Dear referee:

Thank you for providing these insights. We appreciate the time and effort you and each of the reviewers have dedicated to providing insightful feedback on ways to strengthen our paper.

The following is a point-by-point response to the specific comments:

1. radiation transfer model, or radiative transfer model? Please check which is better. I think the words "radiative transfer model" are better.

RESPONSE: We agreed with your assessment that the words "radiative transfer model" are better. We will change the words in the revised manuscript.

2. L121, the cloud particle size distribution in this paper is

$n(r) = c/r \exp[-(\ln r - \ln r_0)^2 / (2\delta^2)]$

While the Nakajima and Nakajima (1995), the n(r) is:

$n(r) = N / (\sqrt{2\pi}\, \delta) \exp[-(\ln r - \ln r_0)^2 / (2\delta^2)]$.

Why your eq. for the first term contains "r", while the Nakajima's is "N"?

Nakajima, T.Y., Nakajima, T., 1995. Wide-Area Determination of Cloud Microphysical Properties from NOAA AVHRR Measurements for FIRE and ASTEX Regions. Journal of the Atmospheric Sciences.

RESPONSE: The "N" in Nakajima and Nakajima (1995) means total particle number, which is an arbitrary constant.

While the equation used in L121 of our manuscript is originally based on Nakajima and King (1990), in which "C" is a constant.

Both equations show the same lognormal distribution function for cloud particle size distribution.

Of course, the particle size distribution is considered in the calculation of the COT in CAPCOM. However, the particle size distribution is just used as a relative value to perceive the frequency dependence of the optical thickness. The COT is not directly calculated from the particle size distribution.

Nakajima, T. and King, M. D.: Determination of the optical thickness and effective particle radius of clouds from reflected solar radiation measurements. Part I: Theory, J. Atmos. Sci., 47, 1878–1893, doi:10.1175/1520- 0469(1990)047<1878:DOTOTA>2.0.CO;2, 1990.

3. L160, the reciprocal of dL/ ð ð is ð ð /dL, not dt/dL. Please check it.

RESPONSE: We have checked the line and confirmed that dt/dL was a mistype. We will fix it in the revised manuscript.

4. L195, where is the Fsw from? Please give the reference. And what's the S0, n, k mean in Eq. (5)-(11)?

RESPONSE: Eq. (5) is used to represent a theoretical relationship between shortwave radiation (Fsw), solar constant (S0), cloud cover (n), and the change of cloud albedo ($\Delta\alpha$).

Since the optical thickness of the gas-only atmosphere is approximately 0.2, the changes in global mean shortwave radiation according to $\Delta\alpha$ can be expressed as Eq. (5).

Eq. (9) is also a theoretical relationship that can be found in Brenguier et al. 2011, and "k" equals to 3/2.

We will add the explanations about S0, n, k as well as the reference to the revised manuscript.

Brenguier, J. -L., Burnet, F., and Geoffroy, O.: Cloud optical thickness and liquid water path – does the k coefficient vary with droplet concentration? Atmospheric Chemistry and Physics, 11, 9771-9786, doi:10.5194/acp-11-9771-2011, 2011.

5. L209, Eq. (13) presents the relation between Fsw and CDR, if CDR decreased by 10%, Fsw would decrease by about 4.2Wm-2. So, what the relationship between Fsw and COT? I want to know that how COT changes, resulting Fsw changes?

RESPONSE: From Eq. (11) in L204 we can know that when W is a constant ($\Delta W = 0$), then

$$\frac{\Delta\tau}{\tau} = -\frac{\Delta r_e}{r_e},$$

and we can rewrite Eq. (13) as

$$F_{SW} = 343 \times 0.6 \times 0.81 \times 0.51 \times (1 - 0.51) \times \frac{-\Delta r_e}{r_e} = -42 \times \frac{\Delta\tau}{\tau}.$$

So, if COT increased by 10%, then Fsw would decrease by about 4.2 W/m^2.

6. The CAPCOM can used for retrieval of COT, CER, and CTT or CTH. The authors investigated the smile error on COT and CER, how about the CTH?

RESPONSE: In CAPCOM, CTH is determined by comparing CTT with temperature vertical profile T(z), which is from global objective analysis data. Therefore, the error of CTH is ascribed to the error of CTT, directly.

Since this paper centers on discussing the smile effect on COT and CDR, we did not talk much about CTH or CTT. We believe that the error in CTH (CTT) is expected to be small, at least to have little effect on the shortwave radiation budget. This is because CTT is related to the emissivity determined

by the cloud characteristics, and the emissivity does not fluctuate so much, so we believe that the smile effect does not affect the CTT very much.