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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Properties of young contrails – a parametrisation based on large eddy simulations" *by* S. Unterstrasser

Anonymous Referee #2

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Review of "Properties of young contrails – a parametrisation based on large eddy simulations" by S. Unterstrasser

This study develops a parametrisation of young contrail depth and ice crystal number for incorporation in larger scale models. The proposed parametrisation is based on the evaluation of a Large Eddy Simulations dataset, previously described in other two recent studies (Unterstrasser 2014; Unterstrasser and Goersch, 2014). Contrails in general, and contrail-cirrus in particular, are probably the largest aviation climate forcing and remain its largest source of uncertainty. Improving contrail parametrisations for global circulations models is therefore still needed and this study can potentially bring an important contribution to that effort.

The paper is generally well-written and I think it is an important piece of work. How-

ever, my main concern is that, at least in the present form, the paper does not bring the substantial scientific contribution of an ACP research article and would therefore be more suitable as an ACP technical note or as a Geoscientific Model Development paper.

If the paper is to be kept as a research article, then a major revision would be needed to add a stronger emphasis on the Applications and Discussion sections. There is a number of ways in which this could be achieved, a couple of possible suggestions being the following:

1. A great advantage of this proposed parametrisation is its relatively simple analytic form, which makes it particularly suitable for large scale models. It would be very interesting to quantify how large an effect it would have on current best estimates for contrail cirrus coverage and radiative forcing, maybe by incorporating it in the (Burkhardt and Kaercher, 2009) parametrisation. Also, to what extent is this new parametrisation likely to reduce the uncertainty currently associated with contrail cirrus forcing?

2. The point that current studies focusing on mitigation options through the use of biofuels might overestimate the effect of biofuel if they neglect vortex phase processes is probably the main scientific conclusion of the paper in its current form. It might be interesting if this analysis could be expanded.

Minor specific comments:

- it is stated at page 28941, lines 22-23 that the new parametrisation covers a much larger parameter space than the one in (Unterstrasser, 2008) and is therefore more universal. Is it possible to include somewhere in the results section a quick comparison between the two for a case covered by both parametrisations?

- page 28944, lines 20-23: please add a sentence on how representative is this large LES dataset

- the use of the “U2014” and “UG2014” abbreviations should be revised for consistency

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- page 28957, line 23: “subtleties”, not “subleties”

- page 28960, line 18: please clarify what does 1.65+-0.23 represent (is it a factor?)

- page 28960, lines 20, 25: “analogous”, not “analogeous”

- page 28961, line 9: “importance, which has been”, not “importance, which have been”

- page 28966, line 4: “usually not all of them”, not “usually not all them”

- Fig. 3 legend states that panels (a) and (b) are as in Fig. 2. It should be clarified what is meant by this, considering that they have different X and Y axes.

- Fig. 4: please clarify the exact meaning of “9 down”, “5 down”, “5 up” and “11 up”

- Fig 5: E_obs should be explicitly defined in the caption

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