

### **3.076 Measurements of total ozone reactivity and what they tell us about biogenic organic compounds in the troposphere.**

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Abstract:

Biogenic volatile organic compounds (BVOC) are emitted through plant metabolism and account for a large fraction of the organic carbon loading in the atmosphere. Only a small fraction of the total atmospheric loading and potential species of BVOC have been identified and measured, but they are known to influence several atmospheric chemical processes. Of particular interest are the reactions of BVOC with ozone (O<sub>3</sub>) which lead to the formation of secondary organic aerosol (SOA) and are significant sources of oxidant radicals, especially at night. These reactions can also represent a significant sink for tropospheric ozone.

Total ozone reactivity is a measure of ozone chemical loss rate that does not require prior knowledge of the detailed chemical composition of the BVOC pool. We report measurements of total ozone reactivity (TOR) made using a newly developed instrument designed to measure the decay of a known quantity of ozone caused by the presence of unsaturated hydrocarbons, such as BVOC. The instrument was extensively tested in the laboratory using nitric oxide (NO) and selected BVOC (isoprene,  $\alpha$ -pinene). Together with a proton-transfer-reaction mass spectrometer, the TOR instrument was then used to study BVOC+O<sub>3</sub> chemistry in a chamber with lemonthyme plants (*Thymus citriodorus*) and in a tree branch enclosure. The results of these experiments demonstrate the validity of this approach and provide new insight into the importance of BVOC/O<sub>3</sub> interactions for the Earth's carbon budget and for the tropospheric ozone cycle.