

General comments

Initial paragraph or section evaluating the overall quality of the discussion paper.

The paper is well written and of good quality, with a considerable number of new interesting topics and techniques related to stray light characterization and correction, and shall certainly be published.

However, I am of the opinion that the quality of the paper can be much improved to be more useful with a comparatively small additional effort, in line with the comments and suggestions provided below. After these comments and suggestions have been adequately addressed, the paper shall certainly be published.

1. For the applications in TROPOMI SWIR it is essential to express, quantify and present stray light at L0 and L1b as a percentage of the useful signal for realistic earth atmosphere low-albedo scenes and signals within absorption peaks. This is currently not the case. For example in figure 14 it can be seen that the difference between bright and dark scenes is roughly a factor 8 (see also page 15, line 14), and the difference between rather deep absorption line and continuum is also roughly about a factor 8. Both together would make a difference of a factor 64. For example, in the legend of figure 15 (but also in other places in the paper) it is clear that the stray light is expressed as percentage of the expected continuum in the given row, not as percentage of the useful signal in the absorption lines. If the authors prefer to present the stray light like this, it is essential to at least also show the stray light as percentage with respect to the low albedo useful signal in the absorption lines. This shall be added to the paper in the text, figures and conclusions.

Specific comments

Section addressing individual scientific questions/issues.

1.

Page 8, figure 7:

It is recommended to (also) show the row distances similarly as the column distances as shown in figure 8, to allow a better comparison between the two. For example, it is recommended to add a figure like the lower figure in figure 7 at a horizontal scale of +/-100 pixels, to allow better comparison with figure 8.

2.

Page 11, line 20:

The number is given as 4.3% of the detected light.

In line with the general comment given above, it is recommended to provide also the percentage numbers with respect to low-albedo numbers in the absorption lines.

3.

Page 18, lines 7-10:

Again, in line with the above, this is why it is important to calculate the stray light fraction with respect to the useful signal, because the absorption lines and low-albedo scenes will be filled in with higher signals from the continuum and the higher-albedo scenes. This may also affect the instrument spectral response functions. Please reflect this in the text.

4.

Page 18, lines 11-12:

Again, in line with the above, this is as written not agreed. This sentence shall be removed. In case the authors want to keep this sentence, another sentence needs to be added explaining why stray light needs to be assessed as fraction with respect to the useful signal, not the signal in the continuum.

5.

Section 9, conclusions.

The statement “It is expected that this brings the stray-light error in gas-column retrievals within the required budget” is not discussed or supported by analyses in the paper. Either provide more support material in the paper to corroborate this statement, or remove it from the conclusions.

Technical corrections

Compact listing of purely technical corrections (typing errors, etc.).

1.

The legends of (almost) all figures have symbols that cannot be read. This is at least true in the pdf version. Please correct.

2.

(Almost) all equations (e.g. 3,4,5,7,8,9,10) have symbols that cannot be read. This is at least true in the pdf version. Please correct.

3.

Figure 15: In the legends, please indicate if this is a fraction, percentage or something else.