Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10814, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10814
EGU General Assembly 2008

Water-soluble organic carbon and nitrogen in cloud and rain water in a tropical rainforest, Puerto Rico

A. Gioda (1,2), **O. Mayol-Bracero (1,2),** G. Reyes-Rodriguez (1,2), G. Santos-Figueroa (1,2), J. Collett (3), S. Decesari (4)

1. Institute for Tropical Ecosystem Studies and Department of Chemistry, University of Puerto Rico, San Juan, PR, USA, PO Box 21910, San Juan, PR 00931-1910 USA, (adriana@adam.uprr.pr /Fax 1 787 772 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) Institute of Atmospheric Science and Climate-C.N.R., Bologna, Italy

Water-soluble compounds play a central role for indirect forcing because they can act as cloud condensation nuclei (CCN). Water-soluble organic carbon (WSOC) is composed of a complex mixture of compounds such as mono and dicarboxylic acids, keto-carboxylic, and nitrogen-containing compounds (e.g., amines and amino acids). Amongst water-soluble organic compounds, organic nitrogen (ON) has received little attention. However, because of its solubility in water and its polarity, the water-soluble fraction of ON could be a strong candidate to act as CCN. ON could also influence light absorption properties, photochemical reactivity, the acid buffering capacity of fog water, and could even modify the hygroscopicity and toxicity of aerosols and fog water. Moreover, a significant portion of ON is bioavailable to aquatic microorganisms, being a significant source of fixed nitrogen for water and vegetation. Therefore, the chemical characterization of the water-soluble organic fraction (carbon and nitrogen) is essential for a better understanding of the impact of these species in indirect climate forcing.

Cloud/rain water samples were collected in a mountaintop site (East Peak, 1050 m asl) in a tropical rainforest in Puerto Rico in order to determine water-soluble organic, inorganic, and nitrogen species. Meteorological data and pH measurements

were also performed at the site. Total and dissolved organic carbon and total nitrogen (TOC/DOC/TN) were analyzed using a total organic carbon analyzer and water-soluble ions were analyzed using ion chromatography. Particles suspended in cloud water were filtered and analyzed using a scanning electron microscope with energy dispersive spectrometry (SEM/EDS) and thermal/optical analysis.

Average concentrations obtained during 8 intensive field campaigns for TOC and TN in cloud water were $\sim$1.0 mg/L and 0.8 mg/L for DOC. Rainwater concentrations were lower and ranged from 0.3 to 0.6 mg/L. Changes in concentrations were observed during periods with the influence of anthropogenic (A), African dust (AD), and volcanic ash (VA). In these periods the concentrations of TOC, DOC, and TN were 2 to 4 times higher than in the clean period. TOC was composed mainly of water-soluble organics ($>$70%). The ON contribution to total nitrogen was significant (on average 20-40%) in cloud and rain water. Periods with AD and VA influence showed lower DOC/TOC ratios, suggesting an increase of insoluble particles in these types of air masses. Thermal/optical analysis of the particles showed average total carbon concentrations of 1.5 μg/mL for cloud water, which was composed mainly of organic carbon. When air masses arrived from the African continent, there was a decrease in Na^+ and Cl^- concentrations and an increase in Al^{2+}, Fe^{2+}, and Ca^{2+} concentrations, likely suggesting a crustal origin for these species. Additional results including the concentrations of inorganic ions, ON, and amino acids, the relationship of the results to the origin of the air masses, and more detailed analyses on the sources of these chemical species will be presented at the meeting.