



Comparison of three methods to derive canopy-scale flux measurements above a mixed oak and hornbeam forest in Northern Italy

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Plants emit a wide range of Biogenic Volatile Organic Compounds (BVOCs) into the atmosphere. These BVOCs are a major source of reactive carbon into the troposphere and play an important role in atmospheric chemistry by, for example, acting as an OH sink and contributing to the formation of secondary organic aerosol. While the emission rates of some of these compounds are relatively well understood, large uncertainties are still associated with the emission estimates of many compounds.

Here the fluxes and mixing ratios of BVOCs recorded during June/July 2012 over the Bosco Fontana forest reserve in northern Italy are reported and discussed, together with a comparison of three methods of flux calculation. This work was carried out as a part of the EC FP7 project ECLAIRE (Effects of Climate Change on Air Pollution and Response Strategies for European Ecosystems).

The Bosco Fontana reserve is a semi natural deciduous forest dominated by *Carpinus betulus* (hornbeam), *Quercus robur* (pedunculate oak) and *Quercus rubra* (northern red oak). Virtual disjunct eddy covariance measurements made using Proton Transfer Reaction-Mass Spectrometry (PTR-MS) and Proton Transfer Reaction-Time of Flight-Mass Spectrometry (PTR-ToF-MS) were used to calculate fluxes and mixing ratios of BVOCs above the forest canopy at Bosco Fontana.

BVOC mixing ratios were dominated by methanol with acetaldehyde, acetone, acetic acid, isoprene, the sum of methyl vinyl ketone and methacrolein, methyl ethyl ketone and monoterpenes also recorded. A large flux of isoprene was observed as well as significant fluxes of monoterpenes, methanol, acetaldehyde and methyl vinyl ketone / methacrolein.

The fluxes recorded using the PTR-MS and PTR-ToF-MS showed good agreement. Comparison of the isoprene fluxes calculated using these instruments also agreed well with fluxes modelled using the MEGAN algorithms (Guenther et al. 2006). The detailed tree distribution maps for the forest at Bosco Fontana compiled by Dalponte et al. 2007 enable the estimation of flux from leaf level emissions data. This 'bottom up' estimate will be compared with the fluxes recorded using PTR-MS and PTR-ToF-MS.

References

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