

Response to Editor Comments

We thank the reviewer for the thorough reading of our manuscript and for the constructive comments. Below we provide a detailed point-by-point response.

Comment 1

“There are many claims of excellent or good agreement, but there is no quantitative way to define what that means, besides a non-objective visual comparison of curves in Figures 3 and 4”: please clarify how you define agreement to be good or excellent.

Response: In our manuscript, the terms “good” and “excellent” agreement were based on a qualitative visual comparison of the simulation and theory curves with the observational data ranges depicted by the maximum, average, and minimum values in Figures 3 and 4. More specifically:

- We define the agreement as **excellent** when the simulation and theory curves largely overlap with the average observational curves and remain within the observed range across all altitudes.
- We define it as **good** when the curves generally lie within the envelope of the observational maximum and minimum values, even if there are partial deviations from the average trend.

This approach is consistent with qualitative assessments commonly used in comparative studies of ionospheric outflows (e.g., Barghouthi et al. 2012, 2016), given the significant variability inherent in the observational data. and we add a described paragraph in lines 247 to 254

Comment 2

“In the top panels of Fig 3, at altitudes of 6-8 km, the particle energies are in the range of observations, however the shape of the altitude energy profile $E(h)$ is different than what seen in observations. The slope of increasing energy is much steeper in the simulation/theory curves than in the data”: please clarify if you only compare absolute energies at selected altitudes or also the slopes of the curves, as requested. How do you explain the different slopes? This is not done in the revision.”

Comment 3

“The deviations in the top profiles need discussion. Same applies for the left panel of Figure 4 (steep theory profiles compared to data), whereas the right profiles show better agreement with observations.

You state that ‘...the slopes of bottom panels of figure 3 and panels of figure 4 are similar for observations, mean particle theory and Monte Carlo simulations, this is due to the appropriate choice of diffusion coefficients.’ However this is just a statement — the top panels of Fig 3 clearly show different altitude/energy slopes compared to data, and this is also partly valid for Fig. 4 (left), especially at higher energies where data-based slopes have break, which does not seem to be developing by the models. Please extend the explanation for these discrepancies, or add more explanation or calculations supporting your statement that discrepancies do not exist.”

Response: We thank the reviewer for this valuable comment. We have now expanded our discussion to specifically address these discrepancies.

In the revised manuscript, we have now added a paragraph discussing the differences in the slopes of the altitude-energy profiles between our simulation results and the observations. We have added this explanation in the lines 302 to 345