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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The scale problem in quantifying aerosol indirect effects" *by* A. McComiskey and G. Feingold

A. McComiskey and G. Feingold

allison.mccomiskey@noaa.gov

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Thank you for your attention to our manuscript and thoughtful comments. We value your input as we are working on complementary topics. It seems that the points outlined here are all related to discrepancies or misunderstandings about aggregation of data, the effect it has on statistics, and the use of the term.

We use the term aggregation in is classic sense – a grouping of distinct units. With that grouping there is an implication of averaging over those previously distinct units for many references in our paper. By definition expressed in our Sec 2.2.2, bulk properties measured above the microphysical scale are aggregated (e.g., 1 km or 1°). What you have termed colocation-aggregation we use the simple word separation (between aerosol and cloud properties in space and/or time). While separation can have effects

when combined with averaging, they are distinct concepts in our paper and not always discussed as a unit. We prefer these simple terms that have intuitive meaning for the reader of any background.

We have addressed your concerns regarding references to your paper primarily by modifying wording and omitting the term aggregation from these references. Please note that, due to reviewer comments, much discussion in the paper has been edited and/or moved so these references may appear in different positions in the paper.

Regarding the reference on p 26758 drawing a parallel between our two studies, both of which find that errors in quantifying aerosol-cloud interactions are likely higher in stratocumulus regions. Your paper states "Aerosol types and cloud properties are known to vary spatially within these regions (e.g., George and Wood, 2010), and variations may have a significant impact on observed aerosol indirect effects (Andrejczuk et al., 2008). These spatial variations must be taken into account when studying stratocumulus regions." This point is reiterated in the conclusions "...stratocumulus regions are particularly susceptible to such methodological errors, and particular care must be taken when studying regions." We restated these finding to say that spatial variability in the properties at scales smaller than the sampling region caused error in sensitivities. While this reference appears in the section on separation we do not imply that your work addresses the issue of separation. We have edited the text slightly to clarify this point.

Regarding the use of the term aggregation on P 26761 is a reference to the paragraph from your introduction that begins on P 15419 line 24. This paragraph emphasizes an important fact – that as regions of analysis become large, the potential for multiple aerosol and cloud regimes to exist within that region becomes likely. The implications for our work here are large as we point out the particular patterns and spatial organizations of different cloud regimes have particular impacts on the accuracy of ACI calculations from space. We deleted the latter part of the sentence that mentions aggregation as it is not needed to make the point.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 26741, 2011.