Answer to Reviewer #1:

The article estimates the increase in contrail cirrus radiative forcing (RF) between 2006 and 2050, separating the contributions from the increase in air traffic and cruise altitude, reduction in soot emissions, and background meteorology differences linked to future climate change. The results report an RF increase by a factor of 3 with a relatively modest reduction (15%) from a 50% soot number emissions decrease, concluding that the increase in RF linked to traffic growth (factor of 4) cannot be counterbalanced by improvements in propulsion efficiency and soot emissions.

The manuscript addresses a relevant topic, providing guidance for attribution and mitigation options for the contribution of the aviation sector to climate change. The methodology is sound and based on a tested model and all the sections of the manuscript are clearly presented in a logical way. The manuscript definitely fulfils ACP's standards, and is unreservedly recommended for publication. Only very minor suggestions are made that I hope will improve the clarity and interpretation of the results.

Thank you for your very positive judgement and for comments.

Specific suggestions:

Pg 4 ln 22: It would probably be useful to expand on the magnitude of the future flight altitude shift and add a reference. This will enable the reader to get a sense of the sensitivity of your model to such changes.

This is a very good point but unfortunately the information on the shift that we were able to acquire is limited. We received the data set horizontally gridded and with relatively low vertical resolution (30 levels) from C.-C. Chen, NCAR. We know that the shift causes the maximum of air traffic distance in 2050 to be located at 200 hPa instead of 240 hPa as in the old inventory. Additionally M. Gupta from the FAA assured us that this shift of flight altitude is a realistic consumption in the Volpe future scenario and wrote us that new aircraft seem to fly at higher altitude than the old ones with a difference ranging between 0.3-1.5km. The shift from 200 to 240 hPa lies with about 1 km in the middle of this range.

We added "by between 0.3 and 1.5 kilometres (pers. comm. Mohan Gupta, FAA), resulting in the shift of maximum flight density seen in Fig. 1a" .

Pg 6 ln 19: add a comma after the word "large".

Thanks.

Pg 6 ln 19: It would probably be useful to expand, in the sentence starting in ln 19, if the reduction in ice crystal numbers in the tropics is accounted for in the parameterisation.

The reduction of initial ice crystal numbers is not considered in our parameterization as we describe a constant initial ice crystal concentration for contrail.

We modified for clarification this part: “It needs to be pointed out that contrail optical depth is likely overestimated in the tropics, since in the tropics contrails form within a few degrees of the temperature threshold (Schmidt-Appleman criterion) limiting ice nucleation in the contrail (Bier and Burkhardt, 2019), a process that is not resolved in our simulations (Sect. 2.3). Therefore optical depth and lifetimes of contrails will be overestimated (Burkhardt et al., 2018) and consequently radiative forcing.”

Pg 9 ln 8: remove “of the”

Thanks.

Pg 9 ln 16: add the period in “et al”

Thanks.