visualization page will include a default rolling 24-hour image, and options for visualization in various altitude ranges, colorscales, and time range.

PARTICIPATION IN UCN

The UCN is open to any monitoring agency wishing to participate. Note that participation in UCN is voluntary and monitoring agencies may instead choose to meet the PAMS requirement for reporting hourly mixing layer height by directly reporting their derived mixing height to AQS. However, due to the advantages provided by collection of the full backscatter profile, EPA will consider participation in the UCN as satisfying the requirement to report hourly mixing layer height at PAMS sites.

Monitoring agencies should contact Kevin Cavender (cavender.kevin@epa.gov) for more information on the UCN including information on how to participate.