AN ASSESSMENT OF PERFORMANCE OF WET ATMOSPHERIC DEPOSITION SAMPLERS

PART 2. VALIDATION OF SITING CRITERIA

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Abstract. The variability in performance of 4 wet/dry atmospheric deposition samplers were compared for 1 yr. Samples were collected weekly and analyzed for pH, specific conductance, common ionic chemical constituents, and sample mass. Differences in the results between collectors were interpreted in terms of violations of siting criteria.

Several of the criteria used in siting collectors for the National Atmospheric Deposition Program/National Trends networks were purposely compromised to determine the effect of such criteria on the validity of samples collected at sites where the location of samplers violates accepted siting criteria. This study showed that items should be excluded within a 45° cone of the sampler and also items of sufficient bulk to disturb wind patterns should be excluded within 5 m of the sampler. The nonnormal distribution of residuals from a parametric analysis of variance of the data set necessitated the application of the nonparametric Friedman test to assess comparability of chemical deposition and volume between and within samplers. Statistically significant differences existed for most comparisons, however, the test does not permit quantification of their magnitudes, although general trends may be determined. Two methods to try to estimate the magnitude of differences are presented. Differences in analyte concentrations between samplers were small.

1. Introduction

Siting of samplers must be accomplished so as to satisfy the objectives of the sampling network. When samplers are sited for the purpose of obtaining representative samples of atmospheric deposition, it also is assumed that the sampler is located to be free of any local abnormalities. Many siting criteria have been applied when locations are selected for precipitation samplers. One such set of criteria was applied when the National Trends Network (NTN) was established (Robertson and Wilson, 1982). The checklist for compliance of sites with siting criteria which was used during site visits by Robertson and others (Robertson et al., 1982–1983). The criteria established by the National Atmospheric Deposition Program (NADP) (Bigelow, 1982) are essentially the same as the criteria used by the NTN. The validity of the assumed criteria needs to be examined with actual experimental data. This study attempts to answer questions of validity of three specific criteria.

Three of the samplers used in the study were located to violate three of the siting criteria of the NADP/NTN. The specific criteria which were violated were: (Robertson et al., 1982–1983)

(1) “Objects with sufficient mass to deflect the wind (with the exception of Alter windshields) over 1 meter high will not be located within 5 m of the collector.”

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(2) "No object or structure shall project onto the collector or rain gauge with an angle greater than 45° from the horizontal (30° is considered optimal, but 45° is the highest angle acceptable). Therefore the distance from the sampler to the object must be at least equal to the height of the object (preferably twice the height of the object). Pay particular attention to the anemometer towers and overhead wires."

(3) "Frequent moving sources of pollution, such as air, ground or water traffic or the medium on which they traverse (e.g. runway, taxiway, road, tracks, or navigable river) within 100 m of the collector. The local road net around the site is of particular concern."

This paper presents the analysis of the data obtained from the study. The data analysis will include a description of the application of the 2-way ANOVA of a randomized block design of data and the subsequent use of the nonparametric Friedman test to ascertain differences which exist between the samplers.

2. Methods and Materials

Description of the study site

The monitoring site is located at the Camp Buckner training area, U.S. Military