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Stress-induced emissions of biogenic VOCs: The effects of ozone exposure on tobacco plants

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Volatile organic compound (VOC) emissions by vegetation play a central role in atmospheric chemistry. Biogenic VOC emissions commonly depend on light and temperature, but additionally respond to stress conditions (e.g. ozone, pathogen attack, water and temperature stresses, and leaf wounding). Understanding these stress effects on plants is especially important for the farming industry to minimise costly crop damage. In order to investigate stress-induced emissions, tobacco plants (*Nicotiana tabaccum*, var. Bel W3; known to be particularly ozone sensitive) were exposed to ozone for varying durations, over a range of concentrations, and with different light regimes. Emission patterns were measured on-line with a proton-transfer-reaction mass spectrometer (PTR-MS) allowing the dynamics of the plants' responses to ozone stress to be studied. GC-MS measurements aided compound identification.

VOC emissions induced by ozone exposure included methanol, C6- alcohols and aldehydes (from lipoxygenase (LOX) activity), methyl salicylate and sesquiterpenes. Results show quantitative linear temporal responses of plants to ozone stress that are dependent upon the amount of stress encountered (induction rate vs. ozone flux density). Furthermore, it was determined that the flux density of ozone taken up by the plant, rather than ozone concentration or AOT40 values, was a much more accurate reference for the plants' responses to ozone stress. An absolute response of the plants was also found, with five ozone molecules taken up leading to approximately one LOX-product VOC emitted.

Measurement technique and experimental results will be presented.