

Interactive comment on “Droplet activation behaviour of atmospheric black carbon particles in fog as a function of their size and mixing state” by Ghislain Motos et al.

Anonymous Referee #1

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This study presents the measurement of BC activation by droplet in real world, the topic is within the scope of ACP. I think there are a few places needing to be addressed before it can be accepted.

Firstly as there is no page number, it is hard to make specific comment. The abstract is too long, I would say maximum 2 paragraphs or better with 1 paragraph. It is recommended to include the previous studies in the introduction on BC heating on clouds, reducing cloud cover, decreasing cloud albedo.

The crucial part of this study is how the scavenging fraction has been measured, some of the technical points need to be more clearly addressed:

C1

a) what is the collection efficiency of the total inlet on collecting droplet, i.e. what is the 50% size cut-off for the droplets, some large droplets may be missed?

b) Will the heating of inlet affect the coating amount of coating compositions of BC.

c) A clear plot is needed to show how the comparison looks between total and interstitial concentration for non-fog period. From the description in the text, this scaling varied from time to time, you may need to show a time series of this scaling ratio, and how this scaling ratio was affecting the results, and why.

d) Also as stated: “For the scanning mobility particle sizer instruments, size-dependent scaling factors were calculated for each fog event in order to take into account both the different line losses behind each inlet and the internal measurement errors of each SMPS.” This should be clearly shown by figure.

More explicit definition of internally or externally mixed BC is needed.

Could you also give the scavenging mass fraction of BC or non-BC particles.

What is the black colour in Fig. 11.

A plot showing how the LWC of fog has been associated with SS and related scavenging fraction. What is the source origin of the particles, backtrajectory analysis? A map of the site will help a lot.

How is ACSM used?

“However, Figure 9c clearly shows that droplet activation of BC-containing particles is the mechanism that explains the incorporation of BC cores into fog droplets in the present study: if coagulation between BC particles and fog droplets was giving a dominant contribution, then the fog-activated fraction of BC particles would exhibit much less size and coating dependence and rather with opposite trends.” This discussion is not clear at all, so have you observed the coagulation of the BC with droplet? what “opposite trends” are they?

C2

"Six calibrations were performed, including pre and post campaign, and standard data analysis procedures using the Tofwerk "IgorDAQ" software package (Tofwerk AG, Thun, BE, Switzerland) were applied (reference)." What reference is it?

The key conclusion is to say the model combing ZSR and Kohler theory could well predict the BC activation, but there is no clear plot to show this.

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