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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Climatology of stratocumulus cloud morphologies: microphysical properties and radiative effects" *by* A. Muhlbauer et al.

Anonymous Referee #1

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General comments: This paper is an important contribution, presenting characteristics of three classes of marine low clouds classified by their morphology and type of mesoscale cellular convection (MCC) on a global scale. The classification is based on an artificial neural network scheme developed in a previous study. The physical and radiative properties are presented. Many results are new and important for understanding the cloud and precipitation processes in these types of clouds that are main modulators of cloud radiative forcing with high albedo and cloud coverage. The manuscript is well written and the results are clearly presented. I recommend that this paper is published with minor revisions. There are several suggestions for revisions as

described below.

Major points 1. P6986, L12: The retrieved optical thickness and effective radius are not available or not accurate when the sun is low. Therefore, high latitude regions in winter seasons could not be investigated with the method used in this paper. Nevertheless, Fig. 5 present results for global maps including the high latitude regions in winter. I am wondering how reliable these results are.

2. Sect 4: In my view, I do not feel strong necessity to describe technical details in this section to present the case study results that are not very interesting. The results are all reasonable but it seemed to me that there are few new findings. If implications from the case study and association with subsequent sections are clearly described, it may be helpful for readers.

3. The mesoscale-domain-mean shortwave reflectance and transmittance are determined primarily by cloud fraction and cloud optical thickness. While the authors present variability of cloud fraction, there is no explanations about the cloud optical thickness. Before an explanation of the variability of mesoscale-domain-mean shortwave reflectance, it would be of interest to see the variability of cloud optical thickness.

4. Also, results in Figures 14 and 15 seem to be for domain-mean reflectance and transmittance including contributions from cloudy and clear-sky pixels in the domain. Please specify that definitions to avoid misunderstanding. On Page 6999, line 24, I think this sentence is misleading because the mesoscale-domain-mean shortwave reflectance discussed here may be confused with mean reflectance of cloudy pixels excluding contributions from clear-sky pixels.

Minor points Page 6986, line 9: The MODIS measures the radiances, and “irradiances” should be replaced with “radiances”.

Page 6986, line 10: Please specify a Collection number of the MODIS product.

Page 6987, L9: “The higher horizontal and vertical resolution of the lidar allows. . .”

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Exact values of the resolutions would be of interest.

Page 6990, line 10: “previous satellite-based estimates (Leon et al., 2008)” Would be interested in some more details of similarity and difference between methodologies used in the present study and that of the previous study.

Page 6991, line 11: Please exactly define the “frequency of occurrence of closed MCC”. Is this a fraction of frequency of closed MCC occurrence to total frequency of all low cloud regimes?

Page 6995, line 24: “low cloud fraction determined