

# Grassland: Not only a source for VOCs

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## Background

Biogenic volatile organic compounds (BVOCs) are known to be involved in the production of ozone and the formation of secondary organic aerosols and thus play a key role in atmospheric chemistry. There are still important gaps in the detailed understanding of sources and sinks of BVOCs that pose a challenge for accurate climate modelling and the prediction of reactive carbon budgets.

One main goal of these flux measurements in Neustift was to quantify BVOCs which are emitted from or deposited to the grassland in response to natural processes over a whole vegetation period.

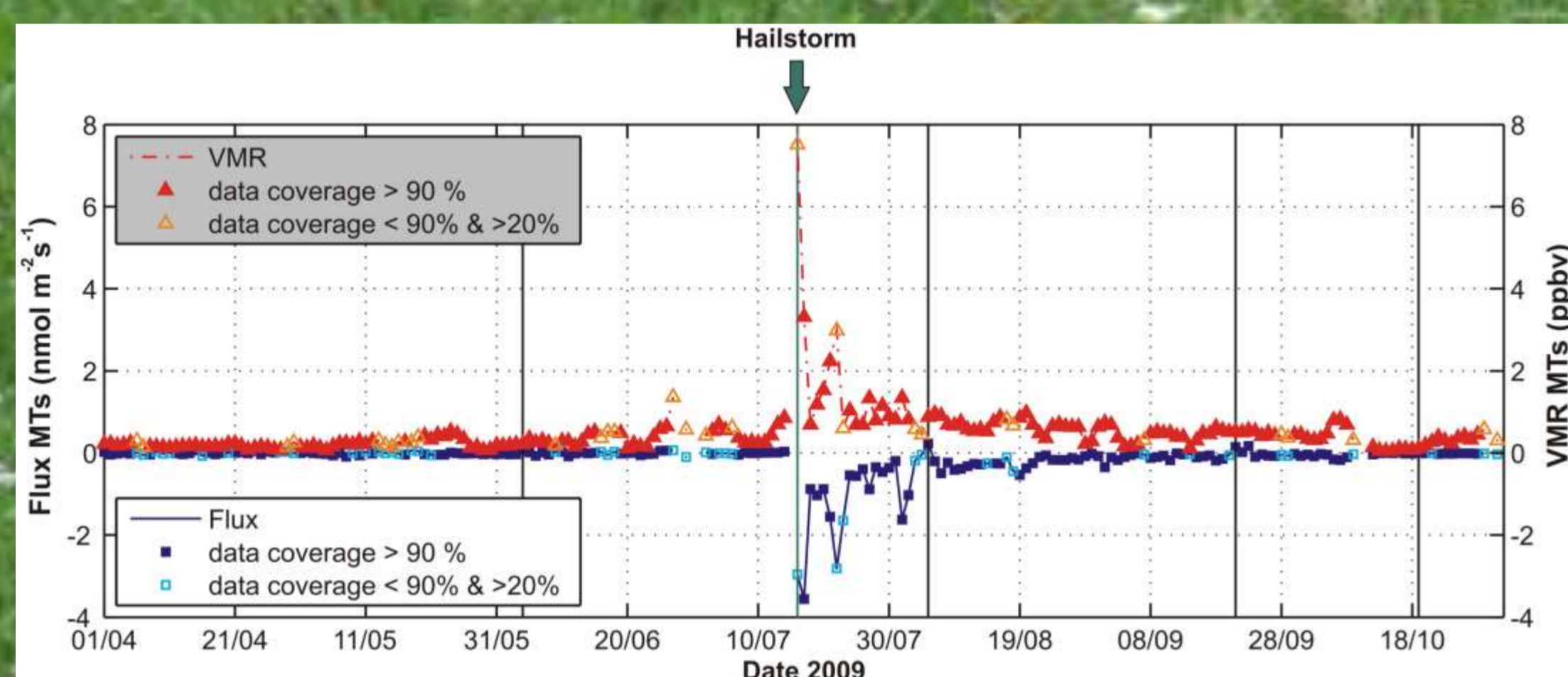
## Experimental

Flux measurements of VOCs were performed above meadow located at a flat valley bottom at an altitude of 970 m above sea level nearby the village Neustift (47°07' N, 11°19' E) in Stubai valley, Austria.

