

We thank the reviewer for their helpful suggestions.

1. The second sentence in the Abstract becomes only clear after reading the paper. It could be left as is, if no better formulations come to mind.

We are not sure which part of the sentence is unclear.

2. page 2 line 17: OSIRIS is already defined on page 1 line 17

We feel that acronyms in the abstract should be repeated in the main body of the manuscript. The editor can inform us on what is correct for AMT.

3. page 9 line 16: Why use 17.5 km?

The justification was later in the paragraph. We have moved it up now:

“Figure 3 shows that the impact of the different forward model modes: the 1D retrieval overestimates NO₂ by 29% relative to the one using the 3D forward model mode at 17.5 km. Note that relative diurnal gradients are expected to be largest below 18 km.”

4. page 12 line 17-21: Why include a climatology only for November and the Southern Hemisphere? What data has been used for this climatology, I presume it is the new algorithm 2D? Should this figure be included, no mention has been made about it other than that it has been included, because no other data south of 22°S has been used?

OSIRIS does not cover the southern extratropical region in all months. In fact, the coverage is better in the northern hemisphere, so only 5 months cover down to 80°S. Additional panels have been added for other months, namely January and March, which correspond to mid and late summer. The 1D algorithm is used. In the last paragraph of section 2, we now write:

“The entire OSIRIS data record has now been processed using the 1D algorithm...”

This figure is included to qualitatively demonstrate the validity of the dataset in the southern extratropics. We now write (p12,L18):

“the climatological (2001-2015) vertical, meridional, and seasonal variation of...”

5. page 21, table 1: Maybe add references to papers for v3.0 and fast in an additional row?

Done.

6. page 24, figure 2: Maybe use 'new algorithm' instead of 'algorithm described above' and add the colours (blue and green) in the figure caption (eg: using the default window (435-477 nm), blue.

Done.

7. page 27, figure 5, line 4: add a 'the': 'and the true atmosphere.'

Done.