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

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Date: June 28, 2001 Table of Contents

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3. **Measurement Program**
   Measurements of RO_x radicals by chemical amplification

4. **Measurement Species and Units**
   $RO_x=HO_2+RO_2+OH+RO$ where R is an organic radical (e.g. CH_3)
   Units: pptv

5. **Representative Size Range (if PM)**
   N/A

6. **Measurement Platform (surface, airborne)**
   The sampling will take place 3 m above ground level on trailer

7. **Measurement Sites (surface only)**
   Langley

8. **Measurement Objective(s)**
9. **Measurement Details**
   9.1. Field Measurements
      9.1.1. Measurement Principle
      ROx radicals: chemical amplification

      9.1.2. Instrumentation (Manufacturer/Model)
      The air sample is doped with high concentrations of NO and CO so that the radicals enter a chemical amplification cycle. As a result a large number (about 150) of NO_2 molecules are produced for each radical that enters the system. This number is called the chain length or amplification factor. The amount of NO_2 produced is the measured with a luminol detector. The chain length is determined using a radical calibration source based on water photolysis. The system has been built in-house and developed at York University.

      9.1.3. Flow System
      The air sample is draw and mixed with NO and CO in a ¼" teflon FEP reactor, passed through the luminol detector and then exhausted thorough a CO to CO_2 converter for safety reasons.

9.1.4. Inlet Height Above Ground (if surface)

3 m above ground level on top of trailer

9.1.5. Nominal Flow Rate

Flow through the Luminol detector 1.6 L min^{-1}

Reagents flows: NO 16 cm^3 min^{-1}

CO 64 cm^3 min^{-1}

9.1.6. Flow Measurement/Control

Mass flow controllers are used to control the sampling flow and the flow of reagents.

9.1.7. Flow Temperature and Pressure

Ambient temperature and pressure

9.1.8. Sampling Times/Period/Frequency

1 minute values averaged to 10 minute values

9.1.9. Sampling Methods

The chemical amplifier samples continuously and the raw data is acquired and stored by a PC.

9.1.10. Filter Type/Coating Type/Reagent Type

9.1.11. Planned Changes to Instruments or Methods During Study

The chemical amplifier is adversely affected by the ambient relative humidity. Changes are under way to diminish this effect. If these changes are not successful, a correction based on ambient relative humidity will be applied to the final radical data.

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

N/A

9.2.4. Analytical Detection Limits

Reported detection limits: 2-6 pptv.

The detection limit for this instrument is determined by the variation of ambient ozone. It will be determined based on the radical data collected form 2am to 5am, when the radicalwsare not expected to be present.

10. Quality Assurance/Quality Control

10.1. Field Quality Assurance/Quality Control

10.1.1. Traceability

Flow rates will be referenced to an MSC MKS primary flow standard. The luminol detector will be calibrated against a traceble NO_2 permeation source.

10.1.2. Calibration

The luminol detector will be calibrated against a traceable NO_2 permeation source once every 3 days or each time the luminol solution will be changed.

The chain length will be determined in the field once every 3 days with the radical calibration source based on water photolysis. If the weather is not favorable for sampling (rain) additional calibrations will be performed.

10.1.3. Zeros and spans

N/A

10.1.4. Blanks

N/A

10.1.5. Field Quality Control procedures

The luminol solution for the NO_2 detector will be prepared on site; the luminol detector will be operated in the linear regime; the raw data will be examined daily to check for possible malfunctions.

10.1.6. Precision determination

10.1.7. Comparison with other measurements

Since the number of other radical detectors in use is relatively small (1 to 2 in North America and 4 to 6 in Europe), comparisons with other similar measurements are difficult because of the budget constraints. The research groups involved in radical measurements by chemical amplification participated in a laboratory intercomparison in 1997 (PRICE) and results show that this good consistency between these instrumnets.

10.1.8. Inspections and Audits

10.2. Laboratory Quality Assurance/Quality Control

10.2.1. Traceability

10.2.2. Calibration procedures

10.2.3. Blanks

10.2.4. Other lab QC

10.2.5. Precision determination

10.2.6. Comparison with other methods

10.2.7. Audits

11. Data Management and Quality Control

11.1. Raw Data Recording

The output from the luminol detector is collected with a 16 bit data acquisition board form Data Translation via Labtech. The 1-second NO_2 raw data is averaged over 1minute and, along with the chain length, is used to compute the radical concentrations.

11.2. Final Data Reporting

The final data will be reported as 10 min average.

11.3. Data Quality Control and Validation

11.4. Validity Flags

The NARSTO flags will be used for the radical data

V0 Valid value
V1 Valid value but comprised wholly or partially of below-MDL data
V2 Valid estimated value
V3 Valid interpolated value
V4 Valid value despite failing to meet some QC or statistical criteria
V5 Valid value but qualified because of possible contamination (e.g.,
pollution source, laboratory contamination source)
V6 Valid value but qualified due to non-standard sampling conditions (e.g.,
instrument malfunction, sample handling)
M1 Missing value because no value is available
M2 Missing value because invalidated by data originator
H1 Historical data that have not been assessed or validated

11.5. Below Method Detection Limit Values

Reported detection limits: 2-6 pptv.
The detection limit for this instrument is determined by the variation of ambient ozone. It will be determined based on the radical data collected form 2am to 5am, when the radical are not expected to be present.

11.6. Derived Parameters

11.7. Explanation of Zero or Negative Data

12. Data Quality Objectives (Pre-Study)

12.1. Accuracy

See section 11.1.7

12.2. Precision

See section 11.1.7

12.3. Comparability

See section 11.1.7

12.4. Representativeness

12.5. Completeness

RO_x radicals completeness objective =70%.

12.6. Other Quality Information

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

15. References: