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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The first aerosol indirect effect quantified through airborne remote sensing during VOCALS-REx" *by* D. Painemal and P. Zuidema

Anonymous Referee #2

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This study reports on results stemming from data analysis of in-situ and remotely sensed observations during the VOCALS study. Southeastern Pacific Ocean stratocumulus clouds were the target of this analysis. The main contributions are the reporting of values of aerosol-cloud interactive metrics relating aerosols to cloud microphysical properties and also cloud albedo. They show that the first indirect effect increases over a finite LWP range (30-80 g m-2), which agrees with satellite data results. This agreement is argued to provide reason for the clouds in this region to be the focus of regional assessments of the first indirect effect for climate models. The topic of this work is relevant for this journal, and for the most part presents scientifically sound data and conclusions supported by the data interpretation. A fair amount of attention was

given to the experimental methods and uncertainties and limitations. The manuscript is written well and is organized. The figures and tables are clearly presented. The one major issue I had with this study was the unrealistically high values of Nd retrieved; this sticks out as a problem since Nd is a major parameter in the various analyses associated with this study. The authors do make an attempt to address this issue in Sections 3-4, but it still is problematic in the big picture of the manuscript. I will leave it to the authors to decide how to handle this issue knowing that other readers will have the same issue that jumps out when reading the paper.

Comments: Pg 25444, Line 15: the subscript on the letter "S" is missing in the equation.

Figure 1. How was Nd obtained in these maps?

Pg 25445, Line 3: Perhaps some mention is warranted for the work of Lehahn et al. (2012) who investigated how coarse aerosol influences drop size in this region. This is related to ACI. Reference: Lehahn, Y., I. Koren, O. Altaratz, and A. B. Kostinski (2011), Effect of coarse marine aerosols on stratocumulus clouds, Geophys. Res. Lett., 38, L20804, doi:10.1029/2011GL048504.

Pg 25446, Line 14: Did the authors mean to write "..do not consist of physical. . ."?

Pg 25449, Line 20: "above-cloud"

Pg 25449, Line 25: report altitude units

Pg 25450: Probably would read better to write ". . .with a constant re as a function of height."

Pg 25451, Line 6: Did the authors mean to write "two-stream"? This applies to many other areas where "two-streams" is written.

Pg 25453, Line 16: should say "underestimate".

Pg 25455, Line 4: remove "a"

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Pg 25456, Line 2: “correlations” instead of “correlation”

Pg 25456, Line 14: “by applying”

Pg 25456, Line 18: should say “dependencies” and also “is” should be “are”

Pg 25460, Line 8: “impact on”

Figure 5: Why is Nd so high, especially relative to Na? This doesn’t make much sense.

Figure 6 and associated discussion: Contrary to what the text of the paper indicates, I do not find the histograms to agree too well. The remote sensing Nd values are too high, as noted above.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 25441, 2012.