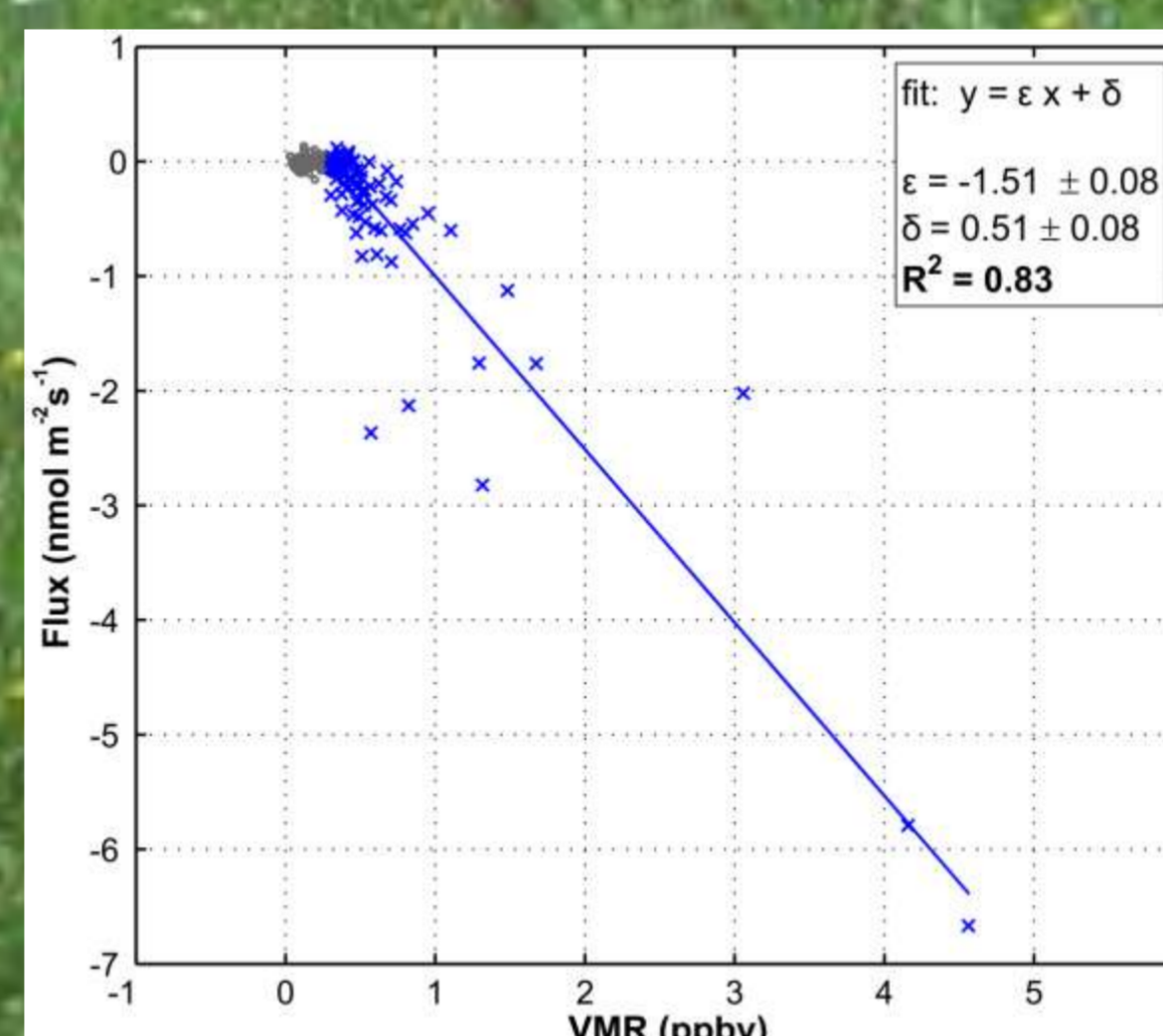


## Results [1]

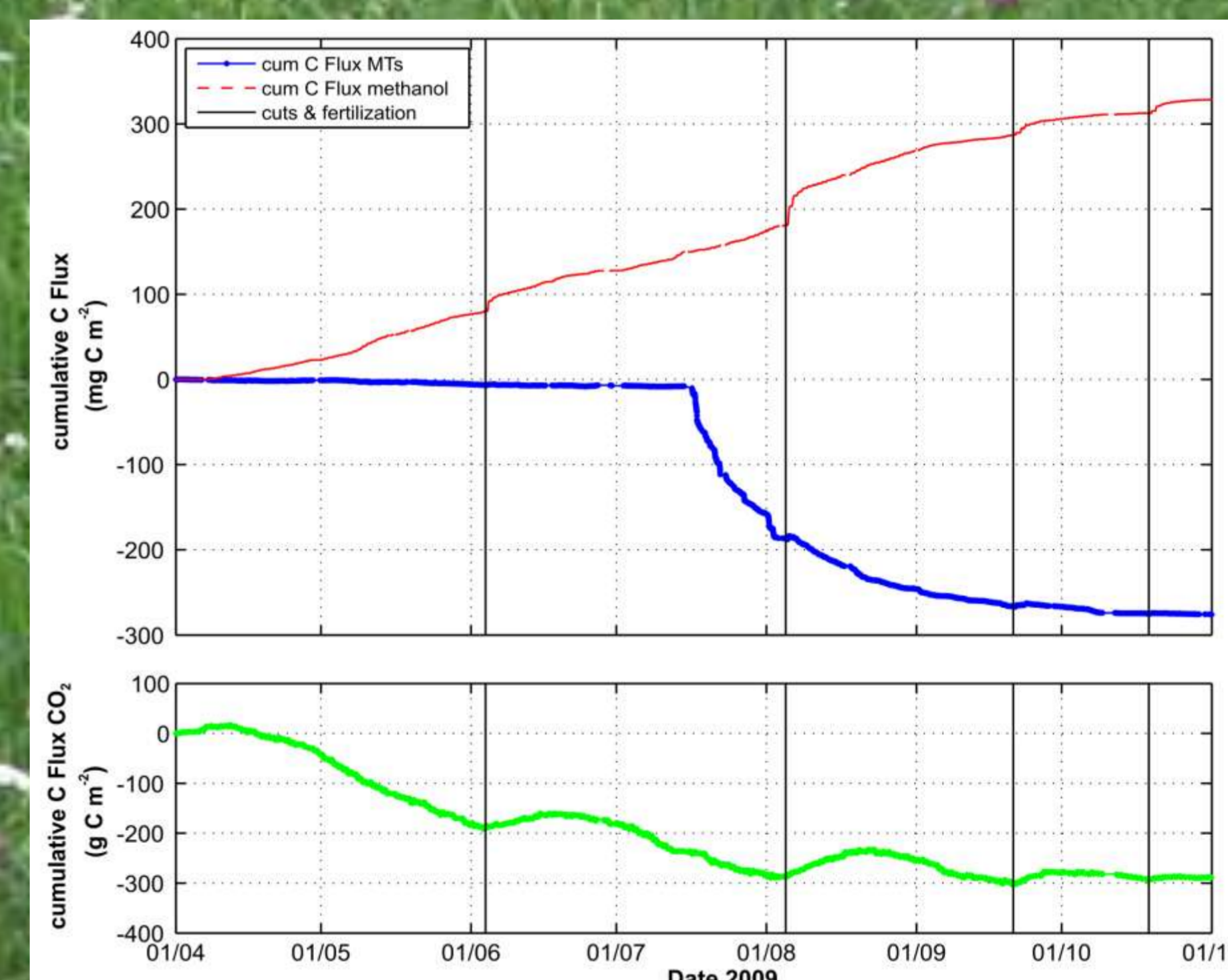
In consequence to a hailstorm in July 2009 (which damaged needles and twigs of coniferous trees at the neighbored mountain slopes) ambient concentrations of monoterpenes within the valley were enhanced and deposition fluxes of monoterpenes were observed for several weeks until return to undisturbed conditions.



