

## ***Interactive comment on “Impacts of solar-absorbing aerosol layers on the transition of stratocumulus to trade cumulus clouds” by Xiaoli Zhou et al.***

### **Anonymous Referee #2**

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#### General Comments:

This study performs a comprehensive investigation of the impact of solar-absorbing aerosol and moisture on the Stratocumulus-to-Cumulus Transition of lightly and heavily drizzling clouds. By using large-eddy simulation, it is indicated that the overlying aerosol can substantially modify the stratocumulus due to an increase in the number concentration of cloud droplets induced by entrained aerosol. Meanwhile, the impacts of additional moisture in aerosol layer are also investigated. The results are generally well presented and structured, and the topic is suitable for publication in Atmos. Chem. Phys. after addressing some specific comments listed below.

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### Specific Comments:

In the baseline and further simulations, ammonium sulphate are assumed to be uniformly distributed vertically. Since it is a typical anthropogenic aerosol and mainly formed near the surface, its concentration is more likely to decrease with height through the troposphere. Thus, it would be better to characterize its vertical distribution according to climatological profile that provided by pre-existing long-term simulation using chemical transport model or available observations.

Several parallel numerical simulations are conducted to isolate the microphysical effect, semi-direct effect and direct effect of aerosols. Using an additional table in Sect. 2 to illustrate the numerical experiment design and how these aforementioned effects are derived based on these simulations may help clarify the link and difference.

Another issue is that the input of meteorological conditions and the characteristics of aerosol layer are derived from different locations, northeast Pacific Ocean and south-east Atlantic, respectively. Using the observations in the same region could make this work more practical and representative.

### Technical Corrections:

Page 8 Line 155: Some basic information like initial time and spin-up duration need to be specified here. It would help to understand the following figures since the x axis are relaxation time.

Fig.1 and 2: It would be more clear to label the local time in the x axis.

Line 199: It is better to use “model top” rather than “domain”.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-255>, 2017.

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