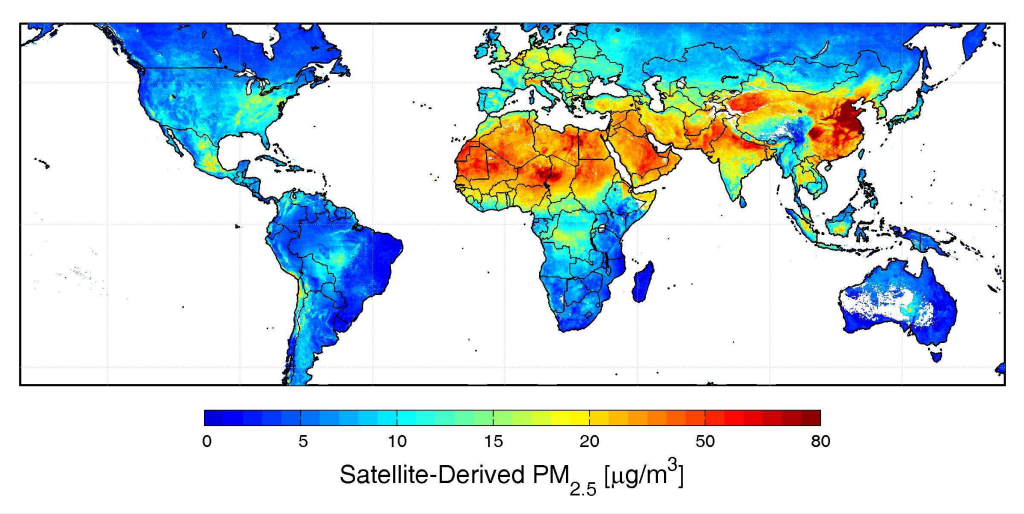
A Brief Guide to AirPhoton Instruments and Their Use in the SPARTAN Network

What is the Surface PARTiculate mAtter Network?

- The first global network of *in situ* $PM_{2.5}$ measurements in populated areas using the same instrumentation
- A network that will provide data to evaluate and enhance satellite remote sensing estimates