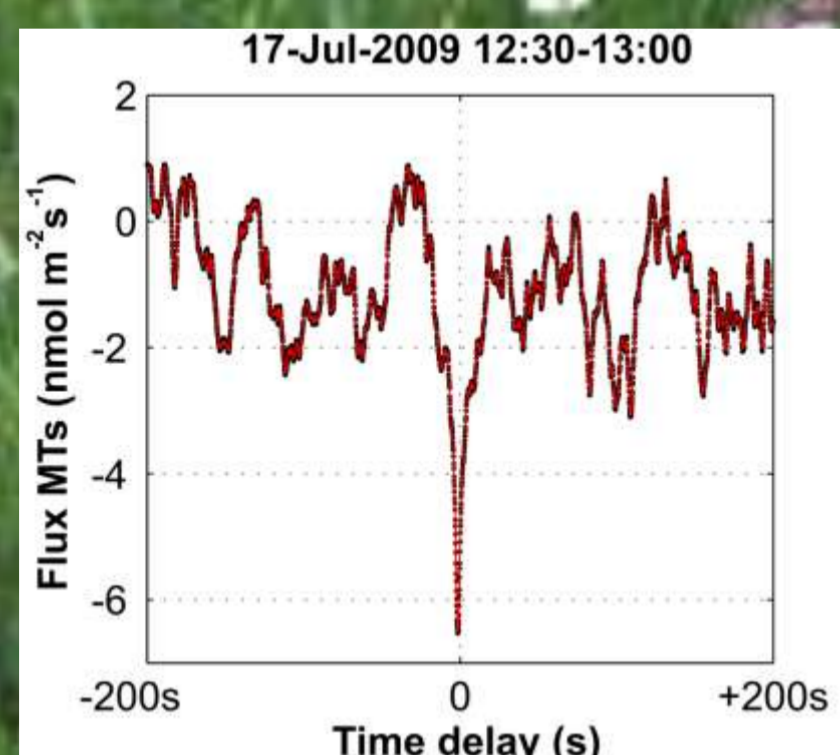
Daily (24h) averages of monoterpene VMRs and fluxes measured above the grassland 2009.



Scatter plot for monoterpene fluxes versus VMRs. A linear relationship ( $R^2=0.83$ ) for data pairs with VMRs  $> 0.3$  ppbv is observed. The corresponding deposition velocity is  $4 \text{ cm s}^{-1}$ .



Cumulative carbon fluxes for methanol and the monoterpenes and  $\text{CO}_2$  from April 1<sup>st</sup> to October 1<sup>st</sup> 2009.



Sample half hour with a clearly visible covariance minimum.

## Conclusions

Contrary to the widely held belief that deposition processes of non-oxygenated compounds are negligible we observed substantial monoterpene and sesquiterpene uptake by mountain grassland.

Our findings indicate that dry deposition of non-oxygenated compounds was underestimated so far. Karl et al. (2010) published corresponding results for oxygenated compounds [2].

Does bi-directional VOC exchange occur for many more, if not all, compounds?

[1] I. Bamberger, L. Hörtnagl, T. M. Ruuskanen, R. Schnitzhofer, M. Müller, M. Graus, T. Karl, G. Wohlfahrt, and A. Hansel, Deposition Fluxes of Terpenes over Grassland, *J Geophys. Res.-Atmos.*, 116, D14305, doi:10.1029/2010JD015457, 2011.

[2] T. Karl, P. Harley, L. Emmons, B. Thornton, A. Guenther, C. Basu, A. Turnipseed, and K. Jardine, Efficient atmospheric cleansing of oxidized organic trace gases by vegetation., *Science*, 330(6005), 816-819, 2010.