

Interactive comment on “Identification of jet lubrication oil as major component of air craft exhaust nanoparticles” by Akihiro Fushimi et al.

Anonymous Referee #2

Received and published: 6 March 2019

The paper by Fushimi et al. presents an investigation of the chemical composition of ultrafine particles measured close to a runway of the Narita International Airport, Japan. Several studies have already shown that large amounts of particles smaller than 30 nm are emitted by aircrafts. However, hardly anything is known about their chemical composition. Since these particles have only little mass, it is very difficult to investigate their composition. The chemical composition, however, is important to know for estimating how relevant aircraft emissions are for public health and whether they have an impact on weather or climate. Knowing where exactly these particles originate would also give the opportunity to find solutions for reducing their emissions. The authors find that the organic compounds of the particles measured near the runway are dominated by nearly intact forms of jet engine lubrication oil. Knowing this can help

C1

to develop techniques for controlling oil emissions, which could greatly reduce aircraft exhaust particles.

The subject of this paper is relevant for ACP. Overall, the experimental data are presented well and sound. I recommend publication of this paper after the authors address my comments.

General comment:

It is known that aircraft emissions largely differ for changing jet engine conditions (e.g. Masiol and Harrison, 2014). The largest amount of particles may not necessarily be emitted while take-off (high thrust). Instead, particle emissions can be also very high while taxiing or just while running the APU. From the map it looks like the measurement site could not only receive the particle emissions from take-off or landing. Since the taxi track and the terminal area are just behind the runway, the measured particles could also well be dominated by other jet engine conditions. The authors need to discuss how much their results on particle composition may depend on these different engine conditions. To my point of view, this is important with regard to the conclusion that is drawn – I think one cannot be sure that the lubricant oil particles are also emitted to a reasonable amount in the upper troposphere, so it is questionable whether they “can potentially affect the radiative balance of the atmosphere”.

Specific comments:

- 1) What was the wind direction and wind speed during each measurement? Was the air transported from the runway to the measurement site for the entire measurement period?
- 2) I would strongly recommend shifting the appendix into the main text because it is important information.
- 3) Fig. 1: How do the authors define a “plume”? Can the peaks in number concentration be attributed to specific take-offs or landing aircrafts? What is the fraction of

C2

“plume” to “no-plume” events?

Technical comments:

- 1) p 1, l 14, “A new particulate. . .”: This sentence is without any context.
- 2) p 6, l 4, “The mass chromatograms. . .”: This sentence makes more sense to shift a few lines above, e.g., to p 5, l 21.
- 3) Fig. 1: It does not say here what the dotted line means.
- 4) Fig. 2: I find the scale of the y-axis somehow weird. Should it not range from zero to 2.5e6 for every single subplot?

References:

Masiol, M. and Harrison, R. M. (2014): Aircraft engine exhaust emissions and other airport-related contributions to ambient air pollution: A review, *Atm. Environ.*, 95, 409-455, <https://doi.org/10.1016/j.atmosenv.2014.05.070>.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2018-1351>, 2019.