AirPhoton Instrumentation for SPARTAN

Each SPARTAN station includes two instruments

Filter sampling station

Provide a reliable means for obtaining ground-level $PM_{2.5}$ around the globe

Nepehlometer

AirPhoton Instrumentation for SPARTAN

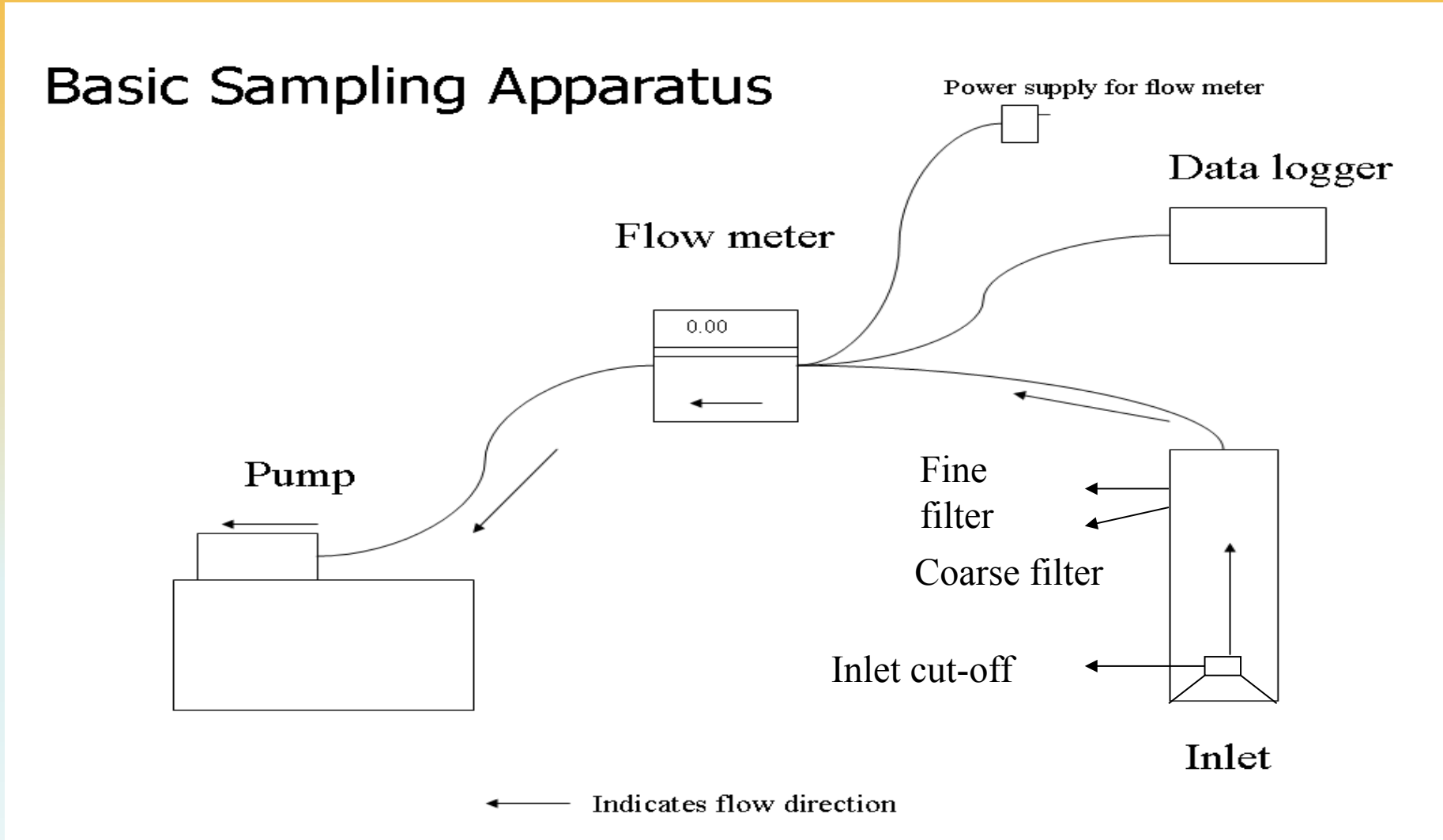
AirPhoton instruments were developed for the demanding needs of the SPARTAN Network

- High Accuracy
- Robust Design For Deployment in Harsh Environments
- Ease of Operation
- Affordable Cost

As SPARTAN and AirPhoton have gained experience in the operation of a global network representing many environments our instruments have continued to develop and improve

Instrumentation for Measuring Aerosol Properties

Filter measurements

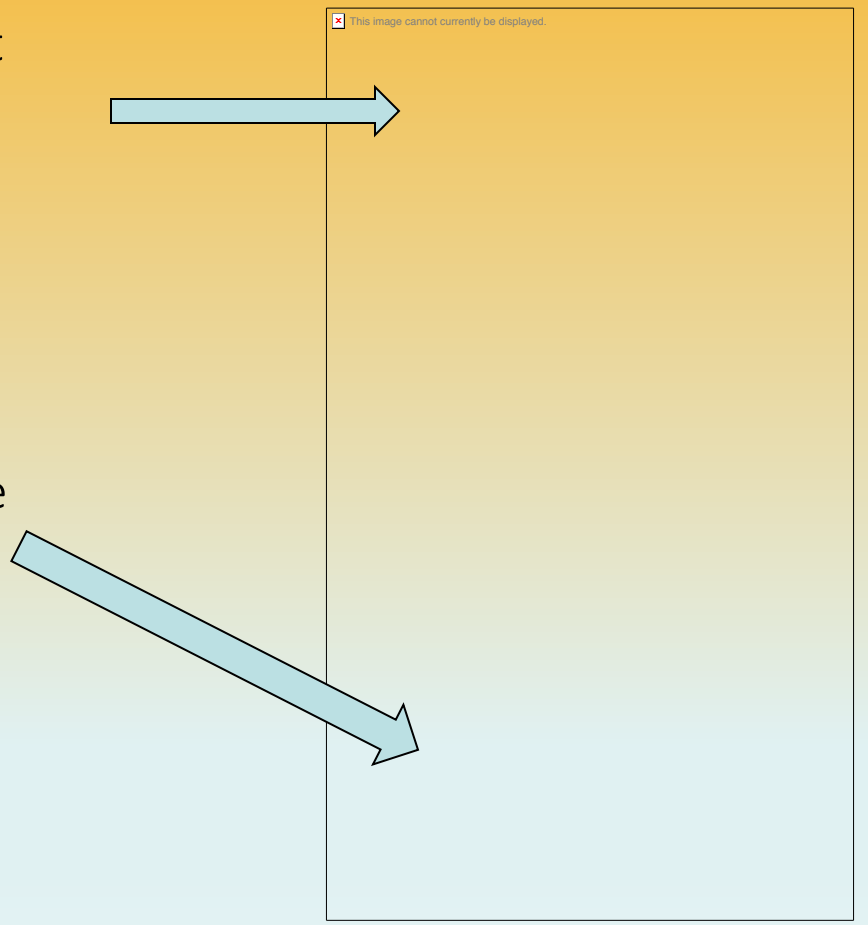


Aerosol Filter Sampler with Cyclone Inlet

- Inlet removes particles below selected inlet cutoff
  PM > 10 µm, 4 µm, 2.5 µm or 1 µm
  SPARTAN uses a 10 µm inlet

- Filters capture particulates.
  Two stage filters can separately collect fine and coarse particles.

- Provides information on:
  - Long-term dry mass
  - Ions
  - Trace metals



Filter Sample Collection

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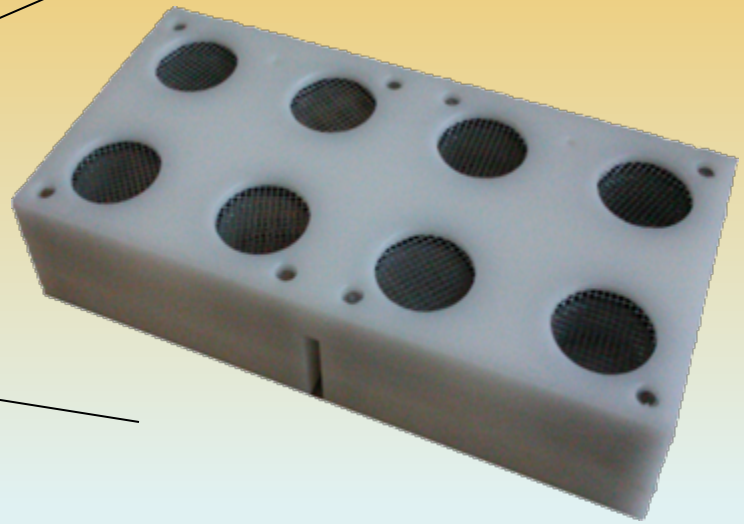
Filter Cartridge

