

COMBINING MASS MEASUREMENT WITH CARBON SPECIATION

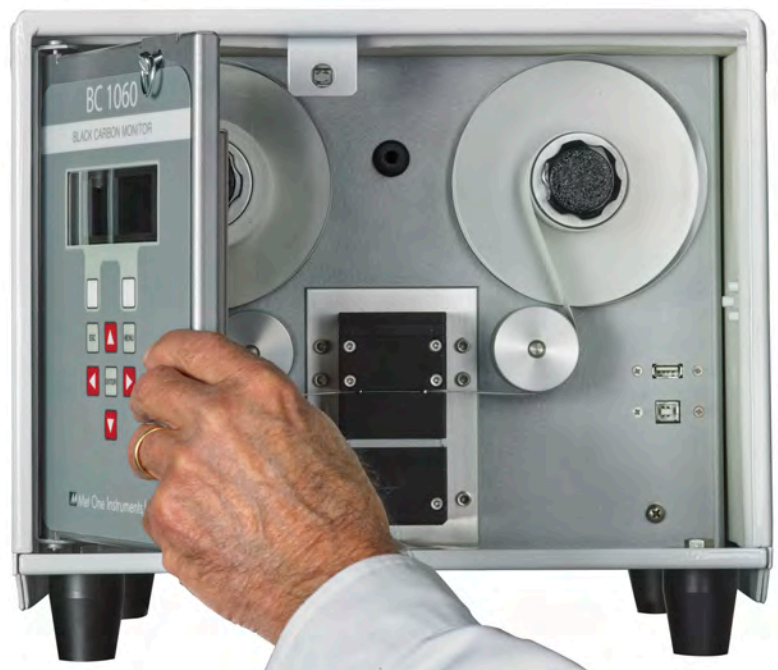
**UTILIZING THE
ES-405
IN CONJUNCTION
WITH THE
BC 1060**



**ES-405 SIMULTANEOUS
PARTICULATE PROFILER**



**BC 1060 PORTABLE CARBON
MONITOR**





BC 1060

PM MEASUREMENT OF BLACK AND BROWN CARBON



The Met One Instruments, Inc. Model BC 1060 Portable Carbon Monitor simultaneously measures transmission of ultraviolet and infrared light across filter media upon which particulate matter "PM" containing black carbon "BC" and brown carbon "BrC" is being deposited. This allows determination of BC and BrC levels with sensitivity of less than 1 ng/m³ in real time. For many air quality measurements, BC and BrC account for between 2% and 5% of total particulate matter. However, there are instances where BC and BrC can account for a much larger fraction of PM than this.



ROADSIDE MONITORING

Roadside monitoring provides a challenging PM monitoring environment for several practical reasons:

- External power is not always available
- Shelters capable of housing equipment are not always available for such applications
- Often it is necessary to periodically relocate the equipment favoring portable equipment

In addition, there are measurement-specific challenges arising from roadside monitoring of gravimetric PM or BC:

- Rapidly changing PM and BC concentrations favor the use of instrumentation capable of reporting with high time resolution (1-minute or less).
- Rapidly changing BC concentrations can make source apportionment computations to determine the contribution from fossil fuel vs. biomass combustion challenging.





BC1060 & ES-405

ELIZABETH, NJ ROADSIDE MONITORING SITE

Met One Instruments has operated a monitoring site for many years in Elizabeth New Jersey, at a toll booth on the New Jersey Turnpike just south of Newark International Airport. Although the general region is highly industrialized, the proximity to the toll booth and the resulting number of large idling vehicles, including diesel powered trucks, can result in the production of locally high levels of soot.



