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Hydrocarbon fluxes above a Scots pine forest canopy: measurements and modeling

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Abstract. We measured the fluxes of several hydrocarbon species above a Scots pine (*Pinus sylvestris*) stand using disjunct eddy covariance technique with proton transfer reaction – mass spectrometry. The measurements were conducted during four days in July at SMEAR II research station in Hyytiälä, Finland. Compounds which showed significant emission fluxes were methanol, acetaldehyde, acetone, and monoterpenes. A stochastic Lagrangian transport model with simple chemical degradation was applied to assess the sensitivity of the above canopy fluxes to chemistry. According to the model, the chemical degradation had a minor effect on the fluxes measured in this study but may have a major effect on the vertical flux profiles of more reactive compounds, such as sesquiterpenes. The monoterpene fluxes derived using M81 and M137 had a systematic difference with the latter one being higher. These fluxes followed the traditional exponential temperature dependent emission algorithm but were considerably higher than the fluxes measured before at the same site. The normalized monoterpene emission potentials at 30°C, obtained using the temperature dependence coefficient of 0.09°C⁻¹, were 2.0 µg g_{dw}⁻¹ h⁻¹ and 2.5 µg g_{dw}⁻¹ h⁻¹, for fluxes derived using M81 and M137.

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