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Temperature and light dependence of the VOC emissions of Scots pine

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Abstract. The volatile organic compound (VOC) emission rates of Scots pine (*Pinus sylvestris* L.) were measured from trees growing in a natural forest environment at two locations in Finland. The observed total VOC emission rates varied between 21 and 874 ngg⁻¹ h⁻¹ and 268 and 1670 ngg⁻¹ h⁻¹ in southern and northern Finland, respectively. A clear seasonal cycle was detected with high emission rates in early spring, a decrease of the emissions in late spring and early summer, high emissions again in late summer, and a gradual decrease in autumn.

The main emitted compounds were Δ^3 -carene (southern Finland) and α - and β -pinene (northern Finland), with approximate relative contributions of 60–70% and 60–85% of the total observed monoterpene emission rates, respectively. Sesquiterpene (β -caryophyllene) and 2-methyl-3-buten-2-ol (MBO) emissions were initiated in early summer at both sites. The observed MBO emission rates were between 1 and 3.5% of the total monoterpene emission rates. The sesquiterpene emission rates varied between 2 and 5% of the total monoterpene emission rates in southern Finland, but were high (40%) in northern Finland in spring.

Most of the measured emission rates were found to be well described by the temperature dependent emission algorithm. The calculated standard emission potentials were high in spring and early summer, decreased somewhat in late summer, and were high again towards autumn. The experimental coefficient β ranged from 0.025 to 0.19 (average 0.10) in southern Finland, with strongest temperature dependence in spring and weakest in late summer. Only the emission rates of 1,8-cineole were found to be both light and temperature dependent.

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