

A Five-Year Statistical Study of AIRMoN Field Blank Samples Are We Seeing Contamination?



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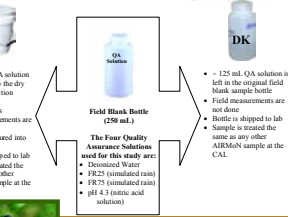
Abstract

Field blank samples are the daily wet deposition sampling sub-network of NADP with ten sites currently in the network. Sites chosen for this study were IL11 at Bondville, IL; TN00 at Oak Ridge, TN; NY67 at Ithaca, NY; and DE02 at Lewes, DE, which represent the western, southern, northern, and eastern regions of the network. A five-year time interval of the study was 1995 through 1999. Four quality assurance (QA) solutions for field blanks were investigated. The four QA solutions were DI water, two concentrations of simulated rainwater, and a pH 4.3 nitric acid solution. The sulfate, nitrate, ammonium, and hydrogen ion concentrations in the first QA solution and the nitrate, ammonium, and hydrogen ion concentrations in the fourth QA solution were compared. The absolute differences of the volumetric difference (DF) (the portion of solution poured from the bottle to the sample collection bucket) and DK (the portion of solution that remains in the sample bottle) field blank samples and the effect of time and regional differences on the results were investigated.

Field Blank Protocol

DF/DK Conditions

- No rain for at least 24 hours
- Lid open fewer than 6 times and less than an hour each time



The Four Quality Assurance Solutions used for this study are:
 • Delonized Water
 • FR25 (simulated rain)
 • FR75 (simulated rain)
 • pH 4.3 nitric acid solution

Calculations and Definitions

Control (QC) Limit Calculations

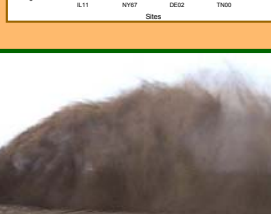
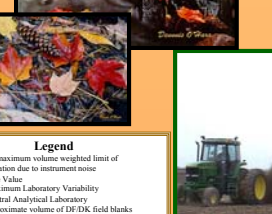
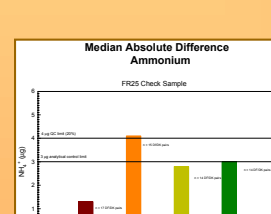
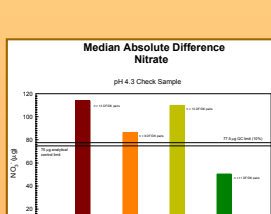
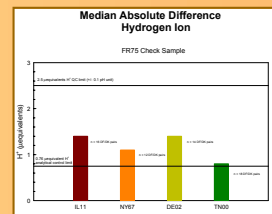
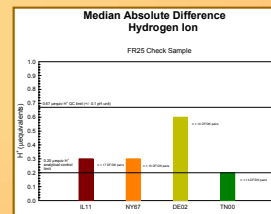
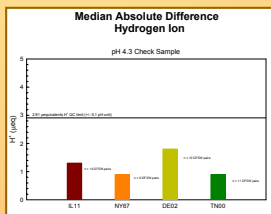
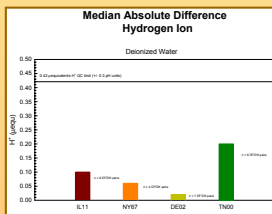
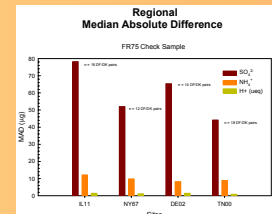
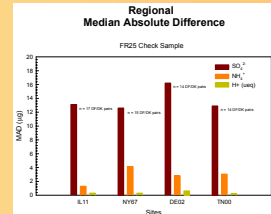
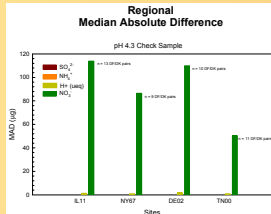
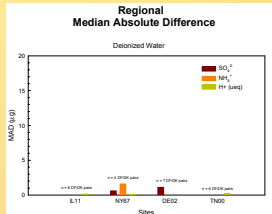
MLV = The maximum volume weighted limit of variation due to instrument noise.
 $MLV = (TV - 10\%) \times MLV$
 $MLV = (TV - 20\%) \times MLV$
 $MLV = (TV - 30\%) \times MLV$
 125 mL = approximate volume of DF-DK field blanks
 $MLV = (TV - 30\%) \times MLV \times 125 \text{ mL} = \mu\text{g}$ (QC limit)

Legal Limit Calculations

QC limit = the maximum volume weighted limit of variation due to instrument noise.
 $QC \text{ limit} = (TV - 30\%) \times MLV \times 125 \text{ mL} = \mu\text{g}$ (analytical control limit)

Legend

QC limit = the maximum volume weighted limit of variation due to instrument noise.
 TV = True Value
 MLV = Maximum Laboratory Variability
 CAL = Central Analytical Laboratory
 125 mL = approximate volume of DF-DK field blanks
 MLV = laboratory control limits
 Mean Absolute Difference (MAD) = the mean of (DF-DK)
 Mean Absolute Difference = the mean of (DF-DK)



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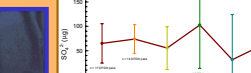
Acknowledgments: We gratefully acknowledge the AIRMoN site operators for collecting samples, Pam Bediet for secretarial support and for poster set-up, Tracie Patten for analyzing pH samples, and Nicole Samson for photography.

Regional Graphs

There were no major differences in the median absolute differences for the four sites used for this study.

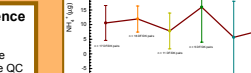
Mean Absolute Difference

Days Bucket in the Field



Mean Absolute Difference

Days Bucket in the Field



Median Absolute Difference Graphs

The H⁺, NH₄⁺, and the SO₄²⁻ were below the QC limit for most of the QC solutions. NO₃⁻ was higher than the QC limit for all sites except for TN00. The NO₃⁻ was plotted and investigated only for the 4.3 check solution.

Overall Summary

- The poster focused on the wet deposition component of hydrogen ion, ammonium, and sulfate.
- The QC limits were not exceeded for the most part by these components indicating there was little or no contamination from sample handling or bucket contamination.
- Nitrate was the exception to this and was investigated only in the 4.3 check solution. Further study could be done to see why the nitrate behaved differently.
- The DI water solution is a poor field blank solution because it showed almost no contamination and what was shown was well below the QC limits.
- Calcium, a dry deposition component, was not investigated. Perhaps it should be studied in the future to see if it shows any contamination in the sample collection buckets.

Mean Absolute Difference Graphs

For days one through three, the value falls between the bars confidence level of 99%. For days the data is inconclusive the buckets were left on the one to three days. Therefore inadequate number of buckets day three makes it difficult to whether there is any correlation between contamination and number of days the buckets are left in the field.

