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Abiotic formation of volatile organic compounds from plant biomass and its dependence on temperature and UV radiation

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The emissions of volatile organic compounds (VOCs) from living vegetation are measured for many different plant species. However, almost no research has been performed on the VOC emissions from plant litter and senescent leaves. The few studies that are done on plant litter indicate that the VOC emissions from this material can be significant for atmospheric chemistry and the global budgets of those VOCs.

Recently, research showed that methane is emitted from dead and senescent leaves, and that the emission rates are influenced by temperature and ultraviolet (UV) radiation. It is also observed that not only methane, but also ethane and ethylene were emitted from leaf material under the influence of UV radiation.

In this study, the emissions of ethane, ethylene, acetylene, propane, propylene, i-butane, n-butane and methyl chloride are measured with a gas chromatograph with a flame ionization detector. The effect of temperature and UV radiation on the emission rates of the different VOCs is measured for leaves of several plant species. The emission rates of ethane, ethylene, propane, propylene, and methylchloride increased exponentially with increasing temperature for all measured plant species, while a linear increase of the emission rates was observed for increasing intensity of the UV radiation. Emissions of acetylene, i-butane, and n-butane were not observed.