Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC3
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Comment on acp-2021-1071

Anonymous Referee #2

Referee comment on "Vertical aerosol particle exchange in the marine boundary layer estimated from helicopter-borne measurements in the Azores region" by Janine Lückerath et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-1071-RC3, 2022

The paper by Luckerath et al. addresses an important topic of aerosol dynamics in the boundary layer where large uncertainties exist in estimating particle fluxes either directly by flying platforms or by indirect/ground measurements. Although scientifically the study does not deliver substantial results, method comparison using specific experimental platform is very important in understanding advantages and limitations of different methods and their uncertainties. The paper is written and developed very well and should be suitable for publication after providing a better context and clarifying few details.

The study was performed over the Northeast Atlantic and the authors should be aware of the number papers over the same region which are relevant both methodologically as well as for their comparative value(Flanagan, Geever et al. 2005, Geever, O'Dowd et al. 2005, Ceburnis, O'Dowd et al. 2008, Ceburnis, Rinaldi et al. 2016)

Comments

Line 36 Very much disputed aspect that sea spray contributes little to aerosol number <300nm. Please refer to (Ovadnevaite, Manders et al. 2014, Xu, Ovadnevaite et al. 2021)

Line 59. Azores are indeed a good location for flight-borne measurements, but is it perfect given dominant high-pressure systems, contributing to mixing? Methods confirm this by 2/3 of the campaign characterized by dry weather with low cloud fraction. Mid-latitude oceans on the other hand are dominated by low pressure systems.

Line 101. I wonder how much of the disturbance helicopter created during the ascent? Wouldn't the descent profile make more sense considering that external cargo was

hanging below a helicopter?

Equation 3. Doesn't this formula produce unrealistic K values? E.g. K=0.3*0.3*20*48=86.4m2/s

Line 164. Should vTAS be vair?

Line 185. derivative instead of specification

Table 2. Comparison to environmental variables is lacking, like horizontal wind speed, etc.

Ceburnis, D., C. D. O'Dowd, G. S. Jennings, M. C. Facchini, L. Emblico, S. Decesari, S. Fuzzi and J. Sakalys (2008). "Marine aerosol chemistry gradients: Elucidating primary and secondary processes and fluxes." Geophysical Research Letters **35**(7): L07804.

Ceburnis, D., M. Rinaldi, J. Ovadnevaite, G. Martucci, L. Giulianelli and C. D. O'Dowd (2016). "Marine submicron aerosol gradients, sources and sinks." Atmospheric Chemistry and Physics **16**(19): 12425-12439.

Flanagan, R. J., M. Geever and C. D. O'Dowd (2005). "Direct measurements of new-particle fluxes in the coastal environment." Environmental Chemistry **2**(4): 256-259.

Geever, M., C. D. O'Dowd, S. van Ekeren, R. Flanagan, E. D. Nilsson, G. de Leeuw and U. Rannik (2005). "Submicron sea spray fluxes." Geophysical Research Letters **32**(15): Artn L15810.

Ovadnevaite, J., A. Manders, G. de Leeuw, D. Ceburnis, C. Monahan, A. I. Partanen, H. Korhonen and C. D. O'Dowd (2014). "A sea spray aerosol flux parameterization encapsulating wave state." Atmospheric Chemistry and Physics **14**(4): 1837-1852.

Xu, W., J. Ovadnevaite, K. N. Fossum, C. S. Lin, R. J. Huang, C. O'Dowd and D. Ceburnis (2021). "Seasonal Trends of Aerosol Hygroscopicity and Mixing State in Clean Marine and

Polluted Continental Air Masses Over the Northeast Atlantic." Journal of Geophysical Research-Atmospheres **126**(11).