Review on "*Aerosol direct radiative effect over clouds from a synergy of OMI and MODIS reflectances*" by de Graaf et al.

I had three major concerns/questions for the original manuscript. The first is about the anisotropy factor, the second is about why OMI and MODIS observed cloud reflectances differ significantly when their overpassing time is only 15 minutes away, and the last question is about the sampling rate of method described in this paper for deriving DRE of above cloud smoke. The authors have addressed these major concerns/questions carefully and thoroughly.

However, I still have a few minor questions and comments left. They have to be addressed before the manuscript can be accepted for publication.

- Even in the revised manuscript, the definition of the DRE derived from the combined OMI-MODIS observation is still not clear and precise enough. As pointed out in *[Zhang et al.,* 2016], the all-sky DRE of aerosol is defined as $DRE_{all-sky} = f_c \overline{DRE_{cloudy}} + (1 - f_c)\overline{DRE_{clear}}$, where f_c is the cloud fraction, $\overline{DRE_{cloudy}}$ and $\overline{DRE_{clear}}$ is the averaged cloudy-sky and clear-sky DRE, respectively. Take a hypothetical example. Assuming that we have an OMI-MODIS pixel with a cloud fraction $f_c = 0.5$. The $\overline{DRE_{cloudy}}$ due to above-cloud smoke is 40 Wm^{-2} and $\overline{DRE_{clear}}$ is 1 Wm^{-2}. Which of the following values does the method described in this paper reports? 1) $\overline{DRE_{cloudy}}$=40 Wm^{-2}, 2) $f_c\overline{DRE_{cloudy}}$=0.5*40 Wm^{-2}=20 Wm^{-2}, or 3) $DRE_{all-sky}$=20 Wm^{-2} +0.5*1 Wm^{-2}=20.5 Wm^{-2}. This question should be clarified early in the paper, for example, in Section 2. It is an important question because the answers will help the readers understand precisely the meaning of the DRE from this study, as well as how to compare the DRE from this study with previous ones such as *[Zhang et al.,* 2016].
- Another question, which is related to the question above, is about how to scale the OMI spectrum to match MODIS observation. If I understand correctly, the reflectance of a cloudy pixel observed by OMI can be decomposed into $R_{OMI} = f_{c,OMI}R_{cld+aer} + (1 - f_{c,OMI})R_{clr}$. Similarly, the reflectance observed by MODIS is $R_{MODIS} =$

$f_{c,MODIS}R_{cld+aer} + (1 - f_{c,MODIS})R_{clr}$. It is not clear to me what the "scaling" in section 3.5 means. Is the "scaling" intended to match R_{OMI} and R_{MODIS}? What is the "scaling" factor and what is its physical meaning? These questions are important, and they need to be clarified in the context of the above equations.

- Page 2 line 20, there are a few noteworthy previous studies on the DRE of above cloud aerosols that might deserve being cited here, e.g., *[Peters et al.*, 2011; *Feng and Christopher*, 2015; *Zhang et al.*, 2016] *and a very recent study [Kacenelenbogen et al.*, 2019]. Some discussion should be made about the originality and significance of the current study w.r.t. these previous studies as well as those from the leading author.

- Page 4, equation (3), again what is the exact definition of DRE_{aer} here? See my first and second questions above.

- Page 7, similarly, what is the DRE derived from *SCIAMACHY?* Is it $\overline{DRE_{cloudy}}$, $f_c\overline{DRE_{cloudy}}$ or $DRE_{all-sky}$?

- Page 10, line3, "*and 0.35 in the red pixel*". Should it be "*and 0.35 in the blue pixel*"

- Also, what does FRESCO stand for?

Feng, N., and S. A. Christopher (2015), *Measurement-based estimates of direct radiative effects of absorbing aerosols above clouds, Journal of Geophysical Research-Atmospheres*, *120*(14), 2015JD023252–n/a, doi:10.1002/2015JD023252.

Kacenelenbogen, M. S. et al. (2019), Estimations of global shortwave direct aerosol radiative effects above opaque water clouds using a combination of A-Train satellite sensors, *Atmospheric Chemistry and Physics*, *19*(7), 4933–4962, doi:10.5194/acp-19-4933-2019.

Peters, K., J. Quaas, and N. Bellouin (2011), Effects of absorbing aerosols in cloudy skies: a satellite study over the Atlantic Ocean, *Atmos. Chem. Phys*, *11*, 1393–1404.

Zhang, Z., K. Meyer, H. Yu, S. Platnick, P. Colarco, Z. Liu, and L. Oreopoulos (2016), Shortwave direct radiative effects of above-cloud aerosols over global oceans derived from 8 years of CALIOP and MODIS observations, *Atmospheric Chemistry and Physics*, *16*(5), 2877–2900, doi:10.5194/acp-16-2877-2016.