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We thank the referee for the critical review and suggestions. In the following, the specific questions are addressed one by one. For improving the manuscript, we incorporated small changes to the text, which are highlighted accordingly. We address one question per page.

Referee's comments/questions in bold upright.

Authors' answers regular upright.

Citations from and changes to the pre-print in regular italic.

line 63: There are also potential ground level impacts from landing aircraft due to lateral dispersion enhanced by wingtip vortices.

This is an important point that was not addressed yet in the manuscript as the results are discussed in light of advection from the airport and the ground-based activities. Nevertheless, we agree that this point should be added to the introduction for completeness, we acknowledge the potential ground level impacts by proposing the following change, inserting on line 63:

Original version:

[...] Ungeheuer et al., 2022). As airports are typically [...].

New version:

[...] Ungeheuer et al., 2022). During take-off and approach in particular, wingtip vortices might enhance the dispersion of UFP from very low altitudes towards the ground (Graham and Raper, 2006; Westerdahl et al., 2008; Hudda et al., 2020). As airports are typically [...].

The change proposed above adds the following two publications to the References section:

Graham, A. and Raper, D. W.: Transport to ground of emissions in aircraft wakes. Part I: Processes, *Atmospheric Environment*, 40, 5574–5585, <https://doi.org/10.1016/j.atmosenv.2006.05.015>, 2006.

Hudda, N., Durant, L. W., Fruin, S. A., and Durant, J. L.: Impacts of Aviation Emissions on Near-Airport Residential Air Quality, *Environmental Science & Technology*, 54, 8580–8588, <https://doi.org/10.1021/acs.est.0c01859>, 2020.

line 81: Yu et al was based on a 4km spatial resolution model that might not account for the finer spatial scale resolution at locations near the airport under the flight path. This is mentioned late in the reference to the Zurich study and also demonstrated initially further downwind by Hudda et al.

Thank you for this comment. As this point may further highlight and motivate explicitly why to study the closer surroundings of an airport, we propose the following change to the sentence spanning lines 79-81:

Original version:

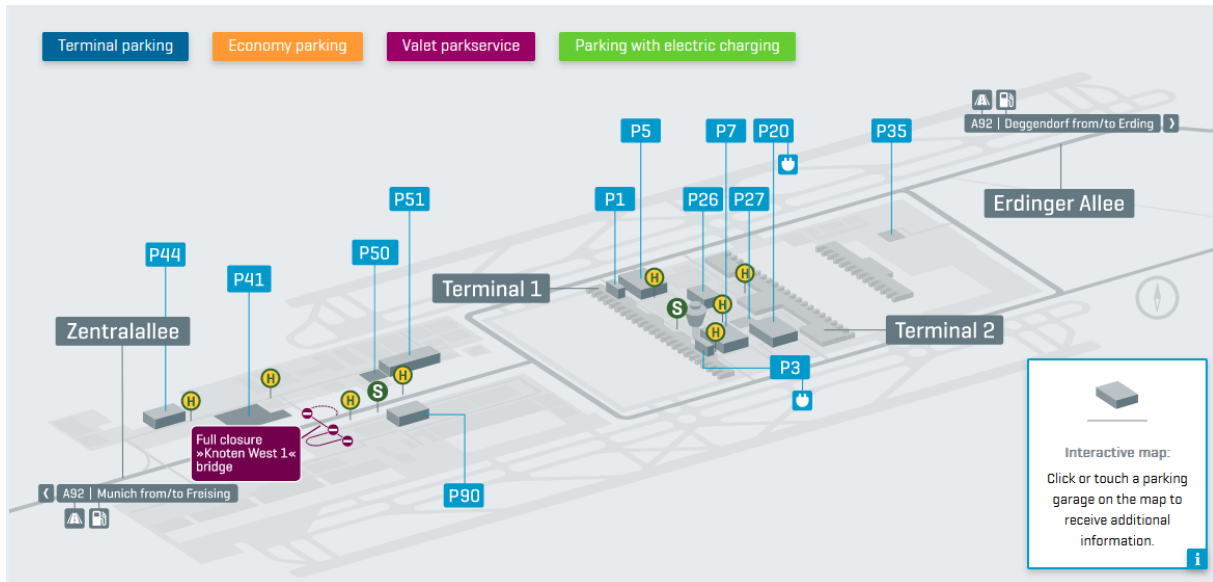
Overall, with a regional chemical transport model study it was calculated that aviation contributed to the ultrafine particulate matter to about 7% in downtown Los Angeles next to other regional sources such as the consumption of natural gas, on-road-traffic, and cooking (Yu et al., 2019).

