We appreciate your thorough review and helpful comments. We have accepted all your editorial comments and made corrections in the revision of the manuscript. The following are our one-to-one responses to your comments. ***Please note that our responses will be given in Bold Italic type face.***

General comment from reviewer: This study presents an alternative model of the hotspot correction that was designed to improve numerical computation efficiency. The new formulation then is compared with the conventional hotspot correction approach for the Reciprocal-Ross-Li BRDF model in the VLIDORT package. With the new development, authors also examined the impact of atmospheric scattering on the simulated hotspot behavior as observed from the TOA.

I appreciate that authors provided a detailed and interesting history of the BRDF developments and RTM modeling developments. The manuscript was well written and results were presented with substantial discussions. Although this is an interesting study, the work needs a substantial improvement in its focus and conclusions.

The innovative part of the paper is the presentation of a new hotspot correction formulation (Eq 9) of computational advantage. This formulation is similar to that proposed by Bréon et al. [2002] but replacing scattering angle by sin^x(scatter angle). However, authors didn't provide why the sine function is introduced here.

Answer: We have added the following:
" … by choosing the function with a smooth transition near the hotspot peak and considering that sin (ζ) can be used to replace ζ approximately when the phase angle is small value. We experimented with different powers of this function, finally coming up with the factor x as noted in the text. …

Comparing with other hotspot correction functions, the proposed new function requires less number of streams and Fourier terms to achieve a similar accuracy. How about the computational efficiency? Would this contribute a significant improvement in practical satellite remote sensing algorithms?

Answer: Lorente et al. (2018) found that, in order to reach an accuracy of 10^{-3} over the hotspot region, 720 Gaussian points were needed for the azimuth integration and 300 Fourier terms for the reconstruction of any BRDF in terms of its Fourier components. These figures are impractical for applications using radiative transfer models such as DISORT and Doubling–Adding; in the end, Lorente et al. (2018) used 360 Gaussian points and 100 Fourier terms for their calculations. In VLIDORT (as is also the case with the DISORT model), the computation time **goes roughly as the third power of the number of streams. Since** ***the number of terms used in our hotspot model is more than 10 times less than that specified for the original hotspot model (as shown in the Table 1), there would be a considerable performance gain with the BRDF simulations using RT models such as DISORT, Doubling–Adding and VLIDORT.***

Above Table 1 we added:

"***the computation time* goes roughly as the third power of the number of streams. Since *the* number of *terms used* in our hotspot model *is more than 10 times* less *than* that specified for *the original hotspot model (as shown in the Table 1),* there would be a considerable performance gain with the BRDF simulations**

With the new development, authors examined the impact of atmospheric scattering on the simulated hotspot behavior as observed from the TOA. From several simulation experiments, authors come up 4 major findings that are listed in the Summary and Conclusion section. Three of those findings, however, were demonstrations of previous studies or known physics. That means, they can be demonstrated even without the development of the new hotspot correction function. So, these analysis should not be the focus of this study.

Answer: We revised the phrase "The main findings from our study are" with "These simulations using VLIDORT show that"

505-511: A same set of BRDF weight factors were used for simulations in Figure 7 for various hotspot correction approaches. The results showed the RossThickHT-L (Lorente et al., 2018) approach were higher than other methods due to the lack of the 4/3pi term. Authors concluded that the hotspot peak using RossThickHT-L seemed too high. I don't think it is a reasonable conclusion. Because it is not appropriate to apply a same set BRDF weight factors to different approaches at the first place. Without constraints (fitting with) observations, such comparisons make no sense.

Also, MODIS BRDF products can be only applied to the Ross-Li-Reciprocal model to construct the BRDF, because the retrieval (i.e., observation fittings) were based on this model. Direct application of them to a different model (no matter which hotspot correction for the Ross-Li-Reciprocal model) would have a chance to deviate from the observation constraints.

Answer: We agree with this comment. In the paper of Lorente et al., 2018, the authors obtained the VLIDORT result using an older version of the code, and this result showed the hotspot peak that was smaller than that generated with the other RT models. We think the reason for this lies with a scaling factor difference between the hotspot BRDF equation cited in Lorente et al., 2018 and the equation used in the earlier VLIDORT model. Hence, we have added this simulation results here in order to bring attention to users when using scaling factor data from the MODIS BRDF product.

We agree that there is no need to emphasize this, so we revised this paragraph and removed the sentences that may lead to confusion. We also removed corresponding wording from the abstract and conclusion.

The major finding #2 is not reasonably explained by the authors. The trends of hotspot amplitudes with respect to solar zenith angle at 469 and 645 nm are different from that in the near-infrared; this difference is mainly due to the stronger Rayleigh scattering in the shorter wavelengths, which is more pronounced for longer path length at larger solar zenith angles.

Answer: We agree and have added the following
"… due to stronger Rayleigh scattering at shorter wavelengths, which is more pronounced for longer path lengths at larger solar zenith angles."

Specific comments

Line 81: An expansion is needed for RTLSR at its first appearance.
Answer: This has been added

Figure 8: Should the x-axis be Solar zenith angle?
Answer: The solar zenith angle equals the viewing zenith angle at the exact hotspot point.

Line 514: It might be arbitrary to say "the best model is the ….". How about "the commonly used model is the …"

Answer: We have adopted this wording.