Influence of urban pollution on the production of organic particulate matter from isoprene epoxydiol in central Amazonia


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Summary
- Measurements of atmospheric particle and gas composition were made at the T3 site, 70 km west of Manaus, in central Amazonia, from 1 Feb 2014 to 31 Mar 2014.
- Positive matrix factorization (PMF) was applied to the organic mass spectra, and six factors were resolved.
- The IEPOX-OOA factor, a surrogate for PM derived from isoprene epoxydiol (IEPOX), had generally lower loadings under polluted conditions when compared to background conditions at the T3 site.
- While sulfate can be a first-order predictor for IEPOX-OOA loadings, an important modulating role of NO on the production of IEPOX-derived PM was revealed.
- An increase in NO3 from 0.5 ppb to 1.5 ppb was associated with a decrease of two- to three-fold in IEPOX-OOA factor loadings, demonstrating the significant dependence of IEPOX chemistry on NO.
- Comparison of probability distributions for NO3 and sulfate between background sites and T3 sites suggests that Manaus city contributes more significantly to NO3 than to sulfate over background concentrations.
- The interpretation of these findings is that the suppressing effect by elevated NO in plume outweighs the enhancing effect by (moderate) additional sulfate with respect to the production of IEPOX-derived PM.
- Further analysis, looking into all PMF factors and including the use of airmass backtrajectories and other pollution indicators, is ongoing.

Source apportionment of organic PM2 during the wet season
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Chemical mechanism and pollution two-level effect
- Competing pollution effects: enhanced sulfate may lead to higher IEPOX-derived PM concentration by means of enhanced particle acidity and volume, whereas higher NO may lead to lower IEPOX-derived PM concentration by means of consumption ISOPOOH to produce MVK/MACR at the expense of epoxydiols.

The Manaus urban plume: a case study
- IEPOX-OOA: isoprene epoxydiols – derived secondary organic aerosol
- MO-OOA: more oxidized - oxygenated organic aerosol
- LO-OOA: less oxidized - oxygenated organic aerosol
- BBOA: biomass burning organic aerosol
- 9Hfac: factor with characteristic m/z 91 peak, anthropogenic correlated
- HOA: hydrocarbon-like organic aerosol

Acknowledgments
- We acknowledge support from the Atmospheric Radiation Measurement (ARM) Climate Research Facility, a user facility of the United States Department of Energy, Office of Science, sponsored by the Office of Biological and Environmental Research, and support from the Atmospheric System Research (ASR) program. Institutional support was provided by the Central Office of the Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA), the National Aeronautics and Space Administration (NASA), and Amazonas State University (UEA). Suzane de Sá thanks support from the Faculty for the Future Fellowship (Schlumberger Foundation).

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17 ARM/ASR PI Meeting