New version:

For example, Yu et al. (2019) calculated that aviation contributed to the ultrafine particulate matter to about 7% in downtown Los Angeles next to other regional sources such as the consumption of natural gas, on-road-traffic, and cooking. However, the model was too coarse to resolve the finer spatial scale variation at residential areas within close proximity to the airport.

line 248: Where is the airport parking? This is also relevant to the conclusion on line 569.

We assume that referee #2 refers to cases at other airports where airport parking is concentrated into a single huge parking area or car park. At Munich Airport the airport parking spreads across multiple parking areas and car parks on the premises of the airport and is hence covered by each site's respective airport sector. See the following schematic of the parking areas and parks that was obtained from <https://www.munich-airport.com/parking-260363> on 20.09.2023.



To reflect this better in the manuscript we propose the following change:

Attach to line 153: *Parking at Munich Airport spreads across multiple parking areas and car parks on the premises of the airport and is not incorporated to a single large scale car park.*

Regarding the conclusion on line 569: The airport parking is part of the airport as an emission source. What line 569 covers is, that with the described approach we can estimate a site specific airport contribution, but this contribution inevitably includes any source located between airport and site. For site N322 this would be the highway A92 and its feeder in particular.

line 299: This paragraph could do a better job of simply describing the cumulative method used here, especially starting on line 306. It took me a while to figure out what was going on.

This is a very valuable feedback, because the method for deriving cumulative concentration roses is critical for this manuscript. Hence, we hope to improve quick access to the method by modifying the whole paragraph “cumulative number concentrations”:

Change on line 299 to 309: Cumulative concentration rose: The presented data covers the annual cycle of the observation period from August 2021 to July 2022 almost completely with a data availability of 92 % for site N322 and 94 % for site S229. Additionally, no extreme particle emissions were observed and the dataset is a good representation of typical airborne particle loads at the two sites during the course of one year. Hence, we first summed up all particle number concentrations to a cumulative number concentration for N_{100} or N_{800} at each site. The final cumulated particle number concentration represents the total particle load at each site after one year (100 %). Next, the observed particle number concentrations were grouped by the wind direction that occurred at the given time (36 bins + 1 calm bin, see Sect. 2.4). For each bin a cumulative number concentration is calculated and divided by the total particle load. This way the contribution of each bin relative to the total particle load for N_{100} or N_{800} over the course of the observation period can be expressed as fraction in percent.

In addition, we think that Fig. 11 is not necessary anymore and that we can free additional space by removing it. Hence, we rewrite line 466 by removing the reference to Fig. 11 and instead referring to the methodology section and the cumulative number concentrations as follows:

Original version:

As the presented data covers the annual cycle of the observation period August 2021 to July 2022 almost completely, it can be used to sum up the observed particle number concentrations to a cumulative value, see Fig. 11.

New version:

As the presented data covers the annual cycle of the observation period August 2021 to July 2022 almost completely, it can be used to sum up the observed particle number concentrations to a cumulative value, see Sect. 2.5 on cumulative number concentrations.

line 330: need a comma rather than a period.

For grammatical correctness, a comma instead of a period would be necessary. However, this would result in a sentence spanning three lines. Instead, we propose to modify the first sentence on line 329 as follows. The period then can remain unchanged:

Original version:

As the number of flights per month [...].

New version:

The number of flights per month [...].

line 458: "strong evidence" is a bit too strong. When the wind is coming from the airport, the evidence is clear. It is just that it is not always coming from the airport.

We now reworded the two sentences, with the aim to discuss our analysis more precisely. We hence propose the following change to lines 458-460 as follows:

Original version:

Overall, the diurnal variation of UFP number concentrations at the two sites does not provide any strong evidence for the impact of the airport on the local air quality. In contrast, the concentration roses for winds blowing from the direction of the airport had the highest daytime UFP number concentrations.

New version:

Overall, it is difficult to assess the impact of the airport on the local air quality from this view on the diurnal variation of UFP number concentrations at the two sites only. Yet, the combined results show that the concentration roses for winds blowing from the direction of the airport had the highest daytime UFP number concentrations.

line 550: at site s229 the effect is evident, although not at the other site.

We understand that the wording should be more precise and propose the following change to lines 548–550:

Original version:

However, when we resolved the details of diurnal and seasonal variations a potential impact of the airport on the two sites atmospheric particle concentrations became less evident.

New version:

However, when we resolved the details of diurnal and seasonal variations a potential impact of the airport on the two sites became less evident, as it was likely covered by the variability of other sources and atmospheric conditions.