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Interactive comment on "Laboratory and field measurements of enantiomeric monoterpene emissions as a function of chemotype, light and temperature" *by* W. Song et al.

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We are great thankful to the reviewer for the valuable and thoughtful comments and suggestions. The following responses have been prepared to address all the comments point by point.

General comments: The authors report laboratory and field measurements of enantiomeric monoterpene concentrations and emissions and investigate their variability within and between races and species and examine variations as a function of light and temperature. The authors have previously published several papers on enantiomeric monoterpene emissions into the atmosphere and this paper provides additional valu-

able information. Their measurement approach is solid and I recommend publication after addressing the following points:

1) It is suggested that the enantiomeric differences among individuals of the same species is genetic but what about the possibility that the variability is induced by some stress which is difficult to detect.

It is possible that stress induced enantiomeric variation happened during our lab experiments, such as root herbivores which are not easily seen. In our experiments, all the species chosen were almost in the same age and the grown in the same environment. There were also online measurements of monoterpenes by GCFID after we placed leaves into the cuvette. The samples for enantiomeric monoterpenes analysis were collected after the online measurements showed a stable emission. We believe therefore that in our case, the possibility of stress induced emission could be neglected.

2) The expectation that there should not be a smooth diel cycle assumes that there is variability in the emissions of the trees within the ambient air sampling footprint, but these trees could all be of the same chemotype. Also, note that in mixed forests that have some trees emitting isoprene and others that do not, there still tends to be a fairly smooth diel cycle due to the relatively large footprint of an ambient concentration sample and the rapid atmospheric mixing.

The ambient enantiomeric ratio footprint is affected by the surrounding tree species and meteorological conditions. It is true that the natural environment has complex conditions compared to our laboratory experiments. We note that diel cycles in enantiomeric ratios may be influenced by vegetation with a wide footprint and that separate light and temperature driven emissions from different species within the ecosystem can likewise cause diel cycles.

3) Page 16811, line 13-17 brings up the question of the usefulness of measurements of enantiomeric monoterpenes for emission modeling or atmospheric chemistry in general. This is an important point and the authors should make an effort at answering

this question based on this work. Although enantiomeric measurements have been shown to be valuable for some biological studies and may be useful for identifying tree populations, this paper seems to show that there is little to be gained for atmospheric studies. Of course, it does not rule out the possibility of different results for other plant species.

The ambient enantiomeric profiles of tree and plants could be useful in the atmospheric modeling of BVOCs, however, this work has shown that for the limited plant species used in the laboratory study, the genetically determined emission ratio (rather than light or temperature mediated emissions) means that such ratios are of limited use to modellers investigation monoterpene emission patterns or temporal emission markers.

Specific edits:

Page 16806, line 12: “found vary” => “found to vary”

It is corrected.

Page 16808, line11: not “proportional” but it is a function of those drivers

It now reads: “While there is a generally accepted empirical emission algorithm for isoprene, which has been established to be influenced by both temperature and light (Guenther et al., 1993, 2006), for monoterpenes the situation is more complex – with some monoterpene emitters responding to temperature, and others to both light and temperature (Fuentes et al., 2000).”

Page 16809, line11: “may has” => “may have”

It is corrected.

Page 16810, line 13: “footprints” => “fingerprints”

It is corrected.

Page 16813, line 9: “condition” => “conditions”

It is corrected.

Page 16822, line 8: “then” => “to”

It is corrected.

Page 16823, line 1 to 5: this should be moved to section 2.2

This part is somehow repeated of the section 2.2, it has been removed.

Page 16823, lines 6-7: this should be in the introduction.

It has been removed from this part and combined in section 1.

Figure 2 legend: “leaves” => leaf”

It is corrected.

Figure 8 legend: “measurements time” => “measurement period”

It is corrected.

Figures 3 to 9: difficult to read. Please use a larger font.

All figures have been improved (see Answers to Referee #1).

Interactive comment on Biogeosciences Discuss., 10, 16805, 2013.