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Atmospheric Measurement Techniques Discussions
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Interactive comment on "Flow-induced errors in airborne in-situ measurements of aerosols and clouds" *by* A. Spanu et al.

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On behalf of all authors of Weigel et al. (2016) I would like to address some issues in the manuscript concerning the statements about our work.

1. Statement in your manuscript (page 2, lines 27-30)
   "Recently Weigel et al. (2016) proposed a more general correction method for compressible flow mainly based on thermodynamical calculations. However, this empirical approach is only partially considering the size-dependent effect of particle inertia on the detected concentration. Furthermore, flow disturbances induced by the aircraft wings are not considered by Weigel et al. (2016)."

   The definition of ξ is not empirical but exclusively based on thermodynamic con-

siderations and is indeed essential to account for the compressed sample air volume under measurement conditions compared to ambient (undisturbed) conditions. The inclusion of μ in the overall correction provided in Weigel et al. (2016) factually considers (not 'only partly') the size dependent effect of particle inertia. Flow disturbances by the aircraft wings are not explicitly resolved as they were not observable as such and may be implied in the compressed condition under which the measurement occurs. So, one could understand your chosen formulation as misleadingly pejorative.

   Please change the phrasing in the manuscript to account for this issue.

2. Statement in your manuscript (page 11, lines 20-22)
   "Weigel et al. (2016) provides a more rough estimation based on the concept that the air compressibility effect will cause particle accumulation near the instrument. However, the concentration at the wing instrument is apparently larger only because particles are slowed down and stay longer in the corresponding region (see Fig. 9)"

   The content of the referred paper might not be fully understood by readers of your paper, since the concept is not that particles accumulate. In Weigel et al. 2016, it is explicitly stated: "Under the preliminary assumptions that the particle number per mass M of the air sample is not affected by compression (i.e. remains constant and thus $\frac{n_{amb}}{M} = \frac{n_{meas}}{M}$) ..."

   This is the case if particles and air volume get compressed equivalently. Your added statement, however:

   "the concentration at the wing instrument is apparently larger only because particles are slowed down and stay longer in the corresponding region"

   is one of the messages provided by Weigel et al. (2016) from the contrary perspective: small particles are capable to move out of their initial (undisturbed) state, induced by the compression region upstream of the underwing probe, due to the approaching aircraft. Larger particles are less capable to get moved out of this undisturbed state due to their inertia.

Please make the relation to Weigel et al. (2016) better visible.

Reference

Weigel, R., P. Spichtinger, C. Mahnke, M. Klingebiel, A. Afchine, A. Petzold, M. Krämer, A. Costa, S. Molleker, P. Reutter, M. Szakall, M. Port, L. Grulich, T. Jurkat, A. Minikin, and S. Borrmann, 2016: Thermodynamic correction of particle concentrations measured by underwing probes on fast flying aircraft. Atmos. Meas. Tech., 9, 5135-5162. doi: 10.5194/amt-9-5135-2016

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