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# Dependence of litter VOC emissions on moisture, temperature and carbon availability: experiments and model development

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Significant amounts of biogenic volatile organic compounds (BVOCs) can be released during decomposition of litter on soils. These VOCs can form secondary organic aerosols in the atmosphere and they also can affect the nitrogen cycle and other processes in soil. Major controls over VOC emissions are environmental variables, (moisture and temperature) and carbon availability, but these have not been examined in detail. The goal of this work is to construct a model based on observations for the correlation of VOC emissions from pine needle litter with moisture, temperature and carbon availability in litter.

Pine needle litter was collected from a Ponderosa pine plantation on the Manitou Experimental Forest (Colorado, US). Emissions of VOCs from litter were measured under controlled moisture and temperature conditions. A closed flow-through system and proton transfer reaction mass spectrometry (PTR-MS) were used to measure VOC emission and to calculate rates. Non-lignin carbon (cellulose and pectin) in litter (likely to be the dominant sources of the most abundant VOCs emissions) was estimated from mass loss after heating litter at 200 °C for 24 hour.

The most abundant VOCs emitted by pine litter are methanol, acetone, acetaldehyde, acetic acid. Monoterpenes and sesquiterpenes are also characteristic from pine needle litter, though they are emitted in lower amounts. A model correlating VOC emissions from pine needle litter with moisture, temperature and carbon availability in litter is presented as a result of the laboratory studies.