

## Measurement of air-surface exchange of speciated nitrogen and sulfur compounds using a modified MARGA 2S: Assessment and control of data quality

Ian C. Rumsey\*, John T. Walker

Improved measurement methods are needed to characterize dry deposition of sulfur and nitrogen compounds to assess ecosystem exposure to nutrients and acidifying compounds and to develop atmospheric deposition budgets in support of critical loads assessments. The purpose of this study is to develop an integrated measurement system for speciating the dry deposition budget of nitrogen and sulfur using micrometeorological flux measurement approaches. The Monitor for AeRosols and GAses in ambient air (MARGA) is an on-line analyzer that measures gases and soluble ions in aerosols at an hourly temporal resolution. The MARGA utilizes a Wet Rotating Denuder (WRD) to collect gases, while aerosols are collected by a Steam Jet Aerosol Collector (SJAC). A modified version of the MARGA 2S was used, which employs dual sample collection boxes, to measure vertical gradients of gas phase ( $\text{NH}_3$ ,  $\text{HNO}_3$ ,  $\text{HONO}$ , and  $\text{SO}_2$ ) and particulate ( $\text{NH}_4^+$ ,  $\text{NO}_3^-$ , and  $\text{SO}_4^{2-}$ ) for the purpose of calculating air-surface exchange fluxes via the modified Bowen-ratio technique. The presentation describes the modifications to the standard MARGA 2S employed to facilitate gradient measurements and the primary aspects of data quality assessment and control as related to concentration and gradient measurements. These include the characterization and control of the stability of  $\text{NH}_x$  ( $\text{NH}_3 + \text{NH}_4^+$ ) in liquid solution, control of accuracy in both the analytical and air sampling components of the system as well as co-location experiments to characterize precision. Methods for quantifying concentration and gradient detection limits are also described within the context of quantifying flux detection limits and overall uncertainty in measured fluxes.

Office of Research and Development, U.S. Environmental Protection Agency,  
Research Triangle Park, NC 27711, U.S.A

\* Corresponding author

Email: rumsey.ian@epa.gov

Telephone: (919) 541-4746

Fax: (919) 541-7885