Atmos. Chem. Phys. Discuss., 15, C8899–C8901, 2015
www.atmos-chem-phys-discuss.net/15/C8899/2015/

Atmospheric Chemistry and Physics Discussions

Open Access

ACPD

15, C8899–C8901, 2015

Interactive Comment

Interactive comment on "Investigations of boundary layer structure, cloud characteristics and vertical mixing of aerosols at Barbados with large eddy simulations" *by* M. Jähn et al.

Anonymous Referee #2

Received and published: 3 November 2015

The manuscript presents a large-eddy simulation of boundary layer structure and vertical profiles of cloud and aerosols at Barbados. The manuscript overall shows very good quality of work. The figures and tables are well presented. However, some re-organization and more elaborations (with literature survey) are recommended, so readers would not be lost in the equations/numbers and can appreciate more about the physics presented in the analysis.

1. Equations/numerics. It appears that cell purtubation method is something interesting of this manuscript. If so, I would recommend authors to focus on this part in section 2, while put only a brief description of other parts of the model in the main text to keep

the text flow. Details of equations/numerics can be put in the appendix.

2. There are quite a few papers on the Saharan dust layer transporting to Barbados, as well as their radiative effects on local temperature and surface energy budget. These papers should be summarized and linked to the numerical simulations here, so that readers can see the link of simulations with the 'real world'.

(1) Section 3.3, 'dust layers arrive at Barbodos having mean base height of about 1.5-2 km asl'. Need a reference for this. Studies in Puerto Rico Dust experiment actually showed that mean dust extinction peaks below 1 km asl (as supported by Figure 10 in the following paper. Authors should acknowledge this difference.

Wang, J. et al., 2003, GOES 8 retrieval of dust aerosol optical thickness over the Atlantic Ocean during PRIDE, J. Geophys. Res., 108(D19), 8595, doi:10.1029/2002JD002494.

(2) Figure 4. This is a very idealized case, which is perhaps ok for large-eddy simulations. however, authors should acknowledge that dust layer has an important effect on solar energy budget. Again, during the PRIDE, it was found that dust layers can affect both long wave and shortwave radiation up to 80Wm-2 (Figure 4 in the following reference). Hence, treating dust aerosols as a passive tracer without allowing any radiative feedback have caveats, and authors should acknowledge this in the manuscript.

Wang, J. et al. (2004), GOES-8 Aerosol optical thickness assimilation in a mesoscale model: Online integration of aerosol radiative effects, J. Geophys. Res., 109, D23203, doi:10.1029/2004JD004827.

(3) vertical distribution of cloud and dust layers. There is common to see boundary layer clouds over islands surrounded by oceans. This review wonders if authors can present a figure showing the vertical distribution of dust and clouds. Reliable simulation of the relative position between aerosols and clouds is important to understand aerosol radiative effect. For an example, in the maritime continents in Asia, Ge et al. found that

ACPD
15, C8899–C8901, 2015

Interactive Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

smoke aerosols above clouds can lead to more warming, and how the vertical distribution of smoke is regulated both by boundary layer process and land/sea breeze,and radiative feedback, and therefore, have a clear diurnal cycle. Dust particles are similar as smoke particles that they absorb solar radiation, and so their vertical distribution in PBL and with respect to clouds are very important. These points can be acknowledged in the abstract as to why we need to simulate the cloud & aerosol vertical distributor correctly in the model.

Ge, C. et al. (2014), Mesoscale modeling of smoke transport over the Southeast Asian Maritime Continent: coupling of smoke direct radiative feedbacks below and above the low-level clouds, Atmos. Chem. Phys. ,14, 159-174.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 22637, 2015.

ACPD

15, C8899–C8901, 2015

Interactive Comment