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Comment on acp-2021-594

Anonymous Referee #2

Referee comment on "Constant flux layers with gravitational settling: links to aerosols, fog and deposition velocities" by Peter A. Taylor, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-594-RC2, 2021

I have the following comments for the author to consider in the revised version of this manuscript.

Abstract can be expanded a bit to include more detailed descriptions of the major findings and results.

Introduction provides a good discussion on the history of the similarity theory, which is based on constant flux layer situations in steady state. Cases under neutral stratification were discussed. May be the author can also provide a brief discussion on how the theory was expanded to unstable stratification, for a complete picture on this topic. The last paragraph in Introduction may be reorganized a bit so the readers can easily find out what materials are from existing theory, what are to be proposed in this study, the major goals of this study, and/or an outline of the following sections.

Line 125: delete "(i.e. not involving rain or snow - wet deposition)" to avoid confusion. This is because dry deposition happens all the time, even during precipitation events. As long as the pollutants are not incorporated into hydrometers before being adsorbed by surface, this process is referred to as dry deposition.

Line 130: add particle sizes for each scenario: "If gravitational settling is the main cause of FQc (e.g., for particles large than several micrometer), we would expect little change in Qc with height, but if turbulent transfer is dominant (e.g., for very small particles) then the choice of zref could be important"

Lien 148: This is my biggest concern of this study. Is this Rs defined here the same meaning as that in Zhang et al. (2001)? If so, then Rs cannot be assumed to be 0. In any

particle dry deposition model, Rs can never be 0, and actually is very large over water surface (Rs is usually >> Ra under unstable and neutral stratification, and on a similar magnitude to Ra under stable stratification).

Because all of the following sections are based on this assumption (Rs=0), which I do not agree with, I do not have much confidence on all the results generated here. If not setting Rs as 0, is there a way to still generate some analytical formula? I guess not.

If section 3 was based on a false assumption (i.e., Rs=0), and if the author cannot fix the error, then this section should be deleted from this manuscript. To make the study still publishable, the author can change the study to a "Short communication" and then focus on Section 2 only. If possible, expand Section 2 to cover all stratification conditions over water surface, and if possible, provide some recommendation on how to expand to other land surfaces (smooth ones first and then vegetated surfaces).