

Review of the study “A Global Assessment of Warm-Phase Convective Invigoration from Aerosol–Cloud Interactions. Part 1: Theory,” by Casey J. Wall

The study presents an analytical model of an ascending air parcel under different aerosol concentrations. After introducing several simplifications and assumptions, the author derives a simple expression that allows one to evaluate the increase in vertical velocity (warm-phase convective invigoration) with the increase in aerosol (drop) concentration. This increase is found to be quite significant. The paper is well written, and I recommend its acceptance subject to minor revisions.

1. I recommend that the author read and cite the following study:

Fan, J., and A. Khain, 2021: “Comments on ‘Do ultrafine cloud condensation nuclei invigorate deep convection?’” *Journal of the Atmospheric Sciences*, 78, 329–339.
<https://doi.org/10.1175/JAS-D-20-0218.1>

In particular, I recommend *considering the Appendix* of Fan and Khain (2021), where convective enhancement is simply derived from the analysis of the supersaturation equation. The Appendix shows that convective invigoration follows directly from the equation governing supersaturation. It also discusses the validity of assumptions employed in the manuscript under review. I believe that referring to this analysis would help place the theoretical results of the present study in the context of previous work and clarify their physical interpretation.