



Cut and growth related VOC emissions from temperate grassland

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Although, grasslands cover one quarter of the earth's land surface, only few studies investigated the VOC emissions of these ecosystems. They mainly concentrated on harvest events. In the present study, VOC fluxes were measured continuously above two grassland fields of different plant composition in central Switzerland during several months in summer 2004 and 2005. The measurements covered growing phases as well as cut and hay drying events. VOC were detected by proton-transfer-reaction mass-spectrometry (PTR-MS) and fluxes were determined by the eddy covariance method. For additional information on the VOC identification, a combined GC-FID-PTR-MS technique was applied.

The highest fluxes were measured directly after cuts, which can be explained by amplified emissions due to plant wounding. Beside methanol, acetaldehyde, acetone and butanone, also significant amounts of hexenal, hexenol, and hexenyl acetates were emitted, but they declined much faster on the following days. By putting single cut plants into a closed chamber, it was found that legume plants and forbs tend to emit a higher number of different VOC species than graminoids. Both study fields also showed continuous daytime emissions during the growing periods that were strongly dominated by methanol. The observed methanol emission showed a distinct diurnal cycle and was strongly correlated with global radiation and water vapour flux. Mean and maximum daily emissions were found to depend on grassland species composition and, for the intensive field, also on the growing state. The field with the larger proportion of legume species had higher emissions than the graminoid-dominated field. On a carbon mass basis, the cut related VOC emissions were in the order of 0.01%-0.05% of the harvest biomass, while the growth related emissions were usually several times higher, up to 0.15%.