Atmos. Chem. Phys. Discuss., 15, C11499–C11501, 2016
www.atmos-chem-phys-discuss.net/15/C11499/2016/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comprehensive tool for calculation of radiative fluxes: illustration of shortwave aerosol radiative effect sensitivities to the details in aerosol and underlying surface characteristics" *by* Y. Derimian et al.

Anonymous Referee #1

Received and published: 13 January 2016

This manuscript reports a systematic assessment of uncertainties in the aerosol direct radiative effect associated with assumptions and simplifications of both aerosol and surface properties, including aerosol scattering phase function, particle shape, and surface reflectance. The assessment was done with a rigorous yet computationally fast tool – GRASP and for several types of aerosol. Although the issues examined here have been touched in some previous studies (references are appropriately cited), this study has its own merit because it represents a systematic evaluation of uncertainties in the aerosol direct radiative effect associated with the assumptions and simplifications

usually made in the community. Some assumptions can cause large uncertainties or even systematic errors, which the community should be aware of at least. The study also shows an application of GRASP system to calculate dust aerosol direct radiative effect in Sahara desert with POLDER/PARASOL data. I recommend the paper be published in ACP after some issues (mainly minor as listed below) are addressed.

Specific comments:

In Figure 13, I would suggest to add the domain average of each variable. It is also helpful if two additional panels are added to show the radiative efficiency (direct radiative effect per AOT at 565 nm) at TOA and BOA.

The paper is well written in general. But there are several places where additional attention is necessary to give a clearer presentation, including:

1. p.33446, line 9: please define radiative efficiency here.

2. p.33447, line 6: add “radiative” immediately after “negative”.

3. p.33447, line 9: “upward” is better than “backward”.

4. P.33447, line 19: Is “contract” a right word?

5. P.33448, line 7: add a reference: Yu et al., A review of measurement-based assessments of the aerosol direct radiative effect and forcing Atmos. Chem. Phys, 6, 613-666, 2006.

6. P.33448, line 8-11: awkward sentence.

7. P.33448, line 28: using “a combination” to replace “combining”.

8. P.33450, line 15: AOT appears first time here. Spell it out.

9. P.33450, line 14: “the strength of the overestimation”, and “the strength of the uncertainty” throughout the paper. Is it better to just use “magnitude” instead of “strength”?

10. P.33458, line 3-5: I don’t understand this sentence.

ACPD
15, C11499–C11501, 2016

11. P.33461, line 10: should “then” be “than”?

12. P.33463, line 22: “spheres are generally scatter stronger in. . .” ???

13. P.33469, line 11: “free” should be “three”?

14. P.33469, line 14: “an important number of”. . . Is it better using “a significant number of”?

15. P.33469, line 16-17: “in the presented here theoretical calculations” what do they mean?

16. P.33470, line 2-3: again what do you mean by saying “from the presented here theoretically calculations”?

17. P.33470, line 19-21: “Especially strong . . ..by aerosol and underlying surface reflectance”. It is not quite clear to me what they mean here.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 33445, 2015.

ACPD

15, C11499–C11501, 2016