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Measurements of exchange of reactive trace gases between atmosphere and Scots pine shoots

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Continuous measurements of emission of monoterpene and carbon dioxide exchange, transpiration, exchange of nitrogen oxides and ozone, photosynthetic photon flux density, air temperature and humidity were performed on shoots of Scots pine (*Pinus sylvestris* L.) and European aspen (*Populus tremula* L.). The monoterpene emission measurements were conducted using a proton transfer reaction mass spectrometer.

Emitted monoterpenes consist of a wide range of different $C_{10}H_{16}$ substances that are secondary products emitted by a wide range of plants. The monoterpenes emitted by the Scots pine measured were mostly Δ^3-carene, with less than 10 percent α-pinene and some 10 percent of other monoterpenes, which was confirmed by simultaneous adsorbent tube measurements from the same trees.

In a timescale of few days, temperature was the best explanatory variable for the monoterpene emissions. However, it seems that the highest emissions do not coincide with the highest temperatures, as expected. This might be due to some change in emission method during the measurement period. The measurements were done at the beginning of fall, between 25th August and 22nd September, 2004, when the trees start to prepare for winter conditions. The carbon dioxide exchange of the shoots declined slightly towards the end of the measuring period indicating a corresponding decline of biological activity in general, attributable to the beginning of the winter hardening period. Monoterpene emissions, on the other hand, did not exhibit the same declining behavior. In autumn pine undergoes major changes in their metabolism. Pho-

tosynthetic capacity starts to decline and frost tolerance increases. The majority of the oldest age class of needles senesces and is shed in September. These physiological changes may also involve changes in production and storage of secondary compounds like terpenes.