Reply to Referee #2

We thank Anonymous Referee #2 for their helpful comments. We have answered to the comments below. The bold text is quoted from the referee's comments, and the text in italics has been added to the manuscript.

GENERAL COMMENTS

The authors present a long-term dataset of proton transfer reaction mass spectrometer (PTR-MS) measurements of monoterpene concentrations at the SMEAR II station in Hyytiala, Finland. The authors then derive a series of proxies by which monoterpene concentrations, and those of organic oxidation products, may be estimated – enabling the generation of longer datasets at this site and potentially estimates of these values at sites where these measurements are not available. The study highlights the importance of monoterpene oxidation by different oxidants at different times of the year and these datasets will be valuable in terms of evaluating the performance of regional and global models that aim to represent processes involving monoterpenes and their oxidation products.

The paper is very well written, clearly structured and very thorough. The proxies used are clearly derived and their performance is well evaluated. I would recommend this manuscript for publication in ACP and only have the following very minor comments and technical suggestions.

MINOR COMMENTS

The authors demonstrate that estimating the NO_3 concentration introduces uncertainty to the monoterpene concentration proxies, that the correlation (with measured monoterpene concentrations) is poorest during the winter when oxidation by NO_3 would dominate, and that the majority of the oxidation products are being generated via NO_3 oxidation outside of winter. Perhaps the authors could add a comment to the conclusions about the need for accurate NO_3 measurements (or measurement systems with a lower detection limit)?

As suggested by the referee, we added the following comment in the conclusions (page 12, line 31 in the ACPD version):

"...thus demonstrating the need for direct measurements of NO_3 concentration with the low enough detection limit."

In the Conclusions the authors mention the application of the proxies at other boreal sites, this is a study I will be very interested to read as I think their success in predicting the monoterpene concentrations at other sites will be the true test of the proxies. Specifically, it will be useful to examine the impact of applying the DOY-dependent function at other sites.

TECHNICAL SUGGESTIONS

p1, line 28: replace volatile with "volatility"

We made this change.

p9, line 27 and 30: perhaps replace "pretty well" and "pretty close" with something more specific/scientific?

We changed the "pretty well" on line 27 to "*adequately*" and "pretty close" on line 30 to "*reasonably close*".