

1 Response to the comments of referee #1

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3 We thank the referee for their valuable and helpful comments. We have
4 addressed all of them one-by-one in details as listed below. The comments
5 are in bold and our replies are in regular font. The line numbers indicated in
6 our replies are given with respect to the track change manuscript, and may
7 differ from the revised manuscript.

8 **General and specific points:**

9 **To split the 2-D interferogram into two single-side interferograms**
10 **around the zero optical path difference is the key process to suc-**
11 **cessfully derive two temperature profiles. The temperature infor-**
12 **mation comes mostly from the center of the interferogram, so it**
13 **would be expected that the temperature retrieval is sensitive to the**
14 **determination of ZOPD. The authors may consider to add some re-**
15 **trieval results when ZOPD cannot be determined precisely, which**
16 **could often happen during actual observations.**

17 The referee points out that it is crucial to know the location of the ZOPD. A
18 sensitivity study was conducted by Ntokas et al. (2022), which showed that
19 the ZOPD needs to be known on the sub-pixel scale, if it is not accounted for
20 during the data processing or retrieval. This requirement is not meet in the
21 raw data and therefore, correction methods needs to be applied. The feasi-
22 bility of these methods is presented by Kleinert et al. (2014) and Ungermann
23 et al. (2022). We added a discussion paragraph regarding this topic in Line
24 269-276.

25 **The text has tendency to omit the definite article "the" in some of**
26 **its sentences. It is recommended that the authors review and add**
27 **"the" where needed.**

28 The revised text includes the necessary definite articles where applicable.

29 **The colored lines in some figures are sometimes difficult to distin-**
30 **guish one from another, e.g., Fig.2(b), Fig. 10(b), Fig. A1(a), and**

31 **I would suggest to either change the colorbar or use markers if**
32 **possible.**

33 We adjusted the above mentioned figures to increase their visibility. Specif-
34 ically, for Fig.2(b) and Fig.10(b), we change the colors. Note for Fig.2 that
35 on behalf of referee #2, the input temperature is shown separately for solar
36 minimum and solar maximum conditions, and the production mechanisms
37 and the estimated intensity count per pixel are shown individually for day-
38 and night-time conditions. Furthermore in Fig.6, the temperature uncer-
39 tainty is presented individually for day- and night-time simulations as well,
40 to be consistent. For Fig.A1(a), we adjusted the colors and removed the stan-
41 dard deviation of the noisy spectra, which are not needed for the discussion.
42 Discussions, captions and references of the figures are adjusted accordingly.

43 **Line 125-157: For O2 A band, self-absorption cannot be omitted**
44 **below 90 km. When no self-absorption is assumed for above 80**
45 **km, it will affect the temperature retrieval to some extent between**
46 **80 km and 90 km. Authors may add some discussions on this.**

47 This comment led us to further investigation on this topic. In Fig. 1 we
48 present the radiance distribution along the line of sight (LOS) normalized
49 to the maximum of each LOS. The limit of 80km was previously derived
50 by Fig. 1a. However, investigating the tangent altitudes between 80km and
51 90km reveals that the lower most altitudes are affected by self-absorption,
52 where 50% from the radiance come from the strong signal region around
53 90km. We therefore agree with the referee and adjusted the manuscript in
54 Line 137-144 and in the conclusion in Line 367-369.

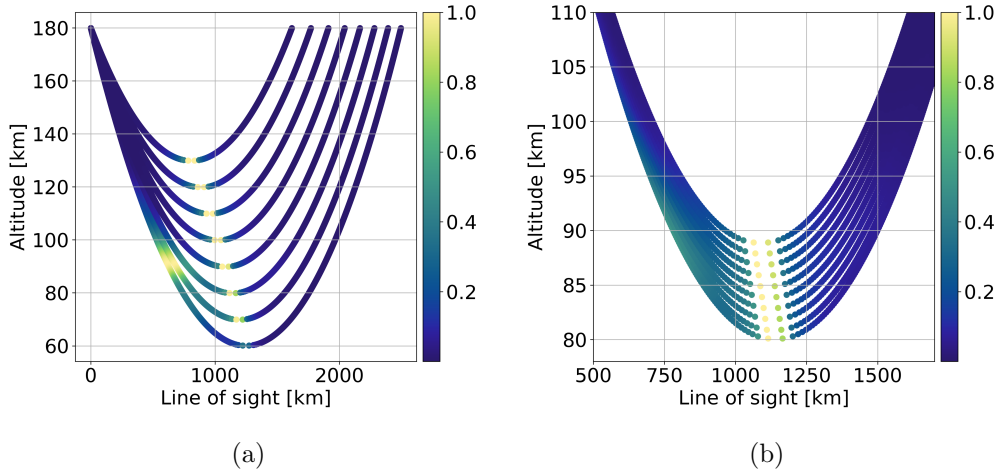


Figure 1: Radiance distribution along the line of sight (LOS) normalized to the maximum of each LOS for (a) selected LOS over the full atmospheric vertical grid from 60km to 180km and (b) a zoom in of the tangent altitudes between 80km and 90km;

55 **Line 228-230: "values ..."** is not clear in this sentence, please con-
 56 **sider to rephrase/complement the sentence.**

57 We reformulated the sentence accordingly in Line 261-264.

58 **Technical comments and typos:**

59 • **Line 18: "...(Vincent (2015))..."** would be **"(Vincent, 2015)"**
 60 **and also in the other indirect citations in the text, e.g., L32.**

61 We changed the text accordingly in Line 18, 44 and 107.

62 • **Line 20: "...summarize..."** would be **"summarized"**

63 We changed the text accordingly in Line 20-21.

64 • **Line 22: "...point out..."** would be **"pointed out"**

65 We added in the text accordingly in Line 22.

66 • **Line 22: "...underline...outlines..."** would be **"underlined...outlined"**

67 We changed the text accordingly in Line 23-24.

- 68 • **Line 45:** "if it it possible..." would be "if it is possible..."
69 We added in the text accordingly in Line 61.
- 70 • **Line 88:** "...a electronic transition..." would be "an electronic
71 transition..."
72 We changed the text accordingly in Line 104.
- 73 • **Line 89:** "..., which" would be "...., and" / "..., where"
74 We changed the text accordingly in Line 105-106.
- 75 • **Line 132:** "...which..." would be "whose"
76 We changed the text accordingly in Line 162.
- 77 • **Line 138:** "...show..." would be "showed"
78 We changed the text accordingly in Line 169.
- 79 • **Line 139:** "...1.4 and 1.6 refers..." to "1.4 and 1.6 refer"
80 We changed the text accordingly in Line 171.
- 81 • **Line 325:** "...decreases..." to "reduces"
82 We changed the text accordingly in Line 370.
- 83 • **Line 326:** duplicated "that" in the sentence
84 We changed the text accordingly in Line 371.
- 85 • **Line 333:** "...affects..." to "affect"
86 We changed the text accordingly in Line 378.

87 References

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