Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Technical note: the enhancement limit of coagulation scavenging of small charged particles" *by* Naser G. A. Mahfouz and Neil M. Donahue

Anonymous Referee #2

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This manuscript is very difficult to read because of missing references, especially related with assumptions used, and insufficient explanation of symbols and subscripts. The topic itself and especially the final result is definitely interesting and useful, if generally true. For readers to properly follow the theoretical treatment, a more thorough writing is, however, needed in my opinion.

Some remarks:

Equation 1: Please add a reference and explain what the variable N means.

Equation 2. Reference?

Lines 32-37: This explanation in words of particle dynamics would be easier to follow if supported by equations.

Equations 3 – 7 and discussion leading to them: Please explain all variables and subscripts. Especially, what is the difference between β, $\beta_{(0,0)}$, $\beta_{(0,\pm)}$, $\beta_{(0,\mp)}$, $\beta_{(\pm,0)}$, $\beta_{(\mp,0)}$, $\beta_{(\pm,\mp)}$ and $\beta_{(\mp,\pm)}$? Also, what is the difference between N, $N_{\{-,0,+\}}$, $N_{(CoagS,0)}$, $N_{(CoagS,+)}$, $N_{(CoagS,-)}$, $N_{(CoagS,\pm)}$ and $N_{(CoagS,\mp)}$?

Based on equations 3-7, the background aerosol seems to be assumed monodisperse. Is this true? If yes, mention this clearly.

Lines 46-47: It is mentioned that also particles that form the coagulation sink can only be singly charged. Is this true? Reference?

Lines 45 and 48 and equation 3: It is assumed that the collision processes are symmetrical with respect to sign. Furthermore, if I understand correctly, collisions between charged and neutral are assumed to be occurring with same rate as collisions between neutrals. How well is this generally true? References?

Equation 3: The theory would be easier to follow if the dynamical equations describing the dynamics of the particle concentrations would be written first and the equilibrium equations (which are not trivial for the general reader) thereafter.

Equation 7: Is this equation valid generally or only with the assumptions made, i.e. e.g. charge symmetry and monodispersity of the coagulation sink?

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-943, 2020.