

## **Two-Column Aerosol Project: Aerosol Light Extinction Measurements Field Campaign Report**

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# **Two-Column Aerosol Project: Aerosol Light Extinction Measurements Field Campaign Report**

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## **Acronyms and Abbreviations**

ARM	Atmospheric Radiation Measurement Climate Research Facility
CAPS PMex	cavity attenuated phase shift extinction monitor
DOE	U.S. Department of Energy
LED	light emitting diode
PASS	photoacoustic soot spectrometer
TCAP	Two-Column Aerosol Project

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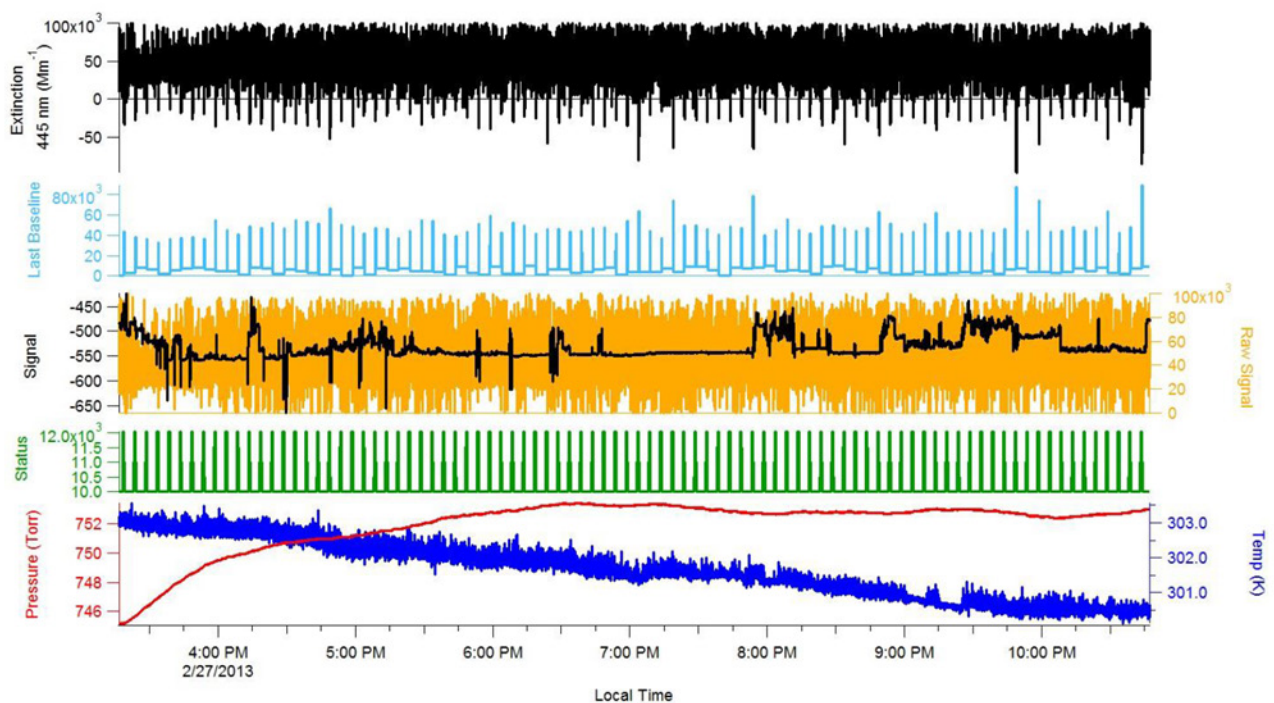
## 1.0 Summary

We deployed Aerodyne Research Inc.'s first Cavity Attenuated Phase Shift extinction (CAPS PMex) monitor (built by Aerodyne) that measures light extinction by using a visible-light-emitting diode (LED) as a light source, a sample cell incorporating two high-reflectivity mirrors centered at the wavelength of the LED, and a vacuum photodiode detector in Cape Cod in 2012/13 for the U.S. Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility's Two-Column Aerosol Project (TCAP).

The efficacy of this instrument is based on the fact that aerosols are broadband scatterers and absorbers of light. The input LED is square-wave modulated and passed through the sample cell that distorts it due to exponential decay by aerosol light absorption and scattering; this is measured at the detector. The amount of phase shift of the light at the detector is used to determine the light extinction. This extinction measurement provides an absolute value, requiring no calibration. The goal was to compare the CAPS performance with direct measurements of absorption with ARM's baseline photoacoustic soot spectrometer (PASS-3) and nephelometer instruments to evaluate its performance.

## 2.0 Results

Unfortunately the new instrument shipped directly from Aerodyne had issues with mirrors and the data quality was not good, as evident by the large noise in the data collected (Figure 1). It was sent back to the manufacturer for service that required a long time and we were not able to redeploy to TCAP as intended.



**Figure 1.** Data collected by CAPS during TCAP were very noisy and not stable. The instrument was sent back for service repaired as demonstrated by future ARM deployments.

However, subsequent to this service and refinements (including a new pump), the CAPS performed well for other ARM campaigns and has been now recommended as a baseline instrument for ARM.

