



## Volatile organic compound emissions from Siberian larch

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Siberian larch (*Larix sibirica*) is one of the major tree species in the Eurasian boreal zone, taiga, forming extensive monocultures in the western Siberia. However, its VOC emissions have not been measured before. Thus the modeled VOC emissions from the taiga region are based on the measurements conducted on other tree species.

We measured VOC emissions from a young Siberian larch tree during summer 2006 using dynamic enclosure technique with adsorbent sampling and GC-MS analysis. The measurements were conducted as six separate two day campaigns distributed from May to September.

Siberian larch was observed to emit mainly monoterpenes (about 90%), of which sabinene and  $\Delta^3$ -carene were the major compounds. Sesquiterpene emissions were about 10% of monoterpene emissions, and were mainly  $\alpha$ -farnesene. No isoprene emission was observed. The monoterpene emission spectra remained constant throughout the measurement period. The sesquiterpene spectra changed in the end of the measurement period when the proportion of  $\alpha$ -farnesene fell from nearly 10% of the total terpenoid emission to about 1%.

The emissions of both mono- and sesquiterpenes correlated well with the temperature, coefficient of determination,  $r^2$ , being mostly in the range of 0.8-0.9 and temperature dependence coefficients in the range of 0.03-0.16 °C<sup>-1</sup> and 0.05-0.19 °C<sup>-1</sup> respectively. The temperature only dependent algorithm described the emissions better than the light and temperature dependent algorithm and terpenoids were emitted also in dark conditions.

The monoterpene emission potential, normalized to 30°C using the temperature dependence coefficient of  $0.09\text{ }^{\circ}\text{C}^{-1}$ , commonly used in the emission inventory models, was  $5.2\text{-}17.4\text{ }\mu\text{g g}^{-1}\text{h}^{-1}$ . The value previously used for the calculation of monoterpene emissions in emission inventories from boreal coniferous tree species has been  $2.4\text{ }\mu\text{g g}^{-1}\text{h}^{-1}$  which is considerable smaller than the emission potential obtained here for Siberian larch. That of sesquiterpenes was  $0.40\text{-}1.8\text{ }\mu\text{g g}^{-1}\text{h}^{-1}$ , normalized using temperature dependence coefficient of  $0.14\text{ }^{\circ}\text{C}^{-1}$ , which was determined from the data presented here.