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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Parameterizations for convective transport in various cloud-topped boundary layers" *by* M. Sikma and H. G. Ouwersloot

Anonymous Referee #1

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The authors have performed LES for various cloud-topped boundary-layers. Through regression of the data they propose improved parametrizations for the cloud core fraction, the cloud core velocity (function of the Deardorff convective velocity scale) and the core tracer concentrations at cloud base.

These results are of interest to the community and the graphical representation is well done. However, i have three main reservations for the paper

-the 'old' school (and the Reviewer belongs to this) believes it is much more accurate and physically consistent to estimate the mass flux directly, e.g. as function of the

surface buoyancy flux), instead of estimating it as a product of two fitted quantities. This requires further analysis -the manuscript is a bit 'thin' in novelty and the authors should make clear what is actually new -the discussion of the parametrization needs and status in large-scale models is in parts a bit superficial also it is not clear how useful and for whom is in practice the relation for the core fraction of the species: eg in forecasting using a mass flux scheme these values are estimated from lifting parcels from near the surface with a certain excess values applying some strong entrainment

Therefore the manuscript requires major revision. A few specific points follow

-page 3, line 12 :('50-200 km)' NWP and GCMs run nowadays at 10-200 km globally and 1-2 km regionally

-page 3, lines 15-25: revise. Adjustment schemes do not transport mass as such, but adjust (relax) the thermodynamic profiles toward a moist adiabat. Please revise references herein as this is all quite inaccurate and obsolete including what you say about diffusive transport. You might have a look in the document below which summarizes also how mass flux schemes work in NWP and how tracer transport is done and also what are adjustment schemes and useful references

http://old.ecmwf.int/newsevents/training/lecture_notes/LN_PA.html ("Atmospheric moist convection")

-page 4, line 15;'In contradiction' there is no contradiction, use different wording

-page 6, Eq (2): A mass flux should always include the factor rho (density) and have units kg/(m2 s)

-page 13, lines 5-8 and page 16 lines 6-7: you give references and say 'global models that use the parametrization of ... overestimate the mass transport'. None of these models computes mass transport using cloud fraction but directly estimates the mass flux! wrong references/literature for that problem

-page 14, eq (12): This formulation can produce negative values in principle, robust?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 10709, 2015.