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**Geoscientific
Model Development
Discussions**

# *Interactive comment on* "Modeling and computation of effective emissions: a position paper" *by* R. Paoli et al.

**Anonymous Referee #3**

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This paper reviews existing methods of evaluating NOx processing in aircraft plumes and their implications for changes in atmospheric composition on a global scale. It does not contain any new results/methods/models. However, this may be acceptable for a good review paper. I recommend to publish it in this journal after major revision according to my comments below.

1. My major concern: I am not convinced that plume processing of aircraft NOx emissions is important for aviation climate impact. The authors know very well that aviation climate impact is the main driver for this research. The O3 change from aircraft NOx emissions is only an intermediate step along these lines. Also, more discussion with related changes in CH4 is necessary. It is pity that the authors did not extent their review to radiative forcing (RF) by O3 and CH4 caused by the plume photochemical



processes. My very crude estimate of the plume processing of aircraft NOx emissions shows the value of about 1 mW/m2 (assuming 5% effect in O3 averaged over the globe according to Figure 19 and aviation O3 RF of 26 mW/m2 (Lee et al., AtmEnv., 2010)). If a half of this RF is compensated by the negative RF from CH4, we deal with a small effect on the global scale. I really would like to see the authors' estimates of the plume processing in terms of globally annually RF instead of O3 change at selected altitudes. If my crude estimate will be confirmed, I will argue that the plume processing of aircraft NOx emissions plays a minor role in aviation impact on climate.

2. Conlusions should be completely re-written. I suggest to include a Table summarizing each of the existing methods with their key assumptions, equations, references, and, most impotant, strengths and weaknesses. Is it possible to validate these methods? If so, how? Did we miss any other important non-linear plume processes which could be important on the global scale? Some heterogeneous chemistry? Since the authors want to show their position on this subject, it will be useful to have a really critical review of existing publications (and not just their very polite summary). Conclusions should also provide recommendations for possible future studies (if the authors think that this topic is important) including their validation.

3. I suggest to modify the title of the paper as follows: "Review of aircraft effective emission modeling". I don't like "...:a position paper" since it has a political smell or at least the authors should be more critical in their review.

4. Important legal question: Since the authors borrowed all Figures from other publications from copyright-protected journals, did they get a permission to reproduce them here?

5. Since there are many acronyms and many equations, I suggest to add the Section "Acronyms" (and list all used acronyms there) and reduce the number of equations by leaving only important ones.

6. I am surprised that the authors did not quote the following references: IPCC Spe-

cial Report on Aviation and the Global Atmosphere (1999), Sausen et al. (MetZ., 14, 555, 2005), and Lee et al. (AtmEnv.,44, 4678, 2010). Are conclusions of this study consistent with those in these assessments? Do we see a good progress in estimating importance of the NOx emission plume processing during last decade? What should be done in future on this front?

7. Kraabol et al. (2002) concluded that plume processing of NOx emissions are important for global O3, while Vohralik et al. (2008) and Meijer et al. (2000) reached the opposite conclusion. Can the authors tell who is right and why?

8. Paper by U.Schumann et al. (Atm.Env., 32,3097-3103, 1998) is very relevant for discussion of the plume dilution.

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