

We thank the reviewer for their thoughtful comments. Our responses to each of the minor comments are provided below. The text in normal font is our direct response to the reviewer and the text in italic font is the text that are added/edited in the manuscript.

Reviewer 1 response:

Minor Comments:

1. **Line 41: Does “N 149.3 nm” refer to atomic oxygen nitrogen line? If so, define it. Atomic nitrogen 149.3 nm line is also referred to as N I 149.3 line.**

Yes, “N 149.3 nm” refers to the atomic nitrogen line at 149.3 nm. The text is updated to *“N I 149.3 nm line”*.

2. **Line 143: Add more description on the procedure. It is not clear what is being done in this step (Step 2).**

The procedure is updated as follows:

The procedure to determine T_{ci} using the two-channel ratio consists of four steps as follows:

1. *Generate a set of synthetic LBH (2,0) bands at the instrument’s pixel size for a range of temperature using the vibrational-rotational band model (Budzien et al., 2001).*
2. *Apply an instrument model on each synthetic band to account for the instrument’s wavelength resolution and wavelength registration.*
3. *Bin each band into channels A and B and least squares fit the ratio, B/A , to temperature.*
4. *Compute the ratio, B/A , from the observed LBH (2,0) band and determine T_{ci} by regressing observed ratio on the predetermined relationship between the ratio and temperature.*

3. **Line 169-171: This line may need rewording, appears confusing to me.**

The text is updated as follows:

“The T_{ci} random measurement error due to shot noise is quantified using Monte Carlo samples of simulated T_{ci} derivations considering the instrument performance (McClintock et al., 2020a,b).”

4. **202-203: LBH contribution function (CF): Figure 5 is very interesting, which shows pressure at the peak of the CF. It would be also interesting to see how the pressure/altitude profile of CF varies with SZA and OZA. If allowed by journal length limit, I would suggest adding another figure on that, at least for some sample SZAs and OZAs.**

We appreciate the reviewer's suggestion but after consideration we do not think there is enough information gained from the suggested figure relative to Figure 5 and also relative to figures provided in Laskar et al, 2020 and Zhang et. al. 2019 to include an additional figure in this manuscript.

5. **260-262: It is still not clear to me why the T_{ci} is compared with T_{MSIS} . As I was suggesting earlier, better compare it with an equivalent height integrated quantity. Except T_{MSIS} , all other quantities are vertically integrated in Figure 7. If there is a special motivation behind showing the non-height integrated T_{MSIS} then it should be made clear.**

T_{MSIS} is updated to be a height integrated quantity with the same procedure taken for T^s_{ci} . Figures 7 and 8 are updated along with the description of T_{MSIS} in Section 4 and Table 1. There are no major changes to the results based on this update but T_{MSIS} is in slightly better agreement with the other datasets for the period of interest.

6. **GOLD TDISK retrieval algorithm is not optimized for auroral latitudes (see Laskar et al., 2021 or GOLD TDISK documentation) due to very different chemical environment. Please provide a comment on the performance of your retrieval at auroral latitudes. Can it explain some of the high-latitude dissimilarities seen in Figure 7?**

A detailed analysis of the retrieval at auroral latitudes has not been conducted. We expect that the performance will remain similar to low latitudes due to the point made in the text that the forward model only consists of a vibrational rotational band model and thus the retrieval is not affected by various excitation and extinction processes along the line-of-sight. However, if there is a change in the $v'=2$ and $v'=5$ population rates at auroral latitudes from what Ajello et al. 2020 found then the retrieval could be biased. It is not clear from Laskar et al. 2021 or the GOLD TDISK documentation why the different chemical environment at auroral latitudes affects the TDISK retrieval. The GOLD TDISK documentation suggests that the population rates appear to remain constant with respect to viewing conditions and geomagnetic conditions. We expect our retrieval performance to be unaffected as a result.