6.035 Influence of anthropogenic emissions on the mass concentration and composition of organic PM1 in the Amazonian wet season (GoAmazon2014/5).

Early Career Scientist

Presenting Author:
Suzane de Sá, Harvard University, suzane.s.desa@gmail.com

Co-Authors:
Brett B. Palm, University of Colorado, Boulder, CO, USA
Pedro Campuzano-Jost, University of Colorado, Boulder, CO, USA
Doug. A. Day, University of Colorado, Boulder, CO, USA
Weiwei Hu, University of Colorado, Boulder, CO, USA
Matt K. Newburn, Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, WA, USA
M. Lizabeth Alexander, Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, WA, USA
Gabriel Isaacman-VanWertz, Massachusetts Institute of Technology, MA, USA
Lindsay D. Yee, University of California, Berkeley, CA, USA
Allen H. Goldstein, University of California, Berkeley, CA, USA
Joel Brito, Universidade de Sao Paulo
Samara Carbone, Universidade de Sao Paulo
Paulo Artaxo, Universidade de Sao Paulo
Rodrigo Souza, Universidade do Estado do Amazonas, Manaus, AM, Brazil
Antonio Manzi, Instituto Nacional de Pesquisas da Amazonia, Manaus, AM, Brazil
Scot T. Martin, Harvard University

Abstract:

As part of GoAmazon2014/5, a high-resolution time-of-flight aerosol mass spectrometer (HR-ToF-AMS) was deployed to characterize the composition of fine-mode particulate matter (PM) and provide insights into the production of organic PM in the central Amazon basin, Brazil. Through a combination of meteorology, emissions, and chemistry, the T3 research site (located 70 km downwind of Manaus) was affected by biogenic emissions from the tropical rainforest that were periodically mixed with urban outflow from the Manaus metropolitan area as well as with biomass burning plumes. Results from the T3 site are presented in the context of measurements at T0a (ATTO) and T2, representing predominantly clean and polluted conditions, respectively. At T3, in the wet season (1/Feb 2014 - 31/Mar 2014) the non-refractory PM_1 mass concentration had values on order of 1 to 2 μg m^{-3}, and the organic component was dominant, contributing 79% by mass.

The analysis of the results aims at delineating the anthropogenic impact on the measurements, especially focusing on the effect of NO_x emissions on the formation of organic PM. Positive matrix factorization (PMF) analysis is applied to the time series of

mass spectra of the organic component of PM_1. The resulting factors and their loadings provide information on the relative and time-varying contributions of different sources and processes of organic PM. The time trend of the different statistical factors is investigated against co-located measurements, and compared between background and polluted conditions. Results suggest that polluted conditions are associated with higher organic mass concentrations, with some PMF factors being favored under those conditions while others are inhibited. This analysis and results represent a step toward the goal of improving the understanding of anthropogenic influences on the mass concentrations and composition of PM_1 in Amazonia.