

Thank you very much for agreeing to review our paper and for your comments. We greatly appreciate your time!

Please find our replies in green below

Is the line width (σ) in Eq.4 same as the shape parameter in Eq.6?

The σ in Eq. 4 and Eq. 6 are different. We changed the symbol in Eq. 6 to κ . Thanks for catching this.

All simulations are from pencil-beam calculations. What would be the impact from antenna beam patterns, say 10 km field of view, on the simulated results and conclusions?

The assumption of a pencil like beam is justified by the mirror/telescope of 40 cm diameter which results in a 1 km FOV at the 100 km tangential point. A non-pencil like beam would have to be approximated in the forward model by a weighted average over several pencil-beam calculations. A wider beam will reduce the vertical resolution of the measurements, leading to less detailed retrieval results.

There are a number of single-sentence paragraphs. Not sure what is their purpose? If they are a key statement/point to make, the authors need to provide the supporting materials to help the reader better understand the claim. If they are a supporting sentence, the authors may consider to group them into the related paragraph.

We identified and corrected the two single-sentence paragraphs:

1. “For all the retrievals, the parameters for the atomic oxygen and temperature parametrisations as well as the spectral shifts converge well and within approximately 15 iterations (see supplementary materials for an example).”, line 250, has been moved to line 231 which now reads:
“In total 31 retrievals have been performed. For all the retrievals, the parameters for the atomic oxygen and temperature parametrisations as well as the spectral shifts converge well and within approximately 15 iterations (see supplementary materials for an example).”
2. “Although the retrieval of winds was not the scope of this study, average winds along the LOS were retrieved and appear to be a good first approximation for capturing wind effects on the observed spectra.”, line 276, has been moved a few lines before where we mention the average deviations:
“Using realistic THz receiver noise temperatures, atomic oxygen concentration were retrieved from 100km to 110km within $\pm 15\%$ average deviations and from 110km to 300km within $\pm 3\%$ average deviations. Temperatures were retrieved within $\pm 3\%$ average deviations from 100km to 175km. Although the retrieval of winds was not the scope of this study, average winds along the LOS were retrieved and appear to be a good first approximation for capturing wind effects on the observed spectra.”