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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The importance of interstitial particle scavenging by cloud droplets in shaping the remote aerosol size distribution and global aerosol-climate effects" *by* J. R. Pierce et al.

Anonymous Referee #1

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The manuscript investigates the importance of scavenging of interstitial aerosol particles by cloud droplets in warm-phase clouds, using a global chemical transport model with a detailed sectional aerosol microphysics scheme. Scavenging of interstitial aerosol particles by cloud droplets has been largely ignored in the study of aerosol-cloud interactions on the global scale, and the present work addresses the gap. The authors find that the process

- changes aerosol concentrations, cloud properties, and the cloud radiative effect in a non-negligible way,

- improves the comparison of simulated vs. observed aerosol concentrations.

The conclusion is that scavenging of interstitial aerosol particles by cloud droplets should be included in large scale atmospheric models that include aerosol-cloud interactions.

The manuscript is well organized and very nicely written. The authors produce new and useful insight. Uncertainties in their study are clearly disclosed by the authors, e.g. that their model does not represent all aerosol-cloud interactions mechanistically (e.g. activation). Owing to the exploratory quality of the work, these uncertainties are not an issue but an encouragement to the community to include the process in question in their models, to improve these models and gain a better understanding of interstitial aerosol scavenging in clouds. I recommend the publication of the manuscript after some very minor corrections.

Page 5599 line 16: "The 2 km layer is shown here as being representative of boundary-layer clouds."

I may be mistaken but it appears that the authors present date at 2 km altitude, is that correct? It would seem better to show mean values in the first 2 km of the atmosphere ... these would be more representative of conditions in the boundary layer. Please comment, clarify, and/or change the manuscript accordingly to address this concern.

Page 5603 line 2: Would you mind adding a sentence, or explaining for this reviewer's benefit, the advantage of the coefficient of determination, compared to simple correlation coefficient, in the context of the model-observation comparison?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 5589, 2015.

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