

Tropospheric ozone fluxes in Norway spruce forest during the transition period from autumn to winter

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Norway spruce exhibits seasonal variations in stomatal conductance and photosynthetic activity typical for overwintering plants, with a decline during autumn and a complete recovery during spring. We investigated ozone fluxes during this transient period (November 2016). Fluxes of tropospheric ozone, the major phytotoxic near-ground pollutant causing injuries to plant tissues, were measured at Bily Kriz experimental station in Beskydy Mountains, the Czech Republic. Dry chemiluminescence fast-response ozone sensor coupled with sonic anemometer was used to measure fast fluctuations in ozone concentration and three-dimensional wind speed, respectively. Apart from this eddy covariance technique, within-canopy ozone concentration gradient was simultaneously measured by UV-absorption based slow-response ozone analysers. Ozone fluxes were subsequently modelled by an Inverse Lagrangian Transport Model (ILTM). A comparison of measured and calculated fluxes is thus available.

Moreover, stomatal ozone flux was calculated based on Evaporative/Resistive method assuming stomata are the most relevant sink in the spruce forest. The low NO_x concentration throughout the year and low concentrations of volatile organic compounds (VOCs) during the transition period led to hypothesize that non-stomatal flux here estimated by difference between total ozone flux and stomatal ozone flux is represented mainly by dry soil deposition and wet deposition during the snow period.

We discuss here the ILTM parameterisation with comparison to measured ozone fluxes. Correct estimation of stomatal ozone flux is essential, especially in transition periods, where main scientific emphasis is put rarely. In addition, this research should help to develop metrics for ozone-risk assessment and advance our knowledge in biosphere-atmosphere exchange over Norway spruce forest.

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