



Composition and seasonal variation of monoterpene emissions from European beech (*Fagus sylvatica* L.)

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The source strength of the emissions of volatile organic compounds (VOC) from vegetation is of great interest for understanding the processes in atmospheric chemistry and the changing climate conditions on earth. In our study we investigated the terpene emissions of European beech (*Fagus sylvatica* L.) in a deciduous forest. In previous studies beech was characterised as monoterpene low- or non-emitter. Our results show that European beech emits significant amounts of monoterpenes, especially sabinene. Applying the branch enclosure technique changes in the emission pattern and the variation of emission rates over the year were investigated over two following vegetation periods. For most compounds the emission pattern changed only slightly over the year. Interestingly, two compounds, tentatively identified as para-cymene and cis-ocimene, showed differences in the emission behaviour in late summer compared to the other monoterpenes. For the main compounds the emission rates changed up to two orders of magnitude as a function of temperature and light over the day. Highest emission rates were observed in summer and lowest in fall. However, no emissions were found in early spring although leaves were fully developed and temperature and light conditions were comparable to the conditions in fall. Moreover, a temperature independent decline of emissions in late summer characterizing a seasonality of terpene emissions was found resulting in changes of the standard emission rate on the order of one magnitude. These results underline the importance to characterize the annual variation of the emission behaviour. Especially for an up-scaling to global VOC emissions, seasonal influences have to be considered to achieve realistic emission inventories.