

Interactive comment on “Identification and Source Attribution of Organic Compounds in Ultrafine Particles near Frankfurt International Airport” by Florian Ungeheuer et al.

Anonymous Referee #1

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This is a well written report of an important and timely study of the organic composition of particles emitted from aircraft operations near a major airport. The paper reports a careful study based on the UHPLC and HRMS analysis of collected PM samples, and interprets the consequences of the resulting compositional information. This is important since there have been many recent studies of UFP near airports, but the source apportionment and the particle composition has been lacking in most of those studies. This is an important advance in the field for this reason.

The reporting on organophosphate emissions adds to the understanding of these significant aircraft engine oil additives. In addition, I think that the authors have offered

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some valuable new details of measuring organic species in aircraft exhaust and have also explored a new specific compound of potential interest and concern, TMP-P.

The paper is well written and the analysis careful and thorough. I have a few comments that, when addressed, I hope might provide improved clarity or otherwise improve the paper.

1) The analysis included accounting for sample blanks, where no sample was drawn. However no ambient background samples were acquired. I realize that the collection times are quite large. However, if the prevailing winds shifted for a long enough period, some background from a non-airport source would be useful to compare to the airport source. I presume that the long sample times preclude collecting sample in a traffic-free period with the prevailing wind direction, although that might even be a preferable ambient background target to another wind direction.

2) Line 38-39, forecasts are quoted for airline traffic growth. I think during the current pandemic, a sentence or two should mention that 2020 has seen a steep decline in air traffic and the recovery to pre-pandemic growth rates is highly uncertain in both time and value.

3) Lines 266-267 (and also abstract line 19), "... the sampled UFP are mainly composed of lubrication oils." Other studies quoted in this report have shown that lubrication oil is an important but not sole contributor to the organic component of aircraft PM. The paper goes on to say "However, other techniques might reveal the presence of additional compounds, which are not detected by the presented technique." Yet it is not clear what fraction of the organics can be attributed to aircraft engine oil. I think some further discussion should be included to either qualify this statement or to provide a quantitative estimate of the oil contribution, with whatever error bounds can be offered. Is UFP more than 50% composed of engine oil (I think not)? Can an estimate even be offered?

4) Line 357: I believe "neurotoxin" is misspelled as "neurotoxine".

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