General comments

This paper presents ground based FTIR measurements at the Hefei site including error analysis of the NH_3 retrievals, vertical distribution, time series and seasonal trend analyses. More additional works such as comparisons of IASI data, relationship with surface CO, temperature, wind speed and direction, and back trajectories analysis are made in this paper. I believe this paper is suitable for publication to Atmos. Meas. Tech. after considering comments as below.
As for dividing into two papers by anther refree, if authors can prepare more analyses and discussions for AMT and another paper, I think it would be better. If not, One paper of AMT looks not bad.

Specific comments

line 2
I feel "measured" is not fitted because of "measured from observations". Retrieved, derived, obtained etc. would be better.

Line 32 and 402
If possible, could you provide error (one standard deviation) for 22.14 % yr-1 annual increase rate?

Line 38-39
"Further, high correlation of NH_3 columns with air temperature is obvious from their diurnal variation during the observation period."
"In addition, the clear correlation between NH_3 columns and air temperature in spring and autumn over Hefei, suggests that agriculture was indeed the main source of ammonia in spring and autumn."
I think a correlation coefficient NH_3 columns with air temperature should be provided, since NH_3 columns with CO concentration is described as R=0.77.

Line 83-89
Authors had better add the GOSAT retrieval from TANSO-FTS TIR spectra as recent results.
Citation: Someya, Y., Imasu, R., Shiomi, K., and Saitoh, N.: Atmospheric ammonia retrieval from

the TANSO-FTS/GOSAT thermal infrared sounder, Atmos. Meas. Tech., 13, 309–321, https://doi.org/10.5194/amt-13-309-2020, 2020.

Line 99-102

"More recently, FTIR measurements have been shown to also provide total column and vertical profiles of ammonia at a high temporal resolution, and are now also used for validation of satellite NH_3 observations (Dammers, et al., 2015; Dammers, et al., 2016; Dammers, et al., 2017b)."

I recommend to adding a name of the satellite, that is, IASI.

Line 226

Some of working in same field can understand "phase", but for wider readers, a little explanation might be necessary.

Line 250

"Many spectra ranging from 700 to 1350 cm^{-1} are saturated in summer (due to high humidity), causing the retrieved NH_3 data to be sparsely sampled relative to those in other seasons."

Are there else any better spectral windows for retrieval of NH_3 in summer season?

Line 281

"The annual increasing rate of ammonia columns in Hefei estimated by our two-year FTIR measurements (22.14 % yr^{-1}) is much larger than the reported value by satellite observations over China. This is likely due to the different sampling years. The increasing trend of NH_3 in Hefei is likely caused by either an increased fertilizer use, or increasing air temperature, or decreased sulfur emissions due to strict SO_2 control measures."

Is it possible to verify the annual increasing rate of ammonia columns over Hefei using other satellite or model data?

Line 291

"We remove the data with negative IASI-NH_3 columns due to large retrieval error."

Negative values for the IASI-NH_3 columns are not physically meaning. I think large retrieval error is not fundamental reason.

Line 303-311

There would be different results comparing of IASI A and IASI B data with the Hefei FTIR data, but they are within one standard deviation. Could you describe this reason by citing the literatures or technical reports from the IASI team? If impossible, a description that the difference is within one standard deviation would be there.

Line 319-321

"So the relative differences between IASI total columns and our FTIR data and standard deviations of the differences are within the range of comparison results from other NDACC site data, and the correlation coefficients are comparable to that of other comparison results."

In table 3 of Dammers et al. (2017b) paper, the mean relative difference (MRD) at Wollongong site is only positive (6.0 ± (74.3)%) and other sites are negative. If readers know this, readers may get confused. More detail discussions and descriptions are necessary.

Line 338

"However, NH_3 columns show high correlation with CO concentrations in summer, as displayed in Figure 7(a)."

How is other seasons ?

Line 345

"Meanwhile, NH_3 columns show weak correlation (R=0.47) with $PM_{2.5}$ concentrations (Fig. 7(b)), meaning that NH_3 contributed to the formation of fine particulates significantly in summer."

If so, a correlation with $PM_{2.5}$ concentrations in other seasons might be higher than that in summer. Did authors check them?

Line 352

"High correlation of NH_3 columns with air temperature is obvious from their diurnal variation during the observation period, as seen in Figure 8. Our measurements are performed generally from 9:00 to 16:00 local time. The whole data are averaged per hour during the two years."

Considering discussions that follow, a plot in Figure 8 prepared for whole data (I understand all seasons) should be prepared for each seasons. Could authors explain a reason that NH_3 columns decreased from 11:30 to 13:30 in figure 8? If plots are prepared for each season, decreasing in spring and autumn might be appeared.

Technical corrections

line 28-29

I fell there is a duplication. One idea is to remove “a measurement site in”.

Line 32

measurement-> measurements

Line 35

Analyze -> analyzed?

Line 143

Remove “retrieved”

Line 169

“recorded”-> “has been recording”

Line 179

“vertical profile”->” vertical profiles”

Line 204

“general”-> “generally”

Line 235

“The seasonal averaged surface level of NH_3 decreased from 10.82 ppb in summer to 2.92 ppb in winter during 2017 and 2018, and the corresponding values are about 5.48 and 6.04 ppb in spring and autumn, respectively.”

Line 261

“The annual mean NH3 column is 1.31×10^{16} and 1.60×10^{16} molec cm^{-2}, respectively, with an increase rate of about 22.14 %.”

If readers can know errors or standard deviation, they might be good.

Line 243, 244, 249 and other

“retrievals at the Hefei site” or “retrievals in the Hefei site.” A lot of inconsistency, “at the Hefei site” might to be good.

Line 264

If authors use “practices” as a noun, I think “maybe” is adverb and there is no verb in this sentence.

Line 269

“agriculture”-> agricultural area?

Line 325

“tunnel studies”

Simple description for them is grateful.

Line 330

“The Dongpu Reservoir air quality monitoring station (31.91°N, 117.16°E) is very close to our site, part of a National Ambient Air Quality Monitoring Network, which monitors and routinely publishes the concentrations of main gaseous pollutants, including CO, NO_2, $PM_{2.5}$, PM_{10}, SO_2, O_3 and Air Quality Index (AQI) etc.”

There is no citation for the data.

Line 434

“Future work” -> “Future works”

Line 435

"to estimate regional"->”estimating regional” or “estimation of regional”

Figure 1 caption

“The regional distributions of NH3 columns (molec cm^{-2}) from 2008-2018 IASI-A and 2013-2018 IASI-B morning overpasses of ANNI-NH3-v3R data.”

Are they averaged values or overlaid ? Clarification would be necessary.

Figure 4 (a)

Higher than 40 km should be removed for a color bar for the altitude and replot would be necessary. If Authors can do them, readers may understand which colors are altitudes for VMR averaging kernels. But I don't know it is useful.

Figure 7 (b)

"ug"->"micro g" Micro is small Greek letter.

Figure 10

Digits after the decimal point might be not necessary for NH_3 column. Also digits after the first decimal point might be not necessary for wind speed.

I feel wind speed would for radial axes and NH_3 columns for color bars would be better for better understanding relationship of NH_3 columns to wind direction and speed. If authors did not try, please try.

Figure S1.

Back trajectories colored with black are very cloudy, if possible could authors color them for each cluster?

Figures S1 and S2

What is light blue curved lines? There is no description for them.