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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The impact of horizontal heterogeneities, cloud fraction, and cloud dynamics on warm cloud effective radii and liquid water path from CERES-like Aqua MODIS retrievals" *by* D. Painemal et al.

Anonymous Referee #2

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General Comments:

This manuscript details an investigation of differences in CERES-like Aqua MODIS liquid water cloud effective radius retrievals at 2.1 and 3.8μm, and corresponding liquid water path (LWP), as a function of cloud fraction (CF) and spatial heterogeneity. While the relationships shown generally support findings from previous investigations, the authors do not convince that using AMSR-E LWP yields significant new insights (other than as a screening mechanism for excluding precipitating clouds), nor do they make

the case that LWP is a suitable proxy for cloud dynamics (as implied by the title). I therefore recommend major revisions.

Specific Comments:

p. 12728, line 25: Is the heterogeneity index calculated using the same pixel sampling as the PSSF (i.e., every other scan line and fourth element), or using all MODIS pixels within a CERES footprint?

p. 12728, line 28: Should be more specific that the Hs used in Zhang and Platnick (2011) is calculated from the 250m 0.86μm reflectances, and was introduced by Liang et al. (2009).

Fig. 2b,c: Should use the same color scale for both effective radius plots.

p. 12730, line 15: Does the larger LWP "yield" (i.e., cause) more vigorous up and down drafts, etc., or is it associated with such dynamics/cloud processes?

p. 12730, lines 23-24: Stating agreement with the two previous studies is a little misleading, as Zhang and Platnick (2011) found little change in re3.8 as a function of subpixel heterogeneity, while Zhang et al. (2012) found smaller 3D RT effects at 3.8μm compared to 2.1μm.

Figs. 4 and 5: I'm assuming these figures are for footprints with CF > 98% (as in Fig. 3)? Should specify this in the text.

p. 12732, lines 6-8: I don't think this statement can be made on the basis of Fig. 4 alone. Certainly the optical thickness is also increasing with increasing LWP, regardless of the heterogeneity index.

p. 12732, lines 24-25: Table 1 values are not necessary for explaining the smaller changes in LWP2.1 with increasing heterogeneity index – the smaller increases of re3.8 with increasing heterogeneity index (and decreasing optical thickness) shown in Fig. 5a is sufficient.

p. 12734, lines 1-3: This statement, presumably referring to Figs. 4 and 5, is unsupported by the presented results. The increasing heterogeneity index in Fig. 4 cannot be considered equivalent to the increase of the heterogeneity index along the x-axis in Fig. 5. As the authors show in Table 1, LWP changes are dominated by changes in cloud optical thickness, thus there cannot be a "rapid decrease of optical thickness with heterogeneity index as the AMSR-E LWP increases."

Technical Corrections:

p 12726, line 25: singular "retrieval error" instead of plural "retrievals error"

p. 12727, line 6: remove comma from "3.8μm channels, provides"

p. 12727, line 22: "used to generate the Clouds..."

p. 12729, line 4: need degree symbol after 0.5

References:

Liang, L., L. Di Girolamo, and S. Platnick (2009), View-angle consistency in reflectance, optical thickness and spherical albedo of marine water-clouds over the northeastern Pacific through MISR-MODIS fusion. Geophys. Res. Lett., 36, L09811, doi:10.1029/2008GL037124.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 12725, 2013.