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Coupling of a thermodenuder with an aerosol mass spectrometer during the AMAZE-2008 campaign in the Brazilian Amazon

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The tropical rain forest is an important source for biogenic emissions and thus for organic aerosol precursors. Our knowledge about these emissions and the understanding of chemical reactions and pathways is by far not complete. This is especially true for the chemical composition of the organic aerosol, which in total can not be resolved using standard methods like chemical extraction and analysis of filter samples. Using these techniques one can only identify and quantify a small fraction of the total organic mass.
Recently, with new developments in online aerosol measurement techniques it has become possible to gain additional insights. One of these new methods is aerosol mass spectrometry, which can even be augmented with mathematical extraction techniques such as positive matrix factorization (PMF).
One recent method that has become very important is the use of thermodenuders together with aerosol mass spectrometers to separate aerosol components of different volatility (Huffman et al., AS&T 2008; ACPD 2009). These instruments heat the aerosol prior to the analysis in order to remove different fractions of the aerosol composition. Depending on the thermodenuder temperature this method offers the possibility to remove the total volatile fraction of the aerosol or only a part of it.
During a measurement campaign in the Amazon in February and March 2008 (AMAZE-2008) in the vicinity of Manaus, Brazil, we coupled a thermodenuder with an Aerodyne High-Resolution ToF-AMS to gain new insights into the chemical composition of the organic aerosol to be found in the Amazonian region.
We used the AMS for measuring the aerosol chemical composition, switching every 15 minutes between the thermodenuder and the ambient inlet. This setup makes it possible to compare both, the aerosol in its unchanged state and modified by the thermodenuder.
For most of the time during which the thermodenuder was coupled with the AMS, we operated the thermodenuder at a temperature of approximately 90°C. At this temperature, only the most volatile fraction of the organic aerosol was found to be removed. For most times, the inorganic, sulfate-dominated fraction was not affected at 90°C.
Here we present first results of the analysis of the AMS/TD data, which show that the organic mass fraction of the aerosol is decreased by 50%-70% when sampled through the thermodenuder at 90°C compared to measurements through the ambient sampling line.