

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-62

Anonymous Referee #2

Referee comment on "Air traffic and contrail changes over Europe during COVID-19: a model study" by Ulrich Schumann et al., Atmos. Chem. Phys. Discuss.,
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This is an excellent and timely study of the climatic impact of contrails. The authors have published extensively in this technical area and are using a tool that has been well exercised in studying contrail impact. This study has addressed a key issue and taken advantage of an unfortunate, timely reduction in air traffic due to the COVID19 pandemic to perform a (somewhat) controlled experiment to determine the radiative effects of contrails. Such a specific change in a key climatic impact is rare, and while annual changes in weather must be, and have, been taken into account, this event provides a unique opportunity to try to quantify this particular impact, largely in isolation. The authors are to be commended for noting this opportunity and taking steps to acquire and process the data to evaluate the climatic impact of contrails.

At the same time, the tool has been refined and evaluated in a few key ways to further develop and improve the model (water vapor exchange between contrails and background air, and accounting for contrail overlap). These updates have been applied to both the before and after COVID19 cases, so direct comparisons are appropriate. These are useful extensions to the modeling approach.

Thus, the paper is very scientifically interesting and offers timely analysis of the aviation climatic impact, as the industry plans recovery from a significant reduction in commercial activity. The paper is well-written and clearly presents the approach and the conclusions. I only have a few comments that I hope will improve the clarity of the excellent disposition of this useful analysis.

- Lines 162 et seq.: The analysis makes use of the ICAO emissions databank to obtain soot emissions indices. I presume that they performed this analysis prior to the publication of the new nvPM entries in the ICAO Edb, which were released in December 2020. Thus, they presumably used the earlier ICAO Edb entries for Smoke Number (SN) to estimate soot parameters. Given that the bulk of the work was done months before the nvPM ICAO data was released, they are unlikely to have been able to use the new nvPM data. However, for readers that are reviewing these results now and later, when the nvPM ICAO data is now available, it is probably important to point out

explicitly that they have made their soot parameter estimation based on SN data in the ICAO data bank.

- Lines 367 et seq.: This paragraph is an “aside” and perhaps did not receive as careful attention as the main conclusions. There are two statements in this paragraph that are not clearly stated.

- The first sentence makes a point about fuel usage and aircraft types over Europe. The second sentence makes an additional point about fuel usage and aircraft types for a different case but does not explain the difference for this second set of statistics. Is it for a different geographic region (North America? The entire globe?)?
- In the last sentence of this paragraph, the largest contrail contribution is noted. However, it is not clear if this is noting the largest contrail contribution for a single/individual airplane, or if it is the largest contribution to the total contrail impact of the fleet. The latter seems to not be the case, because of the prior statement about the twin-engine medium sized airliner (and presumably that was for 2020 also?), but the sentence is not clearly stated.