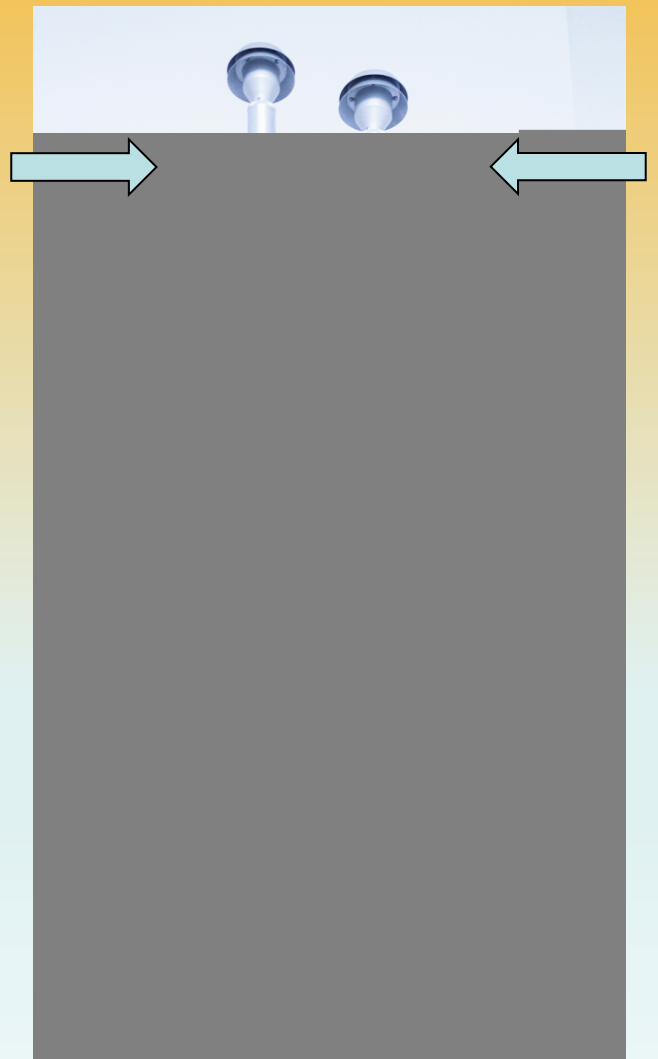


Each position includes can include a fine and coarse filter

Aerosol Impaction Filter Sampler

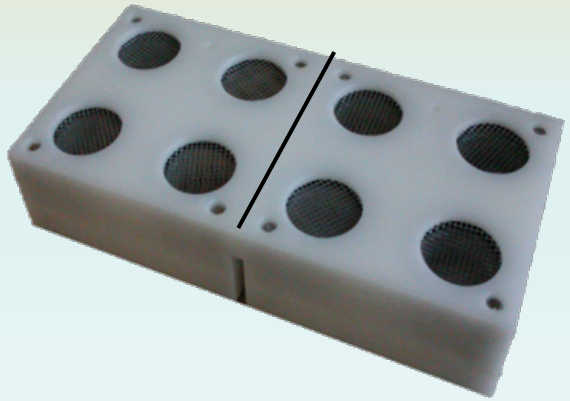
Two different intial cutoff sizes

PM_{10} or PM_{4}

