

# Real time Wildfire Smoke monitoring



## Rationale

As the world's climate becomes hotter and drier, wildfires are increasing in size, duration and severity. Wildfire smoke can be transported for hundreds or thousands of kilometers in high concentrations. It contains both "black" carbonaceous material ('BC') from high-temperature combustion; and "brown" material ('BrC') from smoldering, which contains an enormous range of organic compounds including many toxic and carcinogenic materials. This dense smoke can create widespread public-health emergencies, apocalyptic scenarios, and poisonous fallout over huge areas. Additionally, this input of 'smoke' to the atmosphere can greatly exceed the inputs from anthropogenic sources, which are now regulated.

For the purposes of nowcasting, and the protection of public health, it is essential to have real-time data. For the purposes of regulatory compliance, it is essential to know the amount of pollution that is being advected into a managed area. For the purposes of climate science, it is essential to know the amount of optically-absorbing material that is being injected into the atmosphere.

For all of the above reasons, it is essential to have real-time data that **speciates** the carbonaceous aerosols; provided by a rugged, field-deployable instrument.

The new **Model AE43 Portable Aethalometer®** offers exactly this capability.

# Data Interpretation

The **Model AE43 Portable Aethalometer**<sup>®</sup> provides 1-Hz measurements of absorption at 7 optical wavelengths, representing the concentrations of BC and BrC aerosol mass. This may be combined with meteorological data as inputs to models of dispersion and long-range transport: which, in turn, are the critical elements of nowcasting for creating wide-area public health alerts.

Longer-period averages of aerosol concentrations provide total inputs to the atmosphere, for the purposes of climate-change modeling.

# Instrument Package

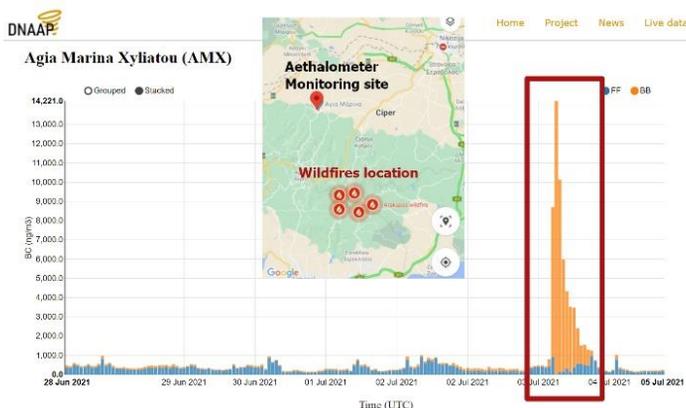
The Magee Scientific **Model AE43 Portable Aethalometer**<sup>®</sup> provides real-time BC and BrC concentrations, source apportionment, and charting relative to wind speed and direction.

- **“Industry Standard” analytical performance.** The analytical optical system of the AE43 is identical to that of the well-established, industry-standard, rack-mount Model AE33. All validation and verification tests may be performed, and the data is fully qualified.
- **Rugged, field-deployable package.** The AE43 is much smaller and lighter than the rack-mount standard. The AE43 operates from 12~16 VDC power and is designed for use in vehicles and mobile labs; off-grid locations with solar panels and batteries; or from its own lightweight matching battery pack, giving 16-hour runtime.

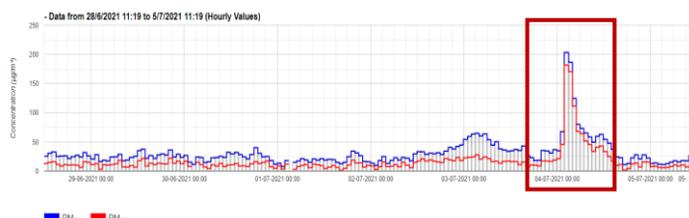


The Magee Scientific Aethalometer<sup>®</sup> model AE43

# Wildfire Smoke example



A wildfire smoke-impact event was recorded by Aethalometer (above) and PM mass analyzers (below). The Aethalometer data provides immediate source identification of “biomass burning”. PM mass data alone cannot make this identification.



## Literature

- (1) X. Liu et. al., „Airborne measurements of western U.S. wildfire emissions: Comparison with prescribed burning and air quality implications“, *Journal of Geophysical Research: Atmospheres*, 122, 6108-6129 (2017).

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