Response to Anonymous Referee #2

We thank the reviewer for her/his supportive and constructive comments. We have revised the manuscript in several instances to address the reviewer's concerns, and believe the paper is stronger overall as a result. This response will address the general and minor concerns raised by this reviewer in the order provided in the review.

General Comments

This paper is about using the flame ionization detector and effective carbon number (ECN) concept as a means of quantifying biogenic VOCs. This is good contribution to the literature and should be published with minor modifications. The authors did a careful job in putting this paper together. It is well written and easy to follow.

> We appreciate the reviewer's supportive assessment.

I suggest a paragraph, early on in the paper, summarizing the all of the uncertainties in the approach taken here in determining the ECNs. Follow this with putting uncertainty limits (+/-) on the ECN numbers given in Table 4. The authors discuss uncertainties in the analytical method previously used in ECN studies but not enough systematic discussion of their own uncertainties. Once the uncertainties are established more clearly, it will help with discussions where uncertainty is involved throughout the rest of the paper.

e.g.,

2430 line 15: "The sum of the contributions of all impurities was always less than 10 % of the response of the target analyte, and thus the overall impact of this correction is expected to be very small relative to the uncertainty associated with the analysis." - this leaves the reader wondering what the uncertainties are – i.e., if 10% is considered very small in relation to the overall uncertainty, then what exactly is the overall uncertainty.

> We agree that this statement is confusing. Our analysis ultimately indicated that the overall uncertainty in our ECN quantification is +/- 10%, as stated on page 2434, lines 12-14: "With it, we have demonstrated that in most cases the ECN correction values used here suffice for quantification of terpenoid compounds within 10% uncertainty." We based this statement on the observed reproducibility of the ECN analysis.
>
> This finding of a +/- 10% overall uncertainty influenced the statement that the reviewer notes above, but the reader could not be expected to know the final results of our analysis at that point in the text. We agree that this oversight should be corrected, but do not think that a fuller discussion of the uncertainty early in the paper is the best approach.
>
> Instead, we think it is preferable to revise the text in question to give more detail on our approach to dealing with compound impurities in our analysis, and then to qualitatively describe the expected impact of this approach to the overall

uncertainty. To better convey our meaning, we have re-written several sentences in section 4.3. This text in the original manuscript has been removed:

> *"All final results were corrected for impurities using the MS to identify the compounds associated with secondary peaks and then applying the theoretical ECN value to the FID response to estimate the impurity concentration. The sum of the contributions of all impurities was always less than 10% of the response of the target analyte, and thus the overall impact of this correction is expected to be very small relative to the uncertainty associated with the analysis."*

In its place, we have added the following new text:

> *"The presence of compound impurities were visible in the chromatographs in a few cases. All reported mixing ratios have been corrected for such impurities (if present) by the following procedure. First, the compound impurities in the chromatograph were chemically identified using the mass spectra. Next the theoretical ECN values of those compounds were applied to the FID response to estimate the concentration of each impurity. We found that the total integrated peak area for all impurities was always less than 10% of the integrated area for the target analyte peak. Since the compound impurities would be expected to co-vary with the target analyte, this suggests that the compound impurities would contribute no more than one-tenth of the overall uncertainty in the final analysis."*

To clarify our conclusion that the 10% uncertainty in ECN values is largely a result of the 10% variability in the dynamic dilution system, we have modified the sentence beginning on page 2434, line 13 so that it now reads:

> *With it, we have demonstrated that in most cases the ECN correction values used here suffice for quantification of terpenoid compounds within 10% uncertainty, similar to the observed variability in the dynamic dilution system used to generate test gases.*

<u>Minor Comment</u>

The following two paragraphs have similar information – I have suggested a possible change:

{Paragraphs listed by the reviewer here have been omitted for brevity.}

> The wording suggested by the reviewer is an improvement over the original. We have incorporated this change into the manuscript.