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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of the actual weather situation on non-CO_2 aviation climate effects: The REACT4C Climate Change Functions" *by* Christine Frömming et al.

Anonymous Referee #2

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The paper address non-CO2 climate impact of aviation, quantifies and presents climatology of these effects for the North Atlantic and discuss possibilities for mitigation of these impacts through alternative routing. This is a very complex scientific question relevant for ACP, also very topical as the non-CO2 climate impacts, if unresolved, makes it difficult for the aviation sector to achieve the Paris agreement targets. The paper present results of model simulations where the local aircraft emissions are followed in a global ECHAM5/MESSy Atmospheric Chemistry model system on Lagrangian trajectories. There are several novel modules developed within the model system associated with these calculations which have been published and are cited as accompanying papers, the most important Grewe et al. (2014) and Rosanka et al. (2020). While Grewe

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Discussion paper

et al. (2014) presents results for 1 case (weather situation), this paper presents results for a number of situations under winter and summer season which allows for more general conclusions based on thousands of simulated trajectories and their complex analysis. These papers represent an impressive piece of work which gives a new insight in climatology of non-CO2 climate effects of aviation and I would like to congratulate the authors to this achievement. Before recommending the paper for publication, I would however like to draw their attention to the following issues: The methods and assumptions in the paper are extremely complex and described in many cases rather briefly with references to other papers. This makes it rather difficult to follow and assess the methodology. I would recommend including more comprehensive and systematic description of the methodology which would give clear idea about how the crucial processes are treated in the model simulations performed for this paper. Even when going to the references I could not follow how the chemistry of the 'multitudes of background trajectories' which the local emission trajectory is mixed with is calculated, recommend explanation of this part in particular. After reading the papers describing the tagging mechanism for quantification of impact of studied emissions, I would like to ask if the non-linear plume effects on ozone formation from NOx emissions, or rather on NOx removal, are considered in some way and, as this has been subject of scientific discussion under quite a long time, what impact these effects have or could have (in case they were not considered). Specific comments: Fig. 2 – Potential contrail coverage for the representative weather situations – what is the figure showing – mean over certain time period of each weather situation? Supplement – Caption or some explanation to the figures is missing

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