

Interactive comment on “Accounting for the photochemical variation of stratospheric NO₂ in the SAGE III/ISS solar occultation retrieval” by Kimberlee Dubé et al.

Anonymous Referee #2

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General Comments

The manuscript quantifies the impact of NO₂ diurnal variability along the SAGE III/ISS line of sight and describes a new NO₂ retrieval algorithm that accounts for this variability. The authors show that accounting for this effect leads to lower NO₂ below 30km and improves the agreement with OSIRIS observations for the mid-stratosphere. This is a useful development that will benefit the community and the work fits well in the scope of AMT. The manuscript is well-written overall, but would benefit from some clarifications, as described in the specific comments.

Specific Comments

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Line 8: What is “undoing” a retrieval? Reversing the algorithm to back out optical depth?

Line 102 and Fig. 2 caption: Which dashed line? There are 2. Maybe draw the SZA on the figure.

Line 146: The text states: “The values in the figure are not multiplied by the path lengths”. Would we expect them to be?

Line 170: Please elaborate on how the bias is not consistent with the differences.

Fig. 6: A panel showing percent difference would be helpful as well.

Fig. 7: Is there bad data in the middle panel of the bottom row?

Fig. 9a: It appears that while the negative bias is reduced in the SAGE_{dv} case, the positive biases at lower altitudes increase. This merits some discussion.

Fig. 9: Are the right (b) panels SAGE_{dv} – SAGE, or (OSIRIS-SAGE_{dv}) – (OSIRIS-SAGE)? In other words, why is “SAGE_{dv} – SAGE” positive when it is stated that “neglect of diurnal variations in the SAGE v5.1 retrieval always biases the results high”? Figure 9 might be more intuitive if it were presented as SAGE – OSIRIS rather than OSIRIS – SAGE.

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