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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Laboratory study of the collection efficiency of submicron aerosol particles by cloud droplets. Part I – Influence of relative humidity" *by* Alexis Dépée et al.

Anonymous Referee #1

Received and published: 29 September 2020

General comments: This paper described a laboratory study of the collection of aerosol particles (AP) by water drops due to the influence of environmental humidity conditionâĂŤspecifically subsaturation. The two forces this paper focuses on are the thermophoretic and diffusiophoretic forces. It has been shown previously that the humidity effect can play an important role in bridging the Greenfield gap of AP wet removal from the atmosphere, but accurate lab measurements of this effect were not available. Hence this work is a welcome follow-up of previous works. I have read the manuscript and found that their approach is reasonable and the experiments were carried out with suitable equipment and careful steps. I believe the paper can be accepted for publication by ACP with the following minor revision suggestions. Specific comments:

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Line 38-40: “anthropogenic APs have also been reported causing 39 cardiovascular disorders on humans. In fact, the Great Smog of London in 1952, one of the best-known related events, caused up to 12,000 deaths (Bell et al., 2004)” – did Bell et al. say that the deaths in London Smog were due to cardiovascular disorder? If so, you should say so. The way you have it now doesn’t make a direct connection. Line 41: “another AP pollution event”âĂŤchange to “another AP pollution hazard” Line 45: “respectively in 1986 and 2011” –change to “in 1986 and 2011, respectively” Line 45: “this caesium-137”âĂŤdelete “this” Line 48-49: “Far away from the source, the main mechanism involved in the AP scavenging originates from the interactions between APs and clouds or their precipitations” – before you mention scavenging, you should have a short paragraph discussing the general removal of AP including the dry removal and wet removal. Then you can start talking about scavenging. Line 54: “AP activation into cloud hydrometeors”âĂŤAP activation to form cloud hydrometeors Line 61: “AP has to leave the streamline that surrounds”âĂŤAP has to deviate from the streamline around” Line 65: “strong enough to leave the streamline” – “strong enough to deviate significantly from the streamline” Line 90-94: this sentence needs to be rewritten Line 100: “it is mandatory” – It is desirable Line 107: “no equivalent” – no similar Line 110: “to fill up the lack of data”âĂŤto fill up the deficiency of data in this area Line 115: delete “finally” Line 119: “specially”âĂŤespecially Line 120: change to: Depee et al. (2019) focused on electrostatic forces but did not consider thermos- and difusiophresis. Line 154: “detailed”âĂŤdescribed

Line 169: “is three times larger”âĂŤbecomes three times larger Line 170: “is used between”âĂŤis installed between Line 173: can you include a chart of your Boltzmann charge distribution? Line 199: “highlighted”âĂŤdo you mean “emphasized”? Line 218: “thanks”âĂŤstrange usage Line 251: “evaluated”âĂŤestimated Line 269: “inserted”âĂŤintroduced Line 277: “inserted”âĂŤintroduced. “a kind of flat torus”âĂŤa flat torus inlet Line 325: “growth factor”âĂŤis this the linear growth factor, i.e., that of the diameter or radius? Line 392-393: “after an experiment results effectively from scavenging event in the In-CASE collision chamber”âĂŤafter the experiment results ef-

fectively from scavenging by drops in the In-CASE collision chamber and not from contamination from other sources. Line 419: “both”âĂŤtwo Line 532: “shown”âĂŤshowed Line 563: “On figure 9”âĂŤIn figure 9 Line 578” “weak”âĂŤsmall Line 579: “dominating”âĂŤdominating over Line 600: Table 2: your T is not the true temperature but temperature difference, right? Line 621: “to check the CE”âĂŤto investigate the CE

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