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Comment

## ***Interactive comment on “Chemodiversity in terpene emissions at a boreal Scots pine stand” by J. Bäck et al.***

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### General Comments

Volatile organic compound (VOC) emission from boreal forests contributes significantly to the VOC-load in the northern hemisphere. The amount and composition of VOC emitted by vegetation is very well known to depend on plant specific as well as on environmental factors. In northern latitude forests, Scots pine is a widely distributed tree species known as terpene emitter. Depending on the genetic endowment, a natural diversity in Scots pine chemotypes exists producing type-specific terpene emission patterns. This variability is often neglected when assessing local or regional air chemical processes. For the first time, this work presents a holistic approach on the effect of BVOC emission variability on corresponding air concentrations by bridging studies on

C5389

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the natural variability on terpene emission with emission/distribution modeling. Based on field sampling, the natural abundance of different Scots pine chemotypes is quantified, the resulting emission patterns determined, and the consequence for chemical compound specific distribution in forest air is shown. The modeling results highlight the need for addressing this observed variability in tree terpene emission for the reactivity of the boreal atmosphere in future assessments.

### Specific Comments

All investigations presented were designed, conducted, evaluated and discussed excellently. Experiments were performed and evaluated using state-of-the-art methods including appropriate statistical tests. However, a critical experimental step - taking twig samples - must be further detailed. Twig samples were taken by cutting twigs from trees and storing the plant material at +4 °C until further analysis. The authors are well aware of the impact such a sampling procedure may have on the reported results. The discussion of possible artifacts resulting from plant wound reaction producing new and more VOCs is carefully conducted. Arguments are shown that the sampling and storing procedures are adequate with some limitations which are considered when presenting the data.

The paper focuses on two issues (1) terpene emission variability of Scots pine and (2) impact of this variability on forest air concentrations. The title does not reflect this. Therefore, it is suggested to change the title in e.g. "Chemodiversity of a Scots pine stand and implications for terpene air concentrations".

The results are well discussed in the light of the relevant literature and original contributions become clear. Mathematics used in the paper is correct. Symbols, abbreviations, and units are correctly defined and used. The content of the paper is presented sufficiently clear with no further recommendations. Referencing is conducted according to the state-of-the-art. The study results are summarized in a concise and complete manner based on a clear and well structured presentation. The language used is fluent

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and precise with only minor improvements suggested.

#### Technical Corrections

Abstract; line 4: Check for text artifact. Should delete phrase “to the surrounding air”.

p. 10581; line 1: Pinef: delete f.

p. 10582; line 13: Replace weight by emphasis.

line 19: Replace in by at.

p. 10589; line 17: Phrase: ... having specific chemical and physical properties and give the emissions a complex character.

p. 10592; line 14: Phrase: ...trees which such a high d3-carene proportion. ...

line 17: Phrase: ...used as an index for a chemotype.

P. 10595; line 1: replace operations by management.

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Interactive comment on Biogeosciences Discuss., 8, 10577, 2011.

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8, C5389–C5391, 2012

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