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Measuring the exchange of total volatile organic carbon from European beech

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Most of the organic carbon that is present in the atmosphere is found in form of volatile and semivolatile organic compounds. Since vegetation represents the dominant source of volatile organics in the atmosphere it also represents a dominant source of atmospheric organic carbon. One of the major limitations in advancing the understanding of tropospheric ozone and aerosol generation is the technical ability to accurately measure these volatile organics. Within this context, a great variety of analytical techniques enabling the measurement of some specified organics has been developed in the past. However, the integration of these single compound measurements to the sum of organic carbon will only represent a lower limit of atmospheric carbon concentrations, since none of these methods is able to analyse all organic compounds that are present in the atmosphere. Consequently only few studies reported on the measurement of total NMOC concentrations in ambient air. Studies considering the exchange of total carbon between vegetation and the atmosphere are absent. Here, we describe the experimental setup of a total NMOC analyser adapted for the performance of plant enclosure measurements to investigate the exchange of total NMOC between plants and the atmosphere. The instrument was tested under laboratory conditions and was evaluated versus an independent analytical technique performing branch enclosure measurements on European beech. The detection limit of the instrument was 0.5 ng carbon and the error of reproducibility accounted to 0.5%. Oxidation efficiencies of different volatiles ranged between 91 and 101%. However, recovery rates of several NMOC compounds need to be improved and represent the strongest source of uncertainty. Intercomparison of diel courses of the NMOC exchange of European beech measured

by means of enclosures showed a perfect agreement between the total NMOC analyser and a GC-FID approach as an independent method.