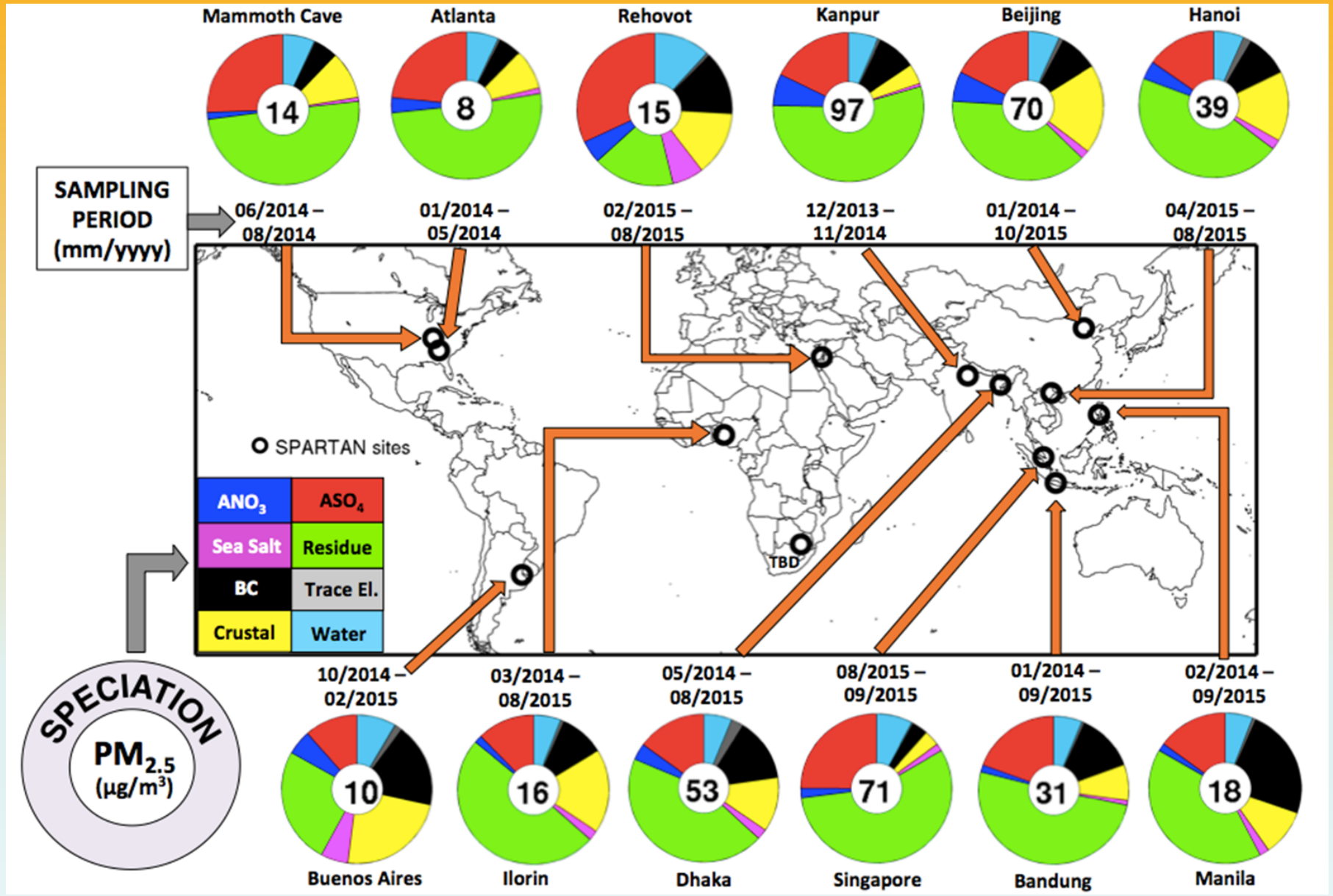


$PM_{2.5}$ or PM_{1}

Each inlet is collected on four filters



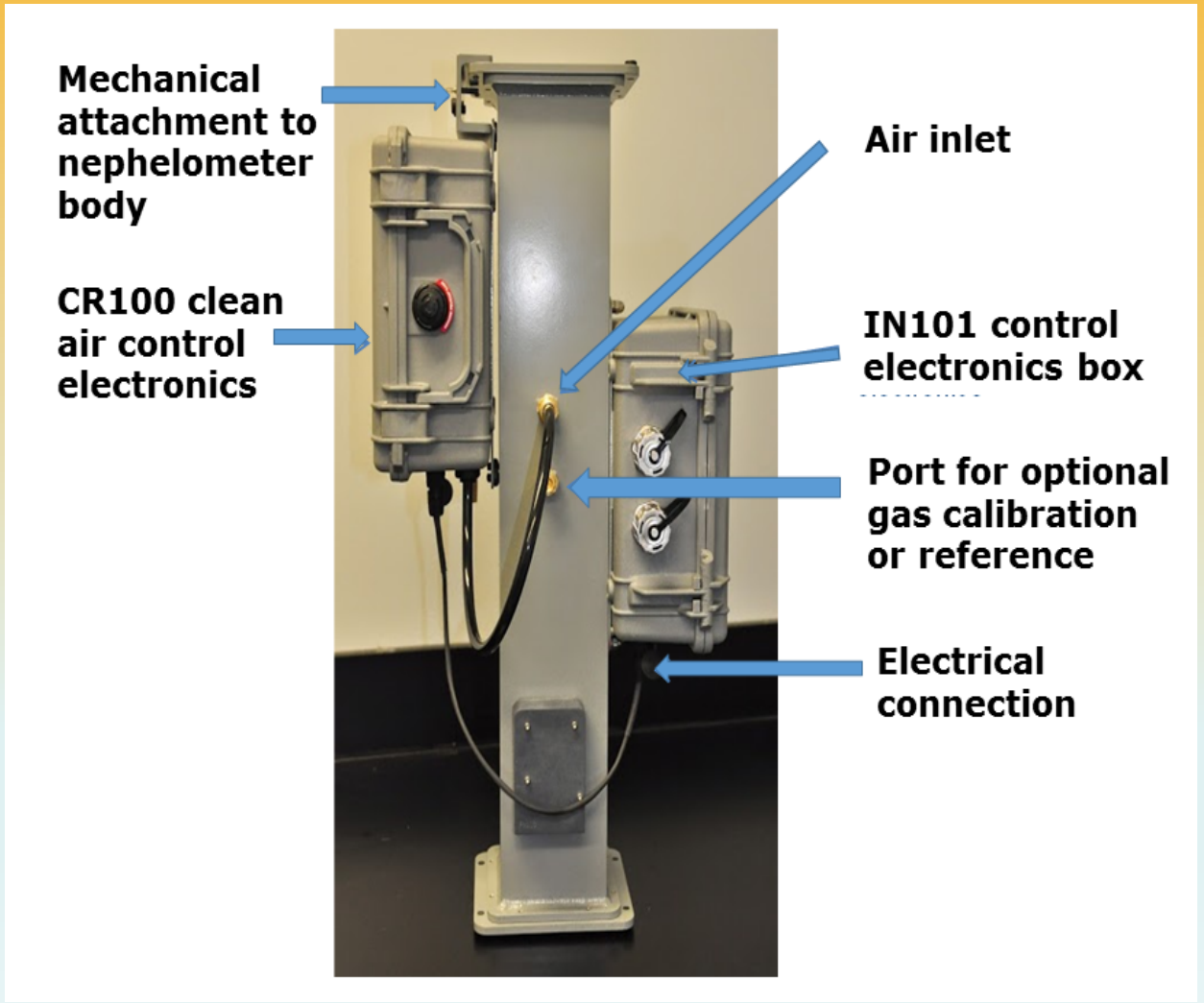
The SPARTAN network has analyzed the filters to determine chemical speciation and PM concentation



