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***Interactive comment on* “A climatology of formation conditions for aerodynamic contrails” by K. Gierens and F. Dilger**

Anonymous Referee #1

Received and published: 25 July 2013

Recommended Disposition

The manuscript can be accepted with minor revisions.

Summary of Paper

The authors present a theoretical climatology of aerodynamic contrail (and persistent aerodynamic contrail) formation based on a year of reanalysis data. Most visible aerodynamic contrails are expected to form between 540 and 250 hPa, and the most important parameter determining their formation is the ambient temperature rather than relative humidity. The authors argue that aerodynamic contrails are likely to have a much smaller climate impact than exhaust contrails on current climate, although their effects may become more important as air traffic increases in the tropics.

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General Comments

The paper is carefully written and is clear and concise. Aerodynamic contrails (AerC) are precisely defined to exclude any aerodynamically-induced cloudiness below typical cruise levels, and the atmospheric conditions for aerodynamic contrails are clearly stated. The expected distribution of AerC (both visible and persistent) is described thoroughly, and compared with the distribution of exhaust contrails to assess their relative climate impact.

I have no serious objections to the manuscript in its current form. It is well written and succinct. One possible objection to this paper would be that it lacks much practical significance. I have been told more than once that exhaust contrails are too unimportant to be of interest, so I can only imagine how those critics would react to a paper about aerodynamic contrail climatology. However, this is an original avenue of research and I believe this manuscript is appropriate for publication, as it is important to determine what possible impacts mankind may have on climate, even though they may appear at first glance to be unimportant.

I do request, however, that the authors increase the size of the lettering in the colour bars in Figs. 3, 4, 6, and 7. They are much too small to be read easily.

Specific Comments

Page 14669, lines 11 through 15: It is not clear to me why the lack of water vapour concentration by itself would make (visible) aerodynamic contrails rare, and not make exhaust contrails rare also. It may be better to say here that unlike exhaust contrails, visible aerodynamic contrails are formed completely from the ambient humidity, thus are more dependent on a sufficient humidity to form. Even so, I'm not sure how much the addition of moisture from the exhaust makes exhaust contrails more likely to be visible than aerodynamic contrails.

Pages 14689 through 14693: The size of the lettering on some of the labels and colour

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bars are much too small for easy reading, especially Figures 3, 4, 6, and 7. Please resize the lettering for those of us with older eyes. :-)

Typographical errors and minor objections

Page 14668, line 16: Change "believe" to "belief".

Page 14668, line 25: Delete the word "even".

Page 14676, line 2: Change "to get visible" to "to become visible".

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 14667, 2013.

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