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Atmospheric Measurement Techniques Discussions

Interactive comment on "Dynamic Infrared Gas Analysis from Longleaf Pine Fuelbeds Burned in a Wind Tunnel: Observation of Phenol in Pyrolysis and Combustion Phases" *by* Catherine A. Banach et al.

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Interactive comment on "Dynamic Infrared Gas Analysis from Longleaf Pine Fuelbeds Burned in a Wind Tunnel: Observation of Phenol in Pyrolysis and Combustion Phases" by Catherine A. Banach et al. Anonymous Referee #3

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General comments: This paper report behavior of 29 gases emitted from biomass burning using two different FTIR acquisition modes (i.e. static and dynamic) as well as

IR thermal imaging. Also, phenol temporal profile was characterized especially. I think the findings shown in this paper are suitable for AMT journal topic. I would recommend accepting this paper with a couple of revision and re-consideration mentioned below.

Specific comments: 1. Table 2: Category (d) includes not only aromatics (benzene, naphthalene, and phenol) but also furan-related compounds (furan and furfural). So, the term of this category should be "aromatics and furans".

Author response This is a good suggestion. While many organic chemistry textbooks do in fact classify furan and related compounds as aromatics because they have a 4n + 2 aromatic system (as per Hückel's rule), furans can perhaps be considered as subgroup of related compounds as compared to e.g. benzene. We have relabeled the category should be "aromatics and furans" as suggested. Thank you.

Referee Comments: 2. page 15, line 355-356: Authors mentioned that they could not estimate the fractions of high-temperature and low-temperature pyrolysis from acetylene-to-furan ratio. But I think, they might be able to estimate those fractions by directly fitting the FTIR results of 29 gases using the high-temperature and low-temperature profiles (reported in Sekimoto et al. 2018). That is, (1) the fractions of 29 gases are extracted from the high-temp. and low-temp. profiles and are normalized. (2) Then the FTIR data is linearly fitted by the normalized selected profiles (i.e. VOC_FTIR = a*High-temp + b*Low-temp). (3) Authors can know the fractions of high-temp. and low-temp. pyrolysis from coefficients "a" and "b". It should be worth to do it. 3. Figure 3: Authors obtained thermal imaging for burn progression. If they could estimate the high-temperature and low-temperature fractions according to my comment #2, how do those fractions correlate with the burn temperature derived from the thermal image?

Author response As discussed in the manuscript, due to a) the short IR scan times and b) the weak furan infrared signals, as well as c) furan's strongest band being largely obscured by saturated CO2 lines, for these data we were unable to use the metric suggested by Sekimoto et al. (2018) to assess the high- vs. low-temperature pyrolysis

as derived from the acetylene-to-furan ratio. Also, to adequately respond to suggestions #2 and #3 would represent a significant re-analysis of the entire data set as well as further interpretation and discussion. This is unfortunately not possible at this late stage: Laboratories such as ours may only work on currently funded and authorized projects. Both funding and authorization for the project ran out on 30 December. Moreover, the two scientists that performed the analysis have both left our institution for other research studies and institutions and are thus no longer available to work on the project, so our capabilities for data re-analysis at this time are limited. But as noted in the manuscript, this is part of a larger study and we plan to investigate the temperature dependent factors, possibly using the analysis methods suggested by reviewer #3, in a future work.

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