

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-411

Anonymous Referee #2

Referee comment on "Mixing state of refractory black carbon in fog and haze at rural sites in winter on the North China Plain" by Yuting Zhang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-411-RC1>, 2021

Zhang et al. "Mixing state of refractory black carbon in fog and haze at rural sites in winter on the North China Plain"

Based on field observations from a single particle soot photometer (SP2), this study investigates the mixing state of rBC under different meteorological conditions at a rural site on the North China Plain. Interesting and valuable results have been found. Particularly, they found that the count median diameter (CMD) of rBC particles during snowfall episodes was obviously larger than that before-snowfall, indicating that smaller rBC-containing particles were much more effectively removed by snowfall; they also found $-4 \sim 0$ °C may be the most suitable temperature range for coating formation of rBC. I would recommend its acceptance for publication after necessary modifications.

Line 76-78, this is not a complete sentence.

Line 79, "adsorption" should be "absorption"

Line 83-84, regarding the absorbing BC aerosols along with the high emissions over North China Plain, a reference could be mentioned here, Yang et al. (2016, doi: 10.1002/2016JD024938).

Line 88, I would suggest using "During recent years" instead of "In recent years"

Line 188, I wonder why the authors assumed 0 for the absorption part in the refractive index after coating.

Section 2.3, On one hand, it might be briefly mention that the HYSPLIT has been widely used for dispersion and trajectory analysis by providing some references, like the recent study by Fan et al. (2021a,b, doi: 10.1007/s11869-021-01023-9, doi: 10.1029/2020GL091065). On the other hand, the potential uncertainties in the trajectory analysis might be worthy to briefly mentioned, which is highly associated with the accuracy in meteorology simulations.

Line 255, I would suggest changing "Liu et al., (2019)" to "Liu et al. (2019)"

Line 330-340, Another potential mechanism is the competition of hygroscopic growth of

aerosol particles and wet scavenging. As indicated by Sun et al. (2019, doi: 10.1029/2019EA000717) and Zhao et al. (2020, doi: 10.3390/atmos11090906), aerosol mass concentration increases with precipitation when precipitation is weak and decreases with precipitation when precipitation is heavy. The snowfall case is similar to weak (or middle) precipitation case with relatively weak wet scavenging capability, making the hygroscopic growth of aerosols essential and further resulting in less small particles and more large particles.

Line 367, "are" -> "were"

Line 424-425, what do the authors mean "in California 2013 during winter"? Do they mean "in California during winter in 2013"? Also, "in Beijing 2018 during summer".

Line 449-451, current location is suggested to add here.

Line 518-519, I do not understand how the authors conclude that "-4~ 0 °C may be the most conducive temperature range" based on descriptions before this sentence. Please explain.