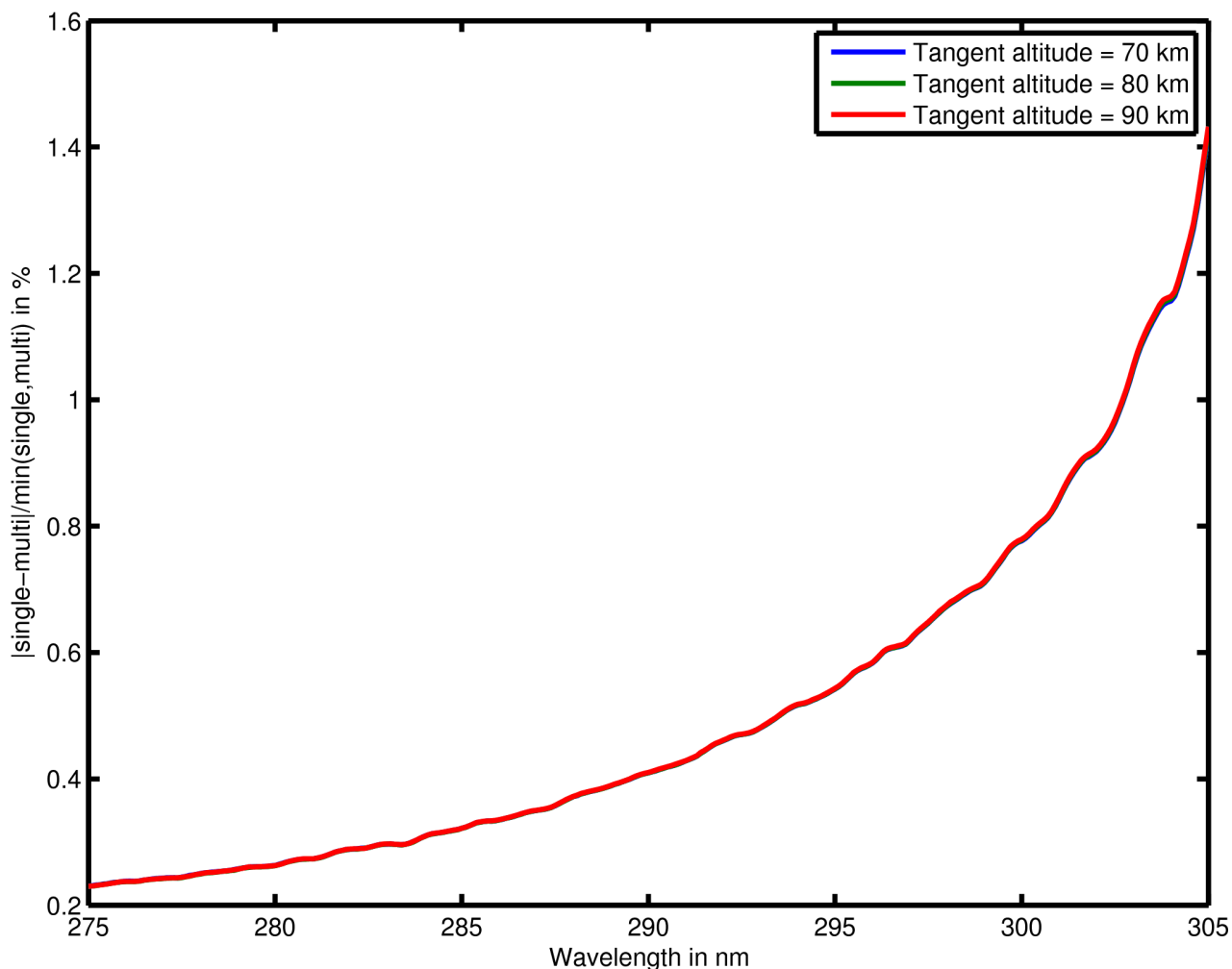


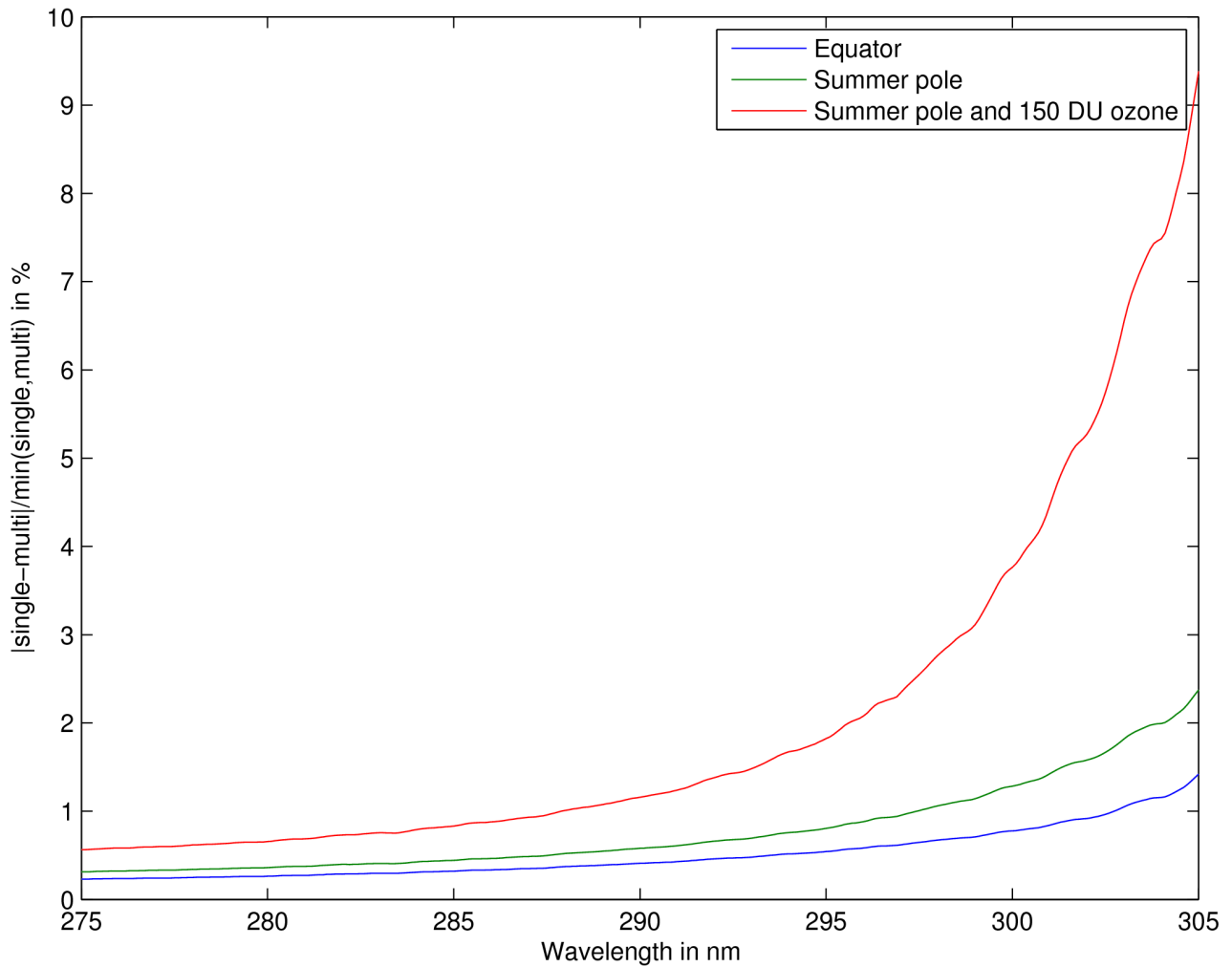
Both Referees suggested a change of figure 2 to a figure comparing multiple and single scattering. We ran different scenarios with SCIATRAN for equatorial conditions as well as summer polar conditions and summer polar conditions with thinner ozone layer of 150 Dobson Units. This was done for 70, 80 and 90 km tangent altitude.

The following figure shows the results of the equatorial scenario for the 3 tangent altitudes. There is nearly no altitude dependence in for the 3 tangent altitudes. This is also not the case for the other scenarios.



The following figure shows a comparison of the 3 different scenarios. Even for the worst case scenario the differences between multiple and single scattering at 285 nm are less than 1% and thus multiple scattering is neglected.

For the paper we exchanged figure 2 with a figure only showing the equatorial scenario, to keep things short and not to have to introduce too many new details.



All other minor corrections have been corrected as suggested..

Detailed list of changes:

Answer to report #1:

( >>**Remarks** and answers)

>>Minor corrections:

>>**4447 Line 25: “90ies” should be 1990s**

Changed as suggested.

>>**4451 Line 20 “pathes” should be paths**

Changed as suggested.