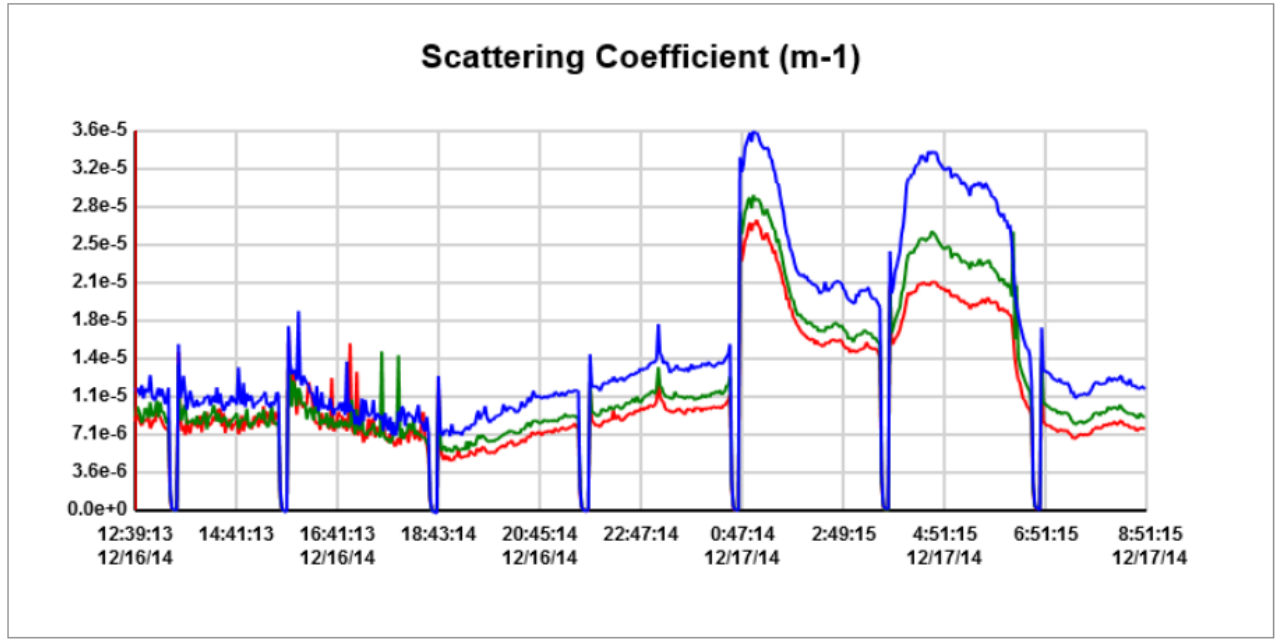
AirPhoton Nephelometers

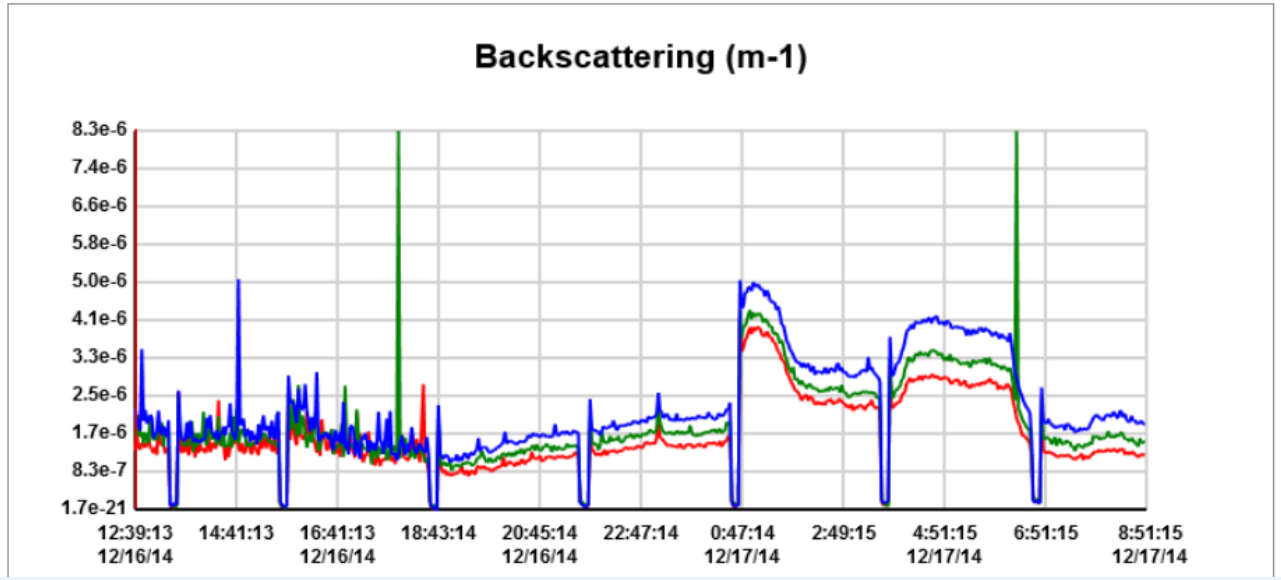
Dimensions: 9” x 10” x 24”
Mass: 6.7 Kg
Power Requirements: 15W @ 120 VAC
Wavelengths: 450, 532, and 632 nm
Angular Range: 7 to 90 degrees
90 to 170 degrees

Nephelometer with and without cyclone



AirPhoton Nephelometer Data From AGU 2014





AIRPHOTON

Use Ctrl +/- to zoom in/out.

Data File:

