

acp-2019-892 (Painemal et al.)

Responses to Reviewer 2

We appreciate the reviewer's comments and suggestions. His/her comments and recommendations are addressed below (in blue).

The paper is easy to follow. The conclusion is, while not surprising, a useful reminder of a limitation in past satellite-based studies of aerosol-cloud interactions. I recommend publication. I only have minor comments

We appreciate the reviewer's positive feedback. We agree with the reviewer that uncertainties should be expected when using satellites observations for quantifying aerosol-cloud interactions. However, little has been done to understand the ACI limitations using nearly-global observations, and how the ACI calculation can be improved using vertically resolved aerosol properties, which are two main goals of our manuscript.

Line 114. Insert a space in Fig. 1and.

Line 123. Clarify that 333-m and 25-km refer to horizontal resolution.

Line 198. 4c should read 4b.

We appreciate the reviewers suggestions, which are implemented in the revised version

Line 204. To emphasize the similarity, unify the axis limits for Nd in Fig. 2, 3 and 6.

Since the focus of each figure is to contrast AOD against aerosol extinction coefficient, we decided to keep the axis limits of the original submission.

Line 216. Are the (mildly) higher r values for the all cases interpreted as strengthening of the relationship by drizzle? Can they be partly explained by the larger number of samples?

We interpret the strengthening of the aerosol-cloud relationship by drizzle as the effect of collision/coalescence and droplet removal to the net decrease in N_d . This is typically more important in more pristine environments, whereas drizzle is less frequent for more polluted condition. This produces a change in the aerosol-cloud relationship that is more weighted toward region with lower N_d and aerosol extinction coefficient. Since the N_d -extinction relationship is linear, and the scatterplot was constructed using binned values containing the same number of samples, the larger number of samples mentioned by the reviewer should have a small effect.