

A collector comparison for wet deposition at a coastal New Hampshire site

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Atmospheric deposition is quantified for various purposes such as quantifying nutrient budgets, determining critical loads for ecosystems, or assessing the potential for foliar damage from pollutants. These atmospheric inputs to ecosystems comprise a complex mixture of compounds originating from a variety of sources deposited via several mechanisms. Wet deposition should be the easiest of these processes to measure directly, but it can be affected by how the collector opens in response to precipitation. The National Trends Network of the National Atmospheric Deposition Program (NADP) historically collected weekly wet deposition using the Aerochem Metrics (ACM) precipitation collector. In 2010, a different collector, the N-CON Atmospheric Deposition Sampler was approved for use. One way these collectors differ is in the type of sensor that identifies precipitation. Recent research has suggested that the ACM collectors respond differently to precipitation than the N-CON. The goal of this project was to compare the chemistry of wet deposition events in the two collectors at a single site for a year. We examined several commonly measured components of precipitation (ammonium, nitrate, sulfate, and chloride) that differ in their origin and the chemical properties in the atmosphere. We also evaluated differences in dissolved organic carbon (DOC) concentrations, which have not previously been measured in other collector comparisons. Further, this coastal site is exposed to more marine influence than other previously examined sites. In general, the differences between collectors were most prominent for low precipitation events. Across all events, the concentration in the N-CON was still significantly higher for ammonium, sulfate, and nitrate, but not for chloride and DOC. Similarly, the volume weighted mean concentration was higher for the N-CON for ammonium, sulfate, and nitrate, but not for chloride or DOC. The less consistent difference between collectors for DOC and chloride may reflect the greater marine influence at this site. As collector comparisons have been done at relatively few sites, the reported differences among solutes in the magnitude of collector effects cannot be ascribed to random variation or to real site-to-site differences in atmospheric chemical and physical processes. Rather, the differences among collectors may be highlighting the difficulty in distinguishing between wet and dry deposition. Therefore, better measurements of total deposition and dry deposition would minimize the importance of variability among collector types.