

Bag Sampling with NADP NTN and AIRMoN Wet Deposition Samples

Tracy Dombek¹, Mark Rhodes¹, and Greg Wetherbee²

¹ Illinois State Water Survey, Champaign, Illinois 61820

² USGS/Branch of Quality Systems, Denver, Colorado 80225

The National Atmospheric Deposition Program's National Trends Network (NADP/NTN) and Atmospheric Integrated Research Monitoring Network (NADP/AIRMoN) began operations in 1978 and 1992, respectively. Throughout their history, both networks have collected wet-deposition precipitation samples using 3.5 gallon food grade plastic buckets. In 2011, a series of tests was conducted to assess the impact of evaporation on a sample's volume and its chemistry. Results of that testing suggest that despite efforts to clean the food grade buckets after each use, a biological component can persist. This has implications for the nitrogen species (e.g., nitrate and ammonia) present in NTN and AIRMoN samples. The presence of phosphate in the sample was found to increase both the rate and the magnitude of nitrogen loss in the samples.

Several procedural changes were tested in an attempt to eliminate the biological component from the walls of the sample buckets including both hydrogen peroxide and peracetic acid at varying concentrations, different application methods, and different contact times. These methods were found to be ineffective, impractical, or presented safety concerns for laboratory staff.

Washed buckets are packaged in cleanroom grade plastic bags for storage, and shipment to NADP sites. These bags were redesigned to line the interior of the sample bucket to prevent the sample from contacting the bucket. Bench testing was performed at the NADP Program Office in Champaign Illinois. Field testing was performed at the NADP NTN site at Bondville, Illinois and at the USGS test site in Arvada, Colorado. Sampling done at the Bondville site used the standard Aerochem Metrics (ACM) collector. Sampling done at the Arvada site used the N-CON bucket collector.

Testing was performed in pairs, to allow comparison between the standard sampling protocol using the 3.5 gallon bucket, and the bag-lined bucket. QA bucket rinse samples were processed for weeks during which no precipitation occurred to compare contamination potential for each protocol.

Preliminary results suggest similar collection efficiencies for the two sampling protocols. Concentrations for all NTN and AIRMoN analytes, pH, and conductivity are similar as well.