Geophysical Research Abstracts
Vol. 14, EGU2012-10196, 2012
EGU General Assembly 2012

Tropical Greenhouse Measurements of Volatile Organic Compounds Using Switchable Reagent Ion Proton-Transfer-Reaction Time-of-Flight Mass Spectromety (PTR-TOF-MS)

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In this presentation, we will summarize the results of measurements made in an approximately 1300 m3 tropical greenhouse at the Johannes Gutenberg University botanical garden in Mainz Germany conducted over a one month period. The greenhouse is home to a large variety of plant species from hot and humid regions of the world. The greenhouse is also host to several crops such as Cocoa and Cola Nut as well as ornamental plants. A particular focus of the species maintained are those which are considered ant plants, or plants which have an intimate relationship with ants in tropical habitats. Volatile organic compounds (VOCs) were measured using a Switchable Reagent Ion Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer (PTR-TOF-MS) using H3O+, NO+, and O_2+ ion chemistry. Measurements will be presented both for primary emissions observed in the closed greenhouse atmosphere as well as the oxidation products observed after the introduction of ambient ozone. The high resolving power (5000 m/Δm) of the time-of-flight instrument allows for the separation of isobaric species. In particular, both isoprene (68.1170 amu) and furan (68.0740 amu) were observed and separated as primary emissions during this study. The significance of this will be discussed in terms of both atmospheric implications as well as with respect to previous measurements of isoprene obtained using quadrupole PTR-MS where isobaric separation of these compounds is not possible. Additionally observed species (e.g. Methanol, Acetaldehyde, MVK and MEK) will be discussed in detail with respect to their behavior as a function of light, temperature and relative humidity. The overall instrument performance of the PTR-TOF-MS technique using the H3O+, NO+, and O_2+ primary ions for the measurement of VOCs will be evaluated.