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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Selected topics on interactions between cirrus clouds and embedded contrails" *by* K. Gierens

R. C. Miake-Lye

rick@aerodyne.com

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This manuscript is a timely and well written account of several short analyses that give insight into the interactions between contrails and cirrus clouds. The chosen topics are those which are directly amenable to analysis, and can provide useful insights. Several of the topics seem to be "intuitively correct", yet haven't been quantitatively analyzed before (to my knowledge). However, at least the last topic is probably not easily anticipated, and has some interesting and useful consequences. I recommend publication, but include a few comments that might further improve an already useful and instructive set of analyses.

Section 2: The effect of cloud contributions to the EI H2O is estimated to be on the

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order of a percent and to be negligible. A useful contrast would be to show the variation in EI H2O for a reasonable range of fuel H/C ratios: easily over 1% (e.g. 1.22 to 1.25 ... to 1.27 in various "standard" jet fuels I've seen analyzed). Bio-derived fuels can be even more different from the average value quoted!

End of Section 4: Comment is made that the "reaction of the cirrus ice to changing saturation is much too slow to retard the sublimation of the contrail ice". This argument is definitely technically correct. However, wouldn't a more useful perspective to say it "the other way around"? That is, that the smaller contrail particles – being smaller, less mass per particle, more surface area per mass – come into equilibrium with the subsaturated vapor pressure faster, and that the larger cirrus ice is thus affected less (slower). Almost a semantics point.

Section 5: After equation 19: "The fall speed of the contrail crystals has been neglected ..." Contrail particles do sediment in some situations. Might be useful to state why that is not of concern for embedded contrails. Or is it potentially of concern and just not covered in this analysis?

Section 6: Summary: "prooemium"? I assume "premium", but even there the wording is a bit awkward. (Perhaps this is a succinct German phrase that doesn't translate perfectly?) I understand what is meant, I think, so maybe it is fine as is with "premium". I guess my version would be "In lieu of more elaborate numerical studies (ref), I have simply and efficiently treated several ..." but that is not as succinct.

Also, the reference given in that sentence at the beginning of Section 6 is not in the reference list. Are the authors reversed, perhaps? If so the date is wrong. Maybe an other reference is needed? And the last sentence of Summary alludes to "the topic of another paper". Is this sentence referring to the same "elaborate numerical studies" mentioned earlier? If so the reference could be repeated here.

These are all minor comments and I look forward to seeing the publication of these nice, concise analyses.

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