



Strong sesquiterpene emissions from a downy birch in a boreal forest

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There are lots of studies on biogenic volatile organic compound (BVOC) emissions of the main coniferous trees in boreal forests, but the data on deciduous trees is more limited. Here we have studied downy birch (*Betula pubescens*) emissions of terpenes, oxygenated VOCs (OVOCs) and green leaf volatiles (GLVs) in a boreal forest at SMEAR II (Station for Measuring Forest Ecosystem–Atmosphere Relations; 61°51'N, 24°18'E; 181 m a.s.l.) in Hyytiälä, southern Finland, using in situ gas chromatographs coupled with mass spectrometers (GC-MSs).

Sesquiterpenes were clearly the dominating VOC group at the beginning of the growing season, but in July and August GLVs had the highest contribution. Monthly mean MT and SQT emissions were 3 – 62 and 5 – 298 ng g_{dw}⁻¹ h⁻¹, respectively. Isoprene emissions were very low (monthly means < 0.3 ng g_{dw}⁻¹ h⁻¹). High emissions of GLVs were detected when leaf damages occurred, leading to monthly means of GLV between 0.5 – 475 ng g_{dw}⁻¹ h⁻¹.

Emissions were highly varying over the growing season. Of the SQTs, β -caryophyllene had the highest contribution, when the leaves were growing, but its emission and emission potential decreased over the growing season. For fully grown leaves from June to August α -farnesene was the most emitted compound. Temperature was the significant factor controlling the emissions of several compounds. Especially β -caryophyllene emissions were highly correlated with temperature ($R^2 > 0.80$). However, the variation of the other significant SQT, α -farnesene, was not explained by the temperature, especially in June and August. Results indicate that downy birch can be a significant contributor for the relatively high SQT concentrations found in the boreal forest air (Hellén et al., 2018).

Hellén, H., Praplan, A. P., Tykkä, T., Ylivinkka, I., Vakkari, V., Bäck, J., Petäjä, T., Kulmala, M., and Hakola, H.: Long-term measurements of volatile organic compounds highlight the importance of sesquiterpenes for the atmospheric chemistry of a boreal forest, *Atmos. Chem. Phys.*, 18, 13839-13863, doi:10.5194/acp-18-13839-2018, 2018.