

Interactive comment on “Influence of cloud microphysical processes on black carbon wet removal, global distributions, and radiative forcing” by Jiayu Xu et al.

Anonymous Referee #2

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This study attempts to improve global model simulations of black carbon (BC) by resolving conversions of BC between cloud liquid, cloud ice, rain, snow, and interstitial air, which are tied to microphysics of clouds and precipitation. A series of sensitivity simulations show the relative importance of various cloud processes on BC distributions and associated radiative effect. The manuscript is a useful contribution to the scientific progress and the modeling methods employed are valid and clearly described. The manuscript is well written and is appropriate for publication in ACP.

Some minor revisions are suggested as follows:

- (1) Page 1, Line 29. Change "Aerosol activation" to "Suppressing BC droplet activation"

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in clouds".

(2) Page 3, Line 27. Change "precipitated" to "settling".

(3) Page 4, Line 2. Change to "...and water vapor condenses".

(4) Page 4, Line 6. Cite Liu et al. (2011) and Wang et al. (2014) which are already listed in the References.

(5) Page 4, Line 21. Change "in an incomplete way" to "without considering all relevant microphysical processes".

(6) Page 5, Line 20. Change to "...and mass mixing ratios".

(7) Page 7, Line 10. Change to "BC aerosols are emitted".

(8) Page 7, Line 11-12. Add at the end of the sentence "although the aging time has been estimated in the range of (references)".

(9) Page 13, Figure 2. The arrow for evaporation of BC_{snow} is pointed toward "BC_{phobic}". Shouldn't it be extended (over BC_{phobic}) toward "BC_{phic}"?

(10) Figure S1. Use "Cloud water conversion rate" or "Rate" to label the y-axis. The unit should be either "g/(m² s)" (column integrated) or "(g/g)/s" (column averaged).

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