Southeastern Section - 58th Annual Meeting (12-13 March 2009)
Paper No. 16-41

Presentation Time: 8:30 AM-12:30 PM

RELATIONSHIPS BETWEEN ATMOSPHERIC ION DEPOSITION AND DISTANCE FROM AN URBAN CENTER IN THE SOUTH CAROLINA PIEDMONT

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Atmospheric deposition can be an important source of ions to terrestrial and aquatic ecosystems. Previous studies have indicated that dry deposition fluxes in and near large cities are greater than in nearby rural areas. However, additional studies are needed to determine if urban areas in general increase rates of dry deposition to landscapes. We measured fluxes of ions in dry deposition, bulk deposition, and throughfall at various distances from downtown Greenville in northwestern South Carolina. Dry deposition was estimated by exposure of two artificial surfaces (glass petri dishes and paper filters) to the atmosphere for rain-free periods of about 2 to 4 days at 13 locations. Petri dishes were used primarily to collect dust particles, whereas filters were used to collect both dust and gases. Throughfall and bulk deposition were collected using HDPE funnels and bottles. Throughfall was collected under tulip poplar (*Liriodendron tulipifera*) canopies at 6 locations, and bulk deposition was collected at or near the 6 throughfall locations and at an additional 3 locations. Fluxes measured by filters were significantly greater than those measured by petri dishes for nitrate, ammonium, phosphate, and fluoride but not for sulfate or chloride. No fluxes measured by petri dishes were significantly correlated with distance from downtown Greenville or with percentage of forest cover within a 2 km radius of each location. Ammonium and nitrate fluxes measured by filters declined significantly with distance from Greenville. Ammonium flux also was significantly negatively correlated with percentage of forest cover within 2 km of each site. The total inorganic N flux (nitrate-N plus ammonium-N) ranged from 0.22 to 3.14 (kg N/ha/yr) and was significantly negatively correlated with distance from the city and percentage of forest cover. Base cation concentrations in dry and bulk deposition typically were below detection, precluding calculation of reliable fluxes. Net throughfall flux of chloride declined with distance from Greenville, but sulfate and nitrate did not show a trend. Overall, our results suggest that even smaller cities can influence atmospheric deposition of nitrogen and other elements, though perhaps not as strongly as larger cities. In this region, dry deposition of gases exceeds dry deposition as dust.

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General Information for this Meeting

Session No. 16--Booth# 41
Undergraduate Research (Posters)
Hilton St. Petersburg Bayfront Hotel: Grand Bay Ballroom
8:30 AM-12:30 PM, Friday, 13 March 2009

Geological Society of America *Abstracts with Programs*, Vol. 41, No. 1, p. 46