Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-656

Anonymous Referee #1

Referee comment on "Subgrid-scale horizontal and vertical variation of cloud water in stratocumulus clouds: a case study based on LES and comparisons with in situ observations" by Justin A. Covert et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-656-RC1, 2021

This relatively straightforward paper uses LES of stratocumulus forced by the VARNAL dataset during ACE-ENA to quantify the vertical variations in the autoconversion enhancement factor (E) and diagnose what causes those variations. The results regarding the vertical variations in E are consistent with observations published previously. The authors find that, in fact, the adiabatic increase in cloud water is the primary source for increasing E at cloud base whereas at cloud top entrainment effects on the cloud water variance have an important effect on E. They conclude that these vertical variations are important to prescribing enhancement factors in low-resolution global models. The data and methods are both appropriate and clearly described. The presentation is of high quality. I have only minor comments listed below.

Fig 1 caption: KZAR -> KAZR.

Fig 1: You should mention in the caption or add a legend for what read squares and blue dots correspond to.

Page 5, Line 145: this -> these

Page 6, line 159: I don't think peaks is the right word here. It is a minimum. '*E is seen to first decrease from cloud base upward until it peaks at around 1 km (i.e., hleg 7), and then increase slightly toward cloud top*'

Page 7, line 197: '*The moisture profile seems to better represent the inversion structure compared with the potential temperature structure, which is more diffuse*'. It is not at all clear what is meant by this statement. What is diffuse? How do you judge this representativeness? Also the statement doesn't seem important to your narrative. Either clarify what is meant or just get rid of it.

Discussion and Conclusions: Most global models will not resolve the vertical structure of a typical stratocumulus. Can you speculate a bit on the relevance of your results to the relevance of global models that don't resolve the kind of structure you show here.