

Interactive comment on “Heterogeneous nucleation of water vapor on different types of black carbon particles” by Ari Laaksonen et al.

Anonymous Referee #2

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The authors describe a new approach to parameterize the CCN activity of insoluble particles. Instead of the solute effect, they use the FHH-adsorption-isotherm to describe the water adsorption on the surface of insoluble carbon black particles. The manuscript is well written and well structured. The scientific content is exciting and fills a long-existing knowledge gap. Therefore, I only have very few minor comments.

P3 L53 “as well”

P3 L 58 “climate active” is a bit vague. I would suggest referring to radiative forcing and cloud formation directly

P7L130 It is a bit confusing when you say “droplet”. Does this refer to a single droplet or to the water patches on the material

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P11 L204 (Aria et al., 2016) investigated the wettability of graphene after exposure to ambient air. While this can be presentative for certain aspects of atmospheric black carbon particles, it should not be taken as an example for an atmospheric aging process. To point out, that exposure to atmospheric condition increases the interaction of black carbon with water, the following studies should be considered as an additional reference

Tritscher, T.; Jurányi, Z.; Martin, M.; Chirico, R.; Gysel, M.; Heringa, M. F.; DeCarlo, P. F.; Sierau, B.; Prévôt, A. S. H.; Weingartner, E.; et al. Changes of Hygroscopicity and Morphology during Ageing of Diesel Soot. *Environ. Res. Lett.* 2011, 6 (3), 34026. <https://doi.org/10.1088/1748-9326/6/3/034026>. Grimonprez, S.; Faccinetto, A.; Batut, S.; Wu, J.; Desgroux, P.; Petitprez, D. Cloud Condensation Nuclei from the Activation with Ozone of Soot Particles Sampled from a Kerosene Diffusion Flame. *Aerosol Sci. Technol.* 2018, 52 (8), 814–827. <https://doi.org/10.1080/02786826.2018.1472367>. Friebel, F.; Mensah, A. A. Ozone Concentration versus Temperature: Atmospheric Aging of Soot Particles. *Langmuir* 2019, 35 (45), 14437–14450. <https://doi.org/10.1021/acs.langmuir.9b02372>.

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