>>**4451 Clarify  $s_a$  and  $s_e$  in Eq 1**

$s_a$  and  $s_e$  are already mentioned in the text.

>>**4480 Fig 2 caption: use commas for clarity with respectively construct**

This has been reformulated.

>>**4452 An RT calculation, for example from SCIATRAN, to show that ozone and multiple scattering are negligible would be much preferable to the discussion here and may render figure 2 unnecessary.**

We changed the figure with a figure showing a comparison of single and multiple scattering with SCIATRAN.

>>**4454 Has this Ring effect linearization been used in the literature before? Is there a reference?**

We are not aware, that this linearization has been used in the literature before. However, figure 4 shows that it works correctly.

>>**4494 Figures 16 and 17 are not specifically mentioned in the text**

These figures are mentioned in line 21 page 4464.

>>**4461 Typo in the least squares equation**

Exchanged x with y on the RHS of the equation.

Answer to report #3:

**>>...2 with a figure showing the effect of ozone and multiple scattering in connection to the >>discussion in the text. I think this would be more convincing. Some suggested minor >>corrections are listed below (see also supplement pdf).**

We exchange figure 2 by a figure showing a comparison of SCIATRAN single and multiple scattering simulations, which show that multiple scattering can be neglected.

**>>Minor corrections:**

**>>Page 4446, line 1: . . .the Earth's atmosphere. . .**

Changed as suggested. Also changed all "earth" to "Earth".

**>>Page 4446, line 5-6: . . .retrieval of metal atom and ion number densities. . .**

Changed as suggested.

**>>Page 4446, line 10: Metal atoms and ions are strong emitters. . .**

Changed as suggested.

**>>Page 4446, line 24-25: The meteoroids ablate. . .**

Changed as suggested.

**>>Page 4446, line 25-26: . . .around 80 to 100 km altitude. . . (to be consistent with the >>rest of the paper).**

Changed as suggested.

**>>Page 4447, line 2-3: The ablated metal atoms may also. . .**

Changed as suggested.

**>>Page 4447, line 25: . . .until the mid 1990s have been. . .**

Changed as suggested.

**>>Page 4451, line 20: . . .absorption paths). . .**

Changed as suggested.

**>>Page 4453, line 21: . . .from this band is negligible small.... "Neglible" is not an English >>word as far as I know. Correct throughout the paper.**

Changed as suggested, at several positions in the paper.

**>>Page 4460, line 15: . . .inverted be  $Kx = y$ , where y represents. . .**

Changed as suggested.

>>Page 4460, line 16: . . .individual measurements, y is a . . .

Changed as suggested.

>>Page 4468, line 17: . . .conditions, like e.g. scattering angles. . .

Changed as suggested.

>>Caption figure 2, line 4: Rewrite to something like “. . .remaining light at 285 nm and  
>>280nm, values of the order of 10<sup>-9</sup> and 10<sup>-14</sup>, respectively, are obtained.”

Changed as suggested.

>>Caption figure 3, line 1, and figure captions in general: This is just my personal opinion,  
>>but avoid having abbreviations in the figure captions without defining them. E.g. for  
>>figure 3, “Fig. 3. Slant column emission (SCE) determination.” Same for SCD, LOS,  
>>  
>>LFS, etc. They are defined earlier in the text and maybe this is enough. . .

Changed in Fig. 3 and (2,8,13.14, 15,16,17,20).

>>Caption figure 4, line 1: remove comma after “line” i.e. . . .285.2 nm line for a limb. . .

Changed as suggested.

>>Caption figure 4, line 4: too many “the”. . .the differences are nearly the same. . .  
Changed as suggested.

>>Caption figure 17, line 2: “. . .center of the line.” or “. . .line center.”

Changed as suggested.

>>Caption figure 17, line 2: something missing between “product” and “solar”. . . maybe  
>>“of”?

Changed as suggested.

>>Caption figure 20, line 5: “so” instead of “that”? . . .the self absorption is so strong, that  
>>the measured. . .

Changed as suggested.

>>Caption figure 30, line 6: . . .the differences drastically rise.  
>>Please also note the supplement to this comment:

Changed as suggested.

>>[http://www.atmos-meas-tech-discuss.net/6/C3078/2013/amtd-6-C3078-2013-  
>>supplement.pdf](http://www.atmos-meas-tech-discuss.net/6/C3078/2013/amtd-6-C3078-2013-supplement.pdf)

Thanks for highlighting the changes.