Seasonal variation of speciated nitrogen and sulfur fluxes above a grass field

Ian C. Rumsey*, John T. Walker

Development of robust air-surface exchange algorithms requires observational datasets that capture the full range of variability in surface conditions, meteorology, and atmospheric chemistry that drive surface-atmosphere fluxes. For development of total nitrogen and sulfur deposition budgets, simultaneous measurement of multiple species is a further requirement. New on-line measurement techniques, such as the Monitor for AeRosols and GAses in ambient air (MARGA) 2S, afford the opportunity for long-term multi-species flux measurements. The MARGA is an on-line ion chromatography system that measures water-soluble gases and aerosols at an hourly temporal resolution. Air-surface exchange fluxes of gases (NH_3, HNO_3, HONO, and SO_2) and aerosols (NH_4^+, NO_3^-, and SO_4^{2-}) were calculated by measuring concentrations at two different heights using a modified MARGA 2S and by employing the aerodynamic gradient method. The presentation summarizes the performance of the MARGA as a gradient system and describes preliminary measurements of nitrogen and sulfur compound fluxes above a grass field during 2012 and 2013 with a focus on seasonal flux variation. The air-surface exchange fluxes are also evaluated with respect to diurnal variations and the influence of meteorological conditions and surface characteristics. The uncertainty of the fluxes is determined by calculating the concentration gradient and transfer velocity precision. The relative contribution of individual nitrogen compounds to the total flux of NH_3 + HNO_3 + HONO + NH_4^+ + NO_3^- is examined with respect to seasonal variations.

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