Browse... AGUTues.txt

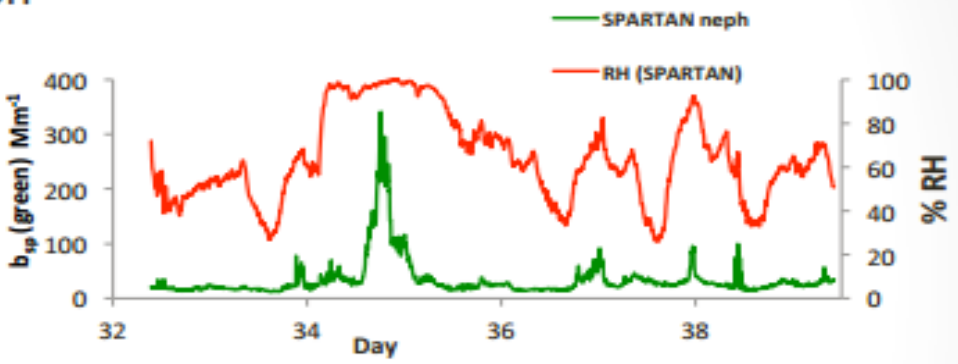
Take Reference

Save Data

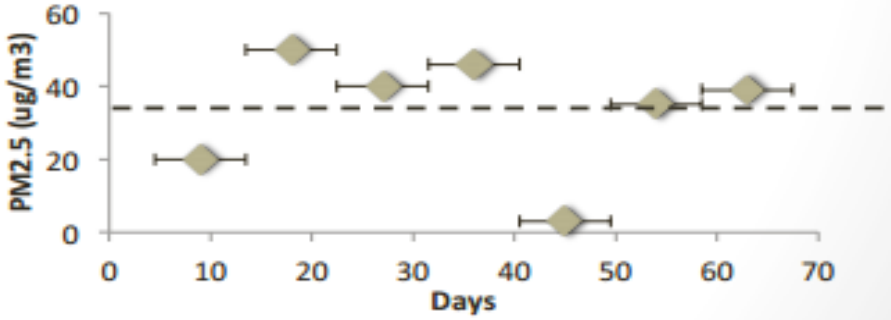
In – Situ Measurement Networks

Information collected

Nephelometer (continuous monitoring): relative changes in fine aerosol concentration



Air filters (intermittent): provides ion speciation, trace metals, and long-term **dry-mass** $PM_{2.5}$



In – Situ Measurement Networks