The Chemical Composition of Aerosols, Clouds, and Rainwater in a Caribbean Tropical Montane Cloud Forest

O. L. Mayol-Bracero (1), A. Gioda (1,4), R. Rivera (1,2), P. Vallejo (1,2), and J. Collett (3)

(1) Institute for Tropical Ecosystem Studies, University of Puerto Rico, San Juan, Puerto Rico (omayol@adam.uprr.pr, 001 787-772 1481), (2) Department of Chemistry, University of Puerto Rico, San Juan, PR, USA, (3) Department of Atmospheric Science, Colorado State University, Fort Collins, Co., USA, (4) Department of Chemistry, Pontífice Universidade Católica do Rio de Janeiro (PUC-Rio), Brazil

The chemical composition of aerosol, clouds, and rainwater samples collected in a Caribbean tropical montane cloud forest in Puerto Rico was studied in order to investigate the influence of air masses' origins on the concentrations of water-soluble organic, inorganic, and nitrogen species. The dominant inorganic species in aerosols, clouds, and rainwater were Na^+, Cl^-, and SO_4^{2-}. Total nitrogen (TN) and total organic carbon (TOC) represented about 2 and 4%, respectively, with TN and TOC concentrations in the organic fractions of about 1 mg/L in cloud water; and 0.4 mg/L (TOC) and 0.25 mg/L (TN) in rainwater. TOC was composed mainly of organic acids (40%), with acetic acid (3 to 18 μeq/L) being the predominant species (60% of the organic acids). TN was dominated by inorganic species (~60%). The chemical composition of aerosols, clouds, and rainwater was related to the origin of air masses. Air masses from North Africa showed a decrease in Na^+ and Cl^- and an increase in TOC, TN, Ca^{2+}, Fe^{2+} and Al^{3+}, suggesting anthropogenic and crustal origins for these species. The highest concentrations of Cl^- and SO_4^{2-} were measured when ashes from the Soufriere Hills volcano reached the site, due to the SO_2 and HCl expelled in the eruptions. Air masses from North America brought anthropogenic pollution as seen by the increase in the levels of nss-SO_4^{2-}, TOC, and TN in comparison with clean air from the North Atlantic Ocean. Differences between the chemical composition of aerosols, clouds, and rainwater as well as the influence of the different types of air masses in these matrices will be discussed.