

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-625

Anonymous Referee #1

Referee comment on "Measurement report: Three years of size-resolved eddy-covariance particle number flux measurements in an urban environment" by Agnes Straaten and Stephan Weber, Atmos. Chem. Phys. Discuss.,
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GENERAL COMMENTS:

The paper presents a report on 3-years measurements of particle number flux measurements in the city of Berlin from April 2017 to March 2020. It is a long term monitoring campaign focused on fluxes of ultrafine particles and accumulation mode particles ($10\text{ nm} < D_p < 200\text{ nm}$). The paper presents average diurnal, seasonal and annual fluxes in order to find a correlation with diurnal concentration peaks, seasonal emission sources and the relationship between F_{TNC} (total number particle flux) and F_{UFP} (ultrafine particle number flux) with land use in the flux footprint. The paper is very well structured, clear and detailed. The methodology is appropriate and supported by a wide bibliography. The authors show that the urban domain investigated is a net source of particles (e.g. particles emissions prevail over particles deposition, especially with reference to ultrafine particles) and the presented results are aligned with other urban case studies. Particles fluxes are investigated considering meteorological parameters of the specific monitoring period (like precipitation, wind speed, wind direction, temperature), the diurnal atmospheric stability classes but even the land use of the territorial domain and hourly traffic intensity data supplied by two different traffic counting stations located near the monitoring site. The authors stress the strong relationship between particles fluxes and the traffic intensity of specific roads in Berlin and exclude a significant contribution of green areas and/or built areas nearby. I would suggest, as future development of the research, to add a multistage cascade impactor to be used as gravimetric analyser in order to get a size-resolved chemical speciation of particles for a source apportionment study. In my opinion the paper only needs minor revisions before publication, clarifying some assumptions and to better support the conclusions of the work.

SPECIFIC ISSUES:

- In the paper it could be interesting to better explain which types of “green areas” are present in the territorial domain as possible emitters or sinks of PM. Maybe the different magnitude of F_{NTC} and F_{UFP} over the years and seasons is not only due to a change in traffic intensity or wind direction ;
- Considering traffic intensity data, are there more specific data available? In Figure A3 the differences in traffic intensity among the 3 years investigated are not statistically significative to justify a change in urban F_{UFP} . Maybe data more strictly related to the type of vehicles running in Berlin during the 3 years could be more representative to support the conclusions (changes in the vehicles fleet, lower traffic intensity in 2020 due to COVID pandemic, etc...)
- The article only presents a table with mean, median, min and max concentrations of TNC, UFP as well as NUC, AIT and ACC mode particles (Table 2). The maximum concentration values indicated (very high!) should be justified. It could be interesting to present some graphs with the particles size distribution from 10 nm to 200 nm and the seasonal diurnal courses of the 3 modes (NUC, AIT, ACC) considering the median values to better correlate the fluxes with potential local emission sources.
- Figure 5 does not show significant differences in land use over the 3 years investigated so that the authors recall a change in traffic intensity during the years, not justified by traffic intensity data reported in Figure A3. Please support better your assumptions.
- Considering data availability I suggest to clarify better the missing periods over the 3 years since potentially some seasonal flux trends could be affected by a considerable lack of data
- Deposition fluxes should be justified better (lines 295-297). Why were deposition fluxes observed mainly with southerly and north-westerly winds according to the authors? And why mainly ACC particles were deposited?
- Lines 333-335: Please specify the ranges of total number fluxes coming from the literature studies compared to the paper results. The sentence is too general.
- An additional local emission source of particles fluxes in the winter season can be potentially given by domestic heating in an urban area. Have you excluded this potential source coming from the build up areas considering the land use impact on seasonal particles fluxes?

TECHNICAL CORRECTIONS:

The following type errors need to be corrected in the paper:

Line 152: eliminate “not”

Line 192: “ratio” instead of “ration”

Line 306: "data set" instead of "data"

Caption of Figure 13: "centered on" instead on "centered of"