QUALITY ASSURANCE PROJECT PLAN (QAPjP) and QA Report for Pacific 2001

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1. **Principal Investigator**
   Dr. Michael Mozurkewich
   Centre for Atmospheric Chemistry
   York University

2. **Team Members**
   Yayne-abeba Aklilu

3. **Measurement Program**
   Measurement of Hygroscopic properties of aerosol using a Tandem Mobility Analyzer

4. **Measurement Species and Units**
   Particulate matter Units: none, reported data are in the form of ratio.

5. **Representative Size Range (if PM)**
   Particle diameter of 32, 52, 76, 96,113 and 144 nm.

6. **Measurement Platform (surface, airborne)**
   Surface

7. **Measurement Sites (surface only)**
   August 3rd -10th: Golden Ears Forest
   August 14th –September 3rd: Sumas Mountain

8. **Measurement Objective(s)**
   To investigate the hygroscopic properties of aerosol impacted anthropogenic and biogenic compounds.
   To Measure hygroscopic properties of aerosol effected by biogenic organics and measure the hygroscopic properties of aged aerosol

9. **Measurement Details**
   - The sample aerosol was dried to a relative humidity of at least 15% and a monodispersed fraction was selected using a DMA (DMA 1). This was then humidified to various relative humidities and the resulting size distribution was scanned with a second DMA (DMA 2).
   - Percent relative humidity and temperature at DMA 1 and DMA 2 are measured using Viasala Humitter 50Y sensor
   - Aerosol fraction reaching DMA 2 in the peak was determined from concentration of particles in each peak divided by the concentration exiting DMA 1.

9.1. Field Measurements

9.1.1. Measurement Principle

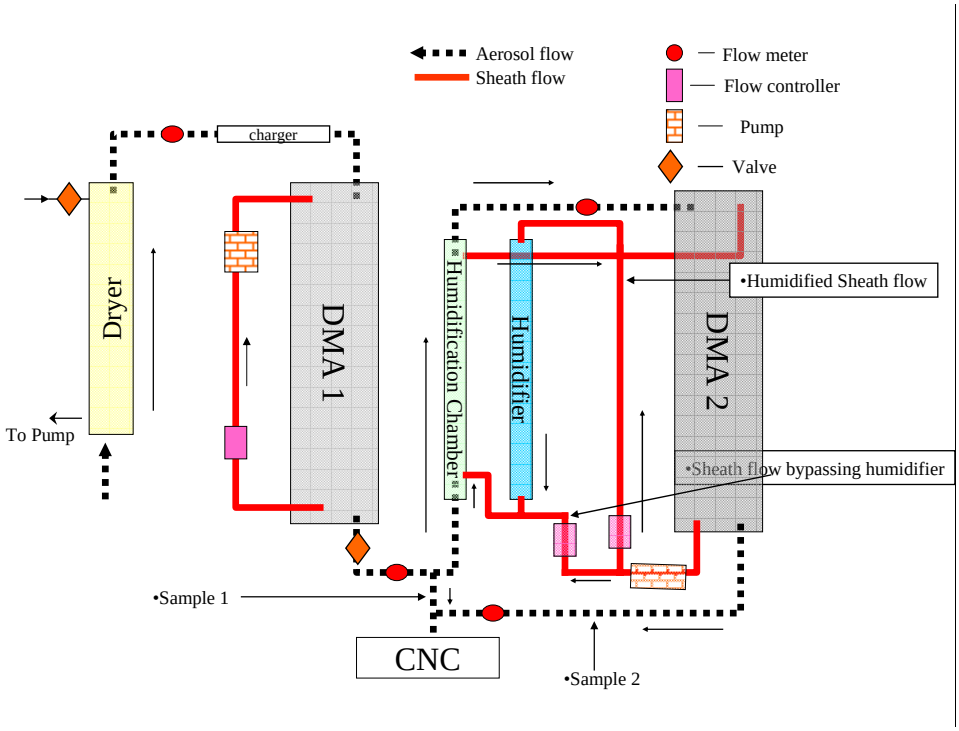
Change in aerosol diameter: TDMA

9.1.2. Instrumentation (Manufacturer/Model)

- Electrostatic Classifier DMA (TSI 3071 as DMA1 & TSI 3079 as DMA 2)
  This instrument classifies particles according to electrical mobility.
- Condensation nucleus counter CNC (TSI 7610)
  The CNC is used to count particles
- Viasala Humitter 50Y relative humidity and temperature sensor
  This instrument was used to measure percent relative humidity and temperature at the excess air outlet of DMA 1 and DMA 2.
- Mass flow controllers (MKS 1259C) and read out (MKS 247C)
  Mass flow controller is part of closed loop sheath air circulation, and is used to control the sheath air flow in the two DMAs.
- Pressure transducer (MKS 223B) and meter (MKS PDR-D-1)
  Used to monitor aerosol outlet flow of the DMA 2.
- Pressure transducer (Omega XP277) and meter (Omega DP25-E-A)
  Used to monitor sample 1 (DMA 1 to CNC) flow.
- Multi tube Nafion Dryer (Perma pure inc. model PD -625-24SS series)
  Used to dry sample before entering DMA 1
- Nafion Dryer (Perma pure inc. model MD 110 24 F)
  Used as humidification chamber, to equilibrate the relative humidity of DMA 2 sheath flow and monodispersed sample flow
- Nafion humidifier (Perma pure inc. model HM 070 24P)
  Used to humidify DMA 2 sheath flow
- Diaphram Pumps (Gast model DOA-P10A-AA and DAA-V174-EB)

9.1.3. Flow System

Air is sampled from a glass manifold inside the trailer, then directed to the instrument though ¼" stainless steal tubing. Inlet height is 4.5 m



9.1.4. Inlet Height Above Ground (if surface)

4.5m

9.1.5. Nominal Flow Rate

Aerosol flow rate to CNC 1.4 l/m
Sample 1 (DMA 1 to CNC) flow rate 0.5 l/m
Sample 2 (DMA 2 to CNC) flow rate 0.9 l/m
Sheath flow rate 10 l/m

9.1.6. Flow Measurement/Control

Aerosol flow: manual control with valves and measured pressure drop across a laminar flow element using pressure transducer or magnehilic gage.
Sheath flow: controlled using mass flow controller and monitored with meter.

9.1.7. Flow Temperature and Pressure

Ambient Temperature
DMA running in under-pressure mode, pressure slightly below ambient.

9.1.8. Sampling Times/Period/Frequency

Data was recorded for every 2 sec
Each scan was about 3.3 min long (about 100 data points for each scan)

9.1.9. Sampling Methods
Documentation of flows entered in to log book. Data stored on computer hardrive and zip disc.

9.1.10. Filter Type/Coating Type/Reagent Type
NA

9.1.11. Planned Changes to Instruments or Methods During Study
NA

9.2. Laboratory Measurements (If Applicable)
9.2.1. Laboratory Name and Address
N/A

9.2.2. Analytical Method(s)
N/A

9.2.3. Sample Extraction or Work-up
NA

9.2.4. Analytical Detection Limits
NA

10. Quality Assurance/Quality Control
10.1. Field Quality Assurance/Quality Control
10.1.1. Traceability
NA
All calibrations of flow meters were done in the laboratory shortly before the field study.

10.1.2. Zeros and spans
Checked Daily

10.1.3. Blanks
NA

10.1.4. Field Quality Control procedures
NA

10.1.5. Precision determination
NA

10.1.6. Comparison with other measurements
NA

10.1.7. Inspections and Audits
NA

10.2. Laboratory Quality Assurance/Quality Control

10.2.1. Traceability

NA

10.2.2. Calibration procedures

NA

10.2.3. Blanks

NA

10.2.4. Other lab QC

NA

10.2.5. Precision determination

NA

10.2.6. Comparison with other methods

NA

10.2.7. Audits

NA

11. Data Management and Quality Control

11.1. Raw Data Recording

Recorded using Nidaq data acquisition board and a PC. IGOR pro was used to manage the data acquisition. Data is recorded every 2 sec. Particle count and DMA 2 voltage is recorded and stored for 2 sec average. Relative humidity, temperature and flow rates and DMA 1 voltage is stored as 3.3 min average.

11.2. Final Data Reporting

Final data will be reported as 3.3 min average (period of one DMA 2 scan).

11.3. Data Quality Control and Validation

All reported data will be flagged as either Valid or Invalid.

11.4. Validity Flags

VO=Valid Value
V4= partially valid data
M1= Missing value because no data collected

11.5. Below Method Detection Limit Values

NA

11.6. Derived Parameters
NA

11.7. Explanation of Zero or Negative Data
NA

12. Data Quality Objectives (Pre-Study)

12.1. Accuracy
NA

12.2. Precision
NA

12.3. Comparability
NA

12.4. Representativeness
Particles sampled at the Golden Ears Park will be representative of biogenic particles and or aerosol transported to the site and influenced by biogenic emission. Very little anthropogenic influence is expected. Particles sampled at the Sumas Mountain site will be representative of aged aerosol with significant influence from biogenic and ammonia sources and effected by the evolution of pollutants throughout the diurnal cycle.

12.5. Completeness
Completeness Objective = 90% (excluding period of instrument or power failure)

12.6. Other Quality Information
NA

End of Pre-Study QAPjP

Start of Post-Study QA Report

13. Significant Changes to Site, Instruments or Methods During Study

14. Post-study Data Quality Indicators (DQIs)

    14.1.1. Accuracy

    14.1.2. Precision

    14.1.3. Comparability

    14.1.4. Representativeness

    14.1.5. Completeness

    14.2. Blank correction (describe whether done and method used):

    14.3. Other Quality Information

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