Aerodynamic Particle Sizer (APS) - TSI

- Measures aerodynamic particle size, distributions, and number concentrations
- Uses time-of-flight to characterize acceleration of aerosols across two laser beams; can be merged with SMPS electrical mobility data to generate a fine-to-coarse mode aerosol distribution
- **Size range:** 523 nm - 19µm
- **Website:** [http://www.tsi.com/](http://www.tsi.com/)

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Aethelometer - Magee Scientific

- Measures black carbon mass concentration and optical absorption coefficients at 7 wavelengths
- Uses a continuously advancing filter to characterize transmission of light through deposited aerosols; may be cross-compared with PSAP absorption coefficients or combined with nephelometer/PMEx data for determination of single-scattering albedo
- **Spectral channels:** 370, 470, 520, 590, 660, 880 and 950 nm.
- **Website:** [http://www.mageesci.com/](http://www.mageesci.com/)

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Beta Attenuation Monitor (BAM-1020) - MetOne Instruments

- Measures aerosol mass concentration at PM2.5 and PM10 size-cuts
- Uses a filter-based technique and beta-attenuation to characterize aerosol loading one per hour; can be combined with TEOM to determine fine/coarse mode particle concentrations
- Website: http://www.metone.com

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CAPS PMex Monitor (Particle Optical Extinction)- Aerodyne Research

- Measures aerosol optical extinction coefficients at three wavelengths
- Uses Cavity Attenuated Phase Shift (CAPS) technique to relate optical extinction to the speed of light as it passes through a mirrored chamber; we can combine extinction information with data from nephelometers, PSAP, or Aethalometer to determine the aerosol single scattering albedo
- Spectral channels: 445, 530, and 630 nm
- Website: http://www.aerodyne.com/

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Cloud Condensation Nuclei Counter (CCN100) - Droplet Measurement Tech

- Measures cloud condensation nuclei size distributions at various supersaturation ratios
- We can use CCN distributions to better understand the hygroscopic properties of in-situ aerosols
- Website: [http://www.dropletmeasurement.com/products/airborne/CCN](http://www.dropletmeasurement.com/products/airborne/CCN)

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**Fast Mobility Particle Sizer (FMPS) - TSI Inc**

- Measures electrical mobility particle size, distributions, and number concentrations
- Uses a high voltage source to neutralize and charge particles for detection at high time resolution (1Hz); we can merge this fine-to-accumulation mode data with information from SMPS and APS.
- **Size range:** 5.6 – 560 nm

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**Nephelometer (TSI Neph)- TSI Inc.**

- Measures aerosol total- and backscattering coefficients
- We operate two of these well-characterized nephelometers: one sampling humidified air and one sampling ambient (drier) air, so that we may determine hygroscopic effects of in-situ aerosols
- **Spectral channels:** 450, 550 and 700 nm
- **Website:** [http://www.tsi.com](http://www.tsi.com)

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**Particle Soot Absorption Photometer (PSAP)- Radiance Research**

- Measures optical absorption coefficients
- This instrument calculates the decrease in optical transmission (or loss of light) across an aerosol-loaded filter; we can cross-compare its data with the Aethalometer or combine it with nephelometer/PMEx data to determine single-scattering albedo
- **Spectral channels:** 467, 530, 660 nm
- **Website:** [http://www.esrl.noaa.gov/gmd/aero/instrumentation/psap_desc.html](http://www.esrl.noaa.gov/gmd/aero/instrumentation/psap_desc.html)

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**Scanning Mobility Particle Sizer Spectrometer (SMPS)- TSI Inc.**

- Measures particle concentration and mobility size spectra
- We operate two of these well-characterized particle sizers: one sampling humidified air and another sampling ambient (dry) air to characterize hygroscopity effects on aerosols.
- **Size range:** 2.5 nm –1000 nm dependent upon flow settings
- **Website:** [http://www.tsi.com/](http://www.tsi.com/)

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Tapered Element Oscillating Microbalance (TEOM)- Thermo Scientific

- Measures aerosol mass concentration at PM1 size-cut
- This instrument physically weighs a sample of collected aerosol to determine its mass concentration; we operate it alongside two BAM-1020 instruments to understand fine/coarse mode particle concentrations.
- Website: http://www.thermoscientific.com

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Total Sky Imager (TSI)- Yankee Environmental Systems

- Collects 360-degree images of sky conditions
- We use this simple but clever instrument to visually confirm if what the radars are telling us is true
- Website: http://www.yesinc.com/

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Trace Gas Analyzers- Thermo Electron Co.

- Measure the concentration of trace gases such as CO, CO$_2$, O$_3$, SO$_2$, NO and NO$_x$.
- These monitors use a variety of techniques, including fluorescence and infrared light absorption, to estimate the concentrations of various *in-situ* gases; Air Quality Designs, Inc., modified our NO monitor to allow us to measure NO$_2$ and NO$_x$/NO$_y$ concentrations at high time resolutions.
- Website: [http://www.thermo.com/](http://www.thermo.com/)

Weather and Visibility Meter (WVIS)- Optical Scientific

- Measures visibility and temperature.
- Used to maintain a record of horizontal visibility to cross-comparison with radar/lidar information.
- Website: [http://www.opticalscientific.com/](http://www.opticalscientific.com/)
Weather Transmitter (WXT520)- Vaisala

- Measures pressure, temperature, relative humidity, wind speed, wind direction and precipitation
- We can use this ancillary data to characterize the atmosphere during a campaign, where reliable meteorological measurements may not be available
- Website: http://www.vaisala.com/

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