

## ***Interactive comment on “FTIR time series of tropospheric HCN in eastern China: seasonality, interannual variability and source attribution” by Youwen Sun et al.***

### **Anonymous Referee #1**

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The study by Sun et al reports the column and partial columns of HCN, a known biomass indicator, along with the column CO from Hefei in China. The authors compare their data with other similar measurements from the NDACC community, and use the standard agreed protocol for retrieve these columns. They derive emission ratios of HCN with respect to CO, and also use back trajectory analyses to trace where the airmasses originated. The trajectories from various global sectors are discussed and compared in the context of the seasonality in the HCN to CO enhancements, which the authors conclude is consistent with the same sources. Finally global fire counts are used to show that fires from various sources explain the observed seasonality in the HCN column enhancements.

C1

In general the paper is well written, organised, and follows NDACC recognised analysis procedures. The skill level of this group Hefei is very good, and improves all the time. The paper is therefore recommended for publication in ACP subject to the list of mainly minor corrections, but also a few not so minor points for the authors to correct/address.

Corrections:

- 1) P2 line 41: replace “in polluted troposphere in eastern China at middle latitude . . .” with “in the polluted troposphere over eastern China at middle latitudes . . .”
- 2) P2/3 line 57/1: suggest replacing last sentence on page 2 with “Both HCN and CO are regularly measured at Hefei (32°N) using the FTIR observations, where influences from biomass burning occurring at long distances or locally can be assessed.”
- 3) P3, line 12: “. . . evaluation of global ..” => “. . .evaluation of the global . . .”
- 4) P3, line 30/31: spelt out the “&”
- 5) P3 line33: The field stop is employed to maximise the S/N consistent with the maximum frequency possible for the wavenumber range that is selected. Is this is what adapt means? Explain.
- 6) P3 caption of figure 1: what is significant about these star spots? Refer to the text for an explanation (just a simple, see section xx). Even so it is not clear on page 16 where this is mentioned, exactly why these points were chosen. Are they the middle of the selected source regions?
- 7) P5, fig 2: Why show the averaging kernel plot of HCN with these two layers when the actual partial column used in this study is from 0 to 15 km? HCN has a dof of 1.3 so there are not 2 independent layers, unlike CO. Perhaps it would be better to plot two averaging kernels for HCN, the total column and the 0-15 km layer?
- 8) P5 table 2: I am not sure about the tabulated error for the line intensity for CO and HCN, they seem to be the wrong way around? The reported uncertainty for the line

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intensity in hitran2008 for CO and HCN is 2-5% and 5-10% respectively. So why is the reported % error for the CO line intensity higher than HCN?

9) P6 line 16: Combine these sentences to read "...September > December, while for the tropospheric CO column, ..."

10) P6 line 18: perhaps "phase" is a better word than "timing"? This word is used elsewhere as well.

11) P7, line 6: type in the word "Fig. A"

12) P7, line 27: be more specific about what timeframes you are actually comparing, what exactly do you mean by "counterpart"?

13) P7, line 32: combine these sentences to read "...2016, while..."

14) P7/8: Maybe summarise all this information in this paragraph in a table? It is otherwise tedious for any reader.

15) P9, line 2,: "proceed" is not the correct word here. Should be something like "using a linear ..."

16) P10, line 28: "seasonal" => "seasonally"

17) P10, line 31: "...occurred before the timing of tropospheric HCN enhancements within one month period. Then, we" replace with "occurring before the timing of tropospheric HCN enhancements within a one month period. Finally, we ..."

18) P13, fig 8 caption: What is the ratio in fig 8a, what is being ratioed against what?

19) P13, fig 8 caption, line 5: Do you mean the each red dot is a fire over the 10 day period. What is written here implies a fire that occurred 10 days before. So this is cumulative over the 10 days, yes?

20) P14, fig 9b: These plots are really hard to make out. Perhaps explore another way of plotting so it clearly shows the different datasets. My suggestion is to try different

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plotting symbols as the one you use seem too large.

21) P15, line 13, "Particularly," => "In particular, "

22) P16, line 8: "cause"

23) P16, line 15: "lifetimes ..." => "where lifetimes ..."

24) P17, line 7: These numbers from other studies though should be entered as a range in table 5, that is, a column that says "literature values" to give the reader a sense of where the emission ratios in this study fall.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2019-736>, 2020.

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