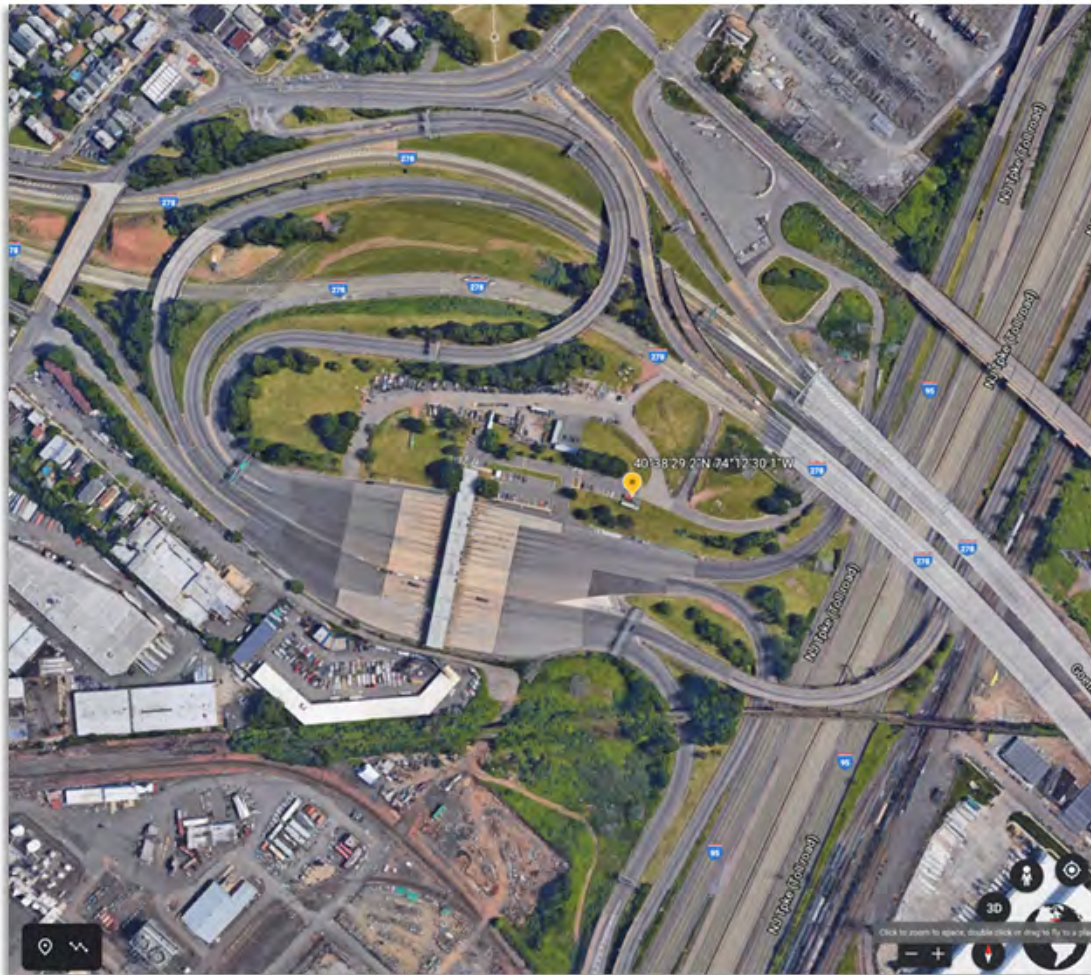


BC 1060 & ES-405

ELIZABETH, NJ ROADSIDE MONITORING SITE

As is shown in this satellite image, the monitoring station is approximately 120 meters from the toll booth and approximately 20 meters from the roadway approaching the toll booth. Vehicles approaching the toll booth from either direction can become backed up. When this happens the idling vehicles can

generate significant levels of PM in the form of BC. During events such as these, the percentage of PM in the form of BC can significantly exceed 5%, especially if there are no other nearby sources of PM being generated. The toll booth exists as a large, geographically fixed source of PM emissions.



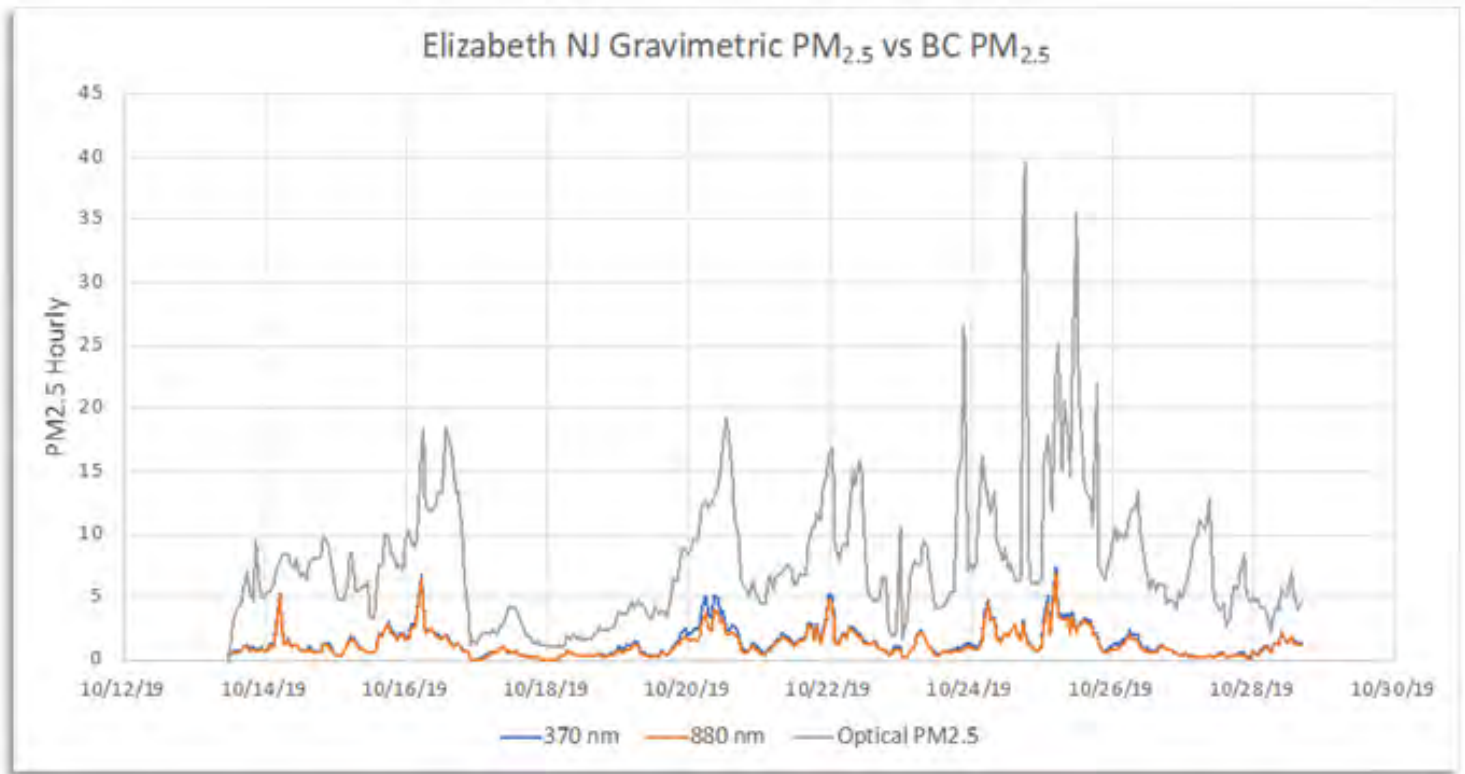


BC 1060 & ES-405

COMBINING MASS SPECIATION & MASS MEASUREMENT

The BC 1060 portable carbon monitor, configured to monitor BC and BrC in the form of $PM_{2.5}$, was collocated with an ES-405 aerosol monitor configured to simultaneously monitor and report PM_{10} , $PM_{2.5}$, PM_4 and PM_{10} . This chart shows the gravimetric $PM_{2.5}$ compared to the BC signals at both 370 nm and 880 nm illumination. All analyzers have the capacity to collect and report data with 1-minute time resolution. Data presented here is with 1-hour time resolution.

The first thing to notice is that the 370 nm and 880 nm outputs are almost identical. This is a strong indication that at this monitoring site for the period monitored, BC comes almost exclusively from the combustion of fossil fuels. If there was BC originating from biomass combustion present, the 370 nm signal would be substantially greater than the 880 nm signal. Given the location of the monitoring station this should not come as a surprise.





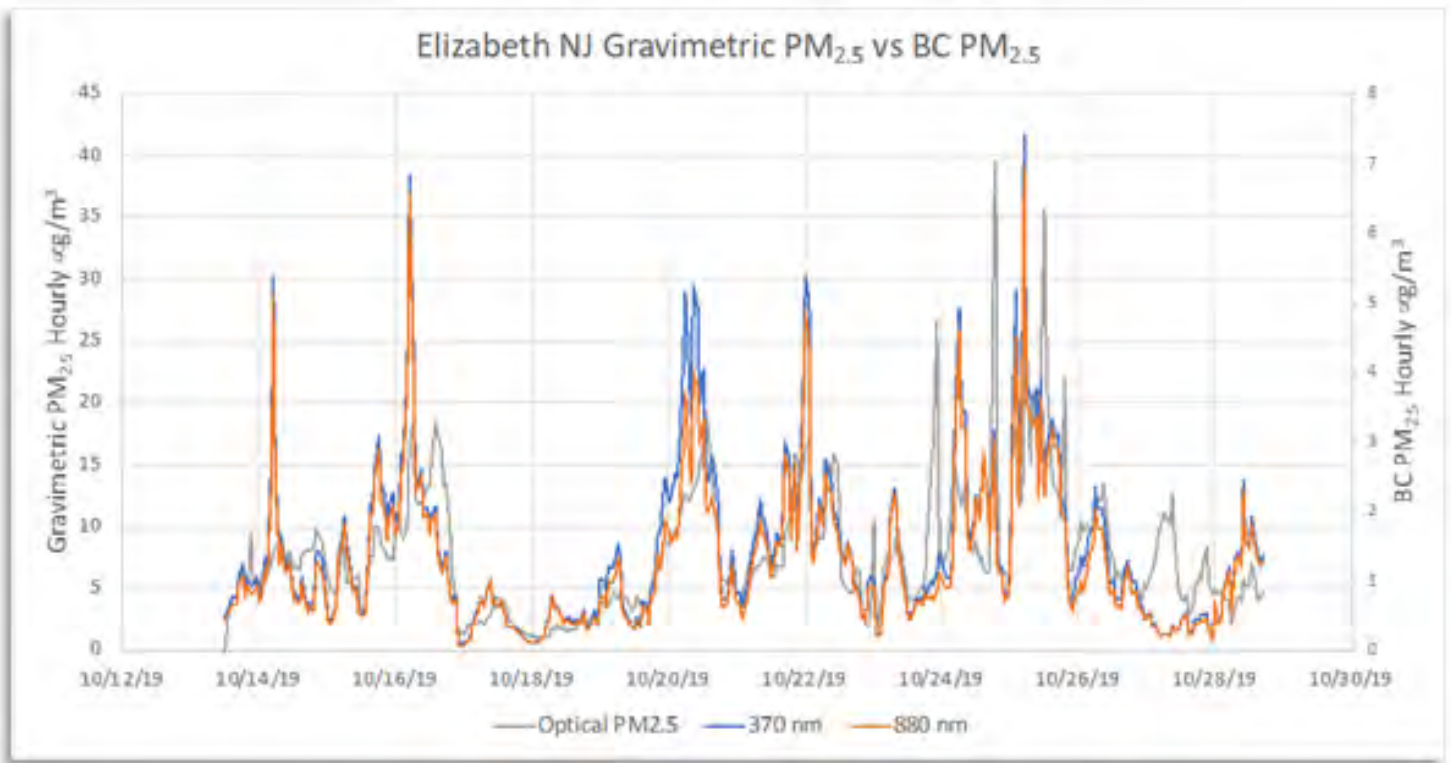
AIR QUALITY
PARTICULATE MONITORS

BC 1060 & ES-405

COMBINING MASS SPECIATION & MASS MEASUREMENT

The second observation made is that the contribution of PM coming from BC is significantly higher than the 2-5% levels that are typically measured at air quality monitoring sites. At this site BC accounts for typically 10-25% of total gravimetric PM. When the BC concentrations are plotted on the secondary axis it is apparent that the correlation between gravimetric

PM_{2.5} and BC PM_{2.5} is quite high. Again, this should come as no surprise given the location of this monitoring station. In the figure below, the BC concentrations are plotted along the secondary y-axis to allow one to see the high degree of correlation between gravimetric mass and BC.





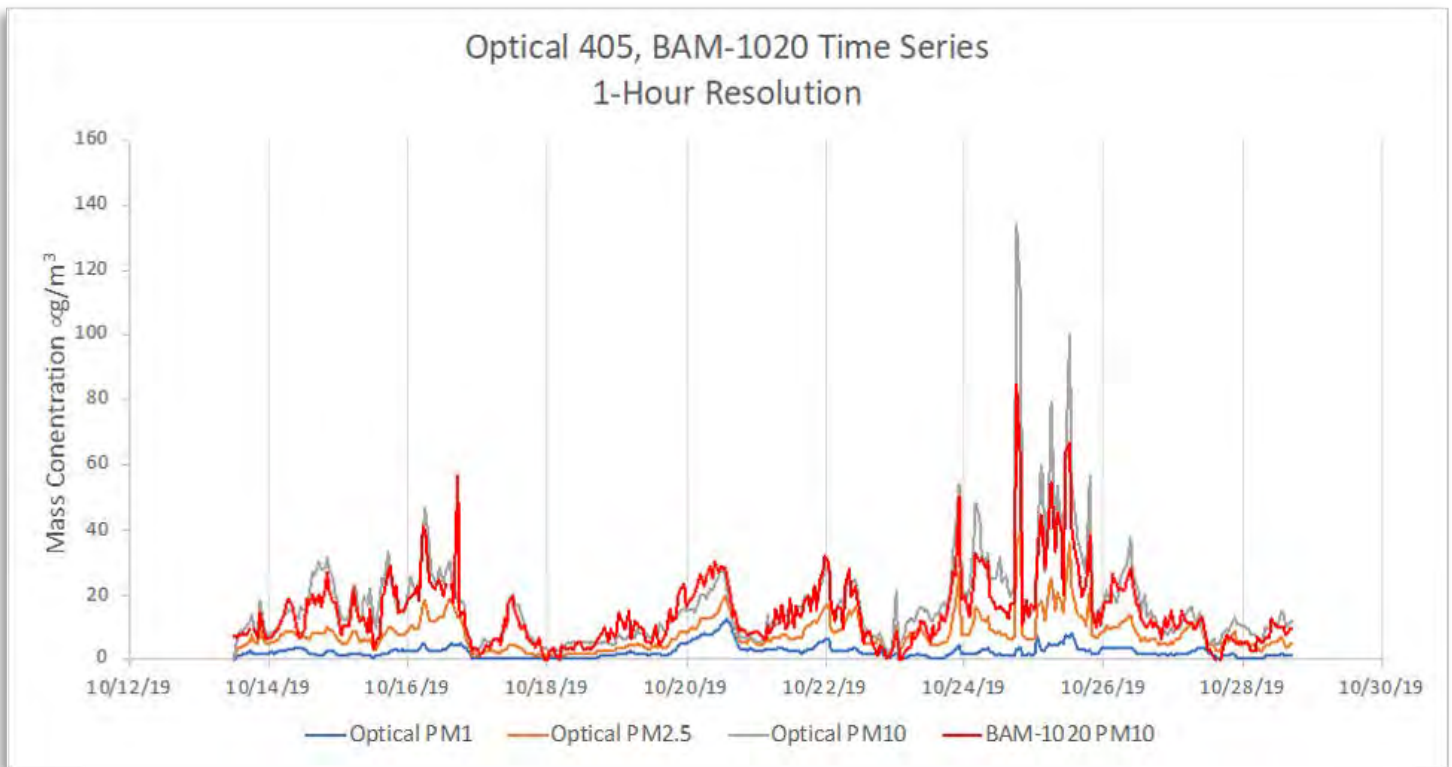
BC 1060 & ES-405

COMBINING MASS SPECIATION & MASS MEASUREMENT

Finally, this chart shows the gravimetric mass concentrations for the ES-405 for PM₁, PM_{2.5} and PM₁₀. In this chart one can see the general agreement between the Met One Instruments, Inc. BAM 1020, an EPA equivalent method for PM₁₀, PM_{2.5} and PM_{10-2.5}, and the ES-405. One can also see the fraction of PM₁₀, which typically includes wind-blown dust, and PM_{2.5} which comes mainly from combustion.

CONTACT OUR SALES DEPARTMENT TODAY FOR A QUOTE:

SALES@METONE.COM



UK & Ireland Distributor



Kingfisher Business Park, London Road, Stroud, Gloucestershire, GL5 2BY, UK

Tel: +44 (0) 1453 733200 **sales@et.co.uk** **www.et.co.uk**