



Sesquiterpenes at a Boreal Forest Site: Emission and ambient Concentration

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Emissions of biogenic volatile organic compounds (VOCs) are known for various compounds. Among the reactive ones, reasonable knowledge has been gathered for isoprene and monoterpenes but not for the very reactive sesquiterpenes. These have an important defensive character for the vegetation with respect to herbivores and ozone protection. In this study is focused on a boreal forest site in Southern Finland, for which we use air ion derived ambient sesquiterpene concentrations at a height of 2 m (measurement cottage). Next we apply Lagrangian trajectory calculations to obtain the emission of sesquiterpenes at needle level. Assuming a needle mass dependency an annual emission behavior is obtained and intercompared with monoterpene emissions. This results in an annually averaged sesquiterpene emission strength of about 10% as high as the monoterpene one. An increase can be seen during cooler periods and a decrease during the middle of the summer. This fact can be explained by a second observation: a linear correlation of sap flows of a reference tree close by and the emissions obtained. The correlation factor agrees well with the estimated water solubility of sesquiterpenes. This indicates that sesquiterpenes are transported from a significant storage pool by water flow to the needles, where emission takes place normally. Other parameters such as temperature correlated well only during summertime. From these

results we conclude that sesquiterpene emissions may originate from two sources, a long term storage pool and an online production, with the latter in a very similar way as the monoterpenes. When splitting the emission in these two terms the same temperature dependency can be found for sesquiterpenes as for the monoterpenes but with smaller intensity.