

**Comparison of Total S Deposition Measurements from 10 Sites in Eastern North America:
NADP and CASTNet vs Throughfall**

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Despite decades of research, generating accurate estimates of total deposition to ecosystems in complex terrain present significant challenges. Two methods have commonly been used: measured and modeled deposition estimates from monitoring networks (MN) (e.g., NADP and CASTNet), and the measurement of throughfall flux (TF), which, for conservative ions such as sulfate, is a measure of total deposition (wet + dry + cloud) to canopies. The TF method has the advantages of 1) being inexpensive and 2) integrating deposition over complex forest canopies and/or heterogeneous terrain where model assumptions for calculating dry deposition fluxes are tenuous, at best. The MN method allows critical temporal and spatial comparisons within and among monitoring locations. Clearly both methods have value; understanding whether and how these two methods compare allows the use of either (or both) to obtain more accurate measures of atmospheric deposition, especially in complex terrain. During the summer of 2002, we collected TF and bulk precipitation at 9 CASTNet sites in the eastern US, and at the Institute of Ecosystem Studies' (IES) Environmental Monitoring Station, to compare sulfur (S) deposition. Bulk deposition (= wet plus some component of dry deposition) and NADP wet deposition showed a strong relationship ($r^2 = 0.80$). There was a strong, positive relationship between total S deposition measured via TF and MN ($r^2 = 0.75$) as well. MN nitrogen (N) and S deposition were also highly correlated ($r^2 = 0.76$), suggesting that TF can be used to estimate both total S and total N fluxes to ecosystems in these regions. However, net throughfall flux of S, which has been used as an estimate of dry deposition, and dry S deposition modeled at the CASTNet and IES sites showed poor correspondence, suggesting either that the TF method is confounded by sources or sinks of S in the canopy, or that the inferential method for estimating dry deposition is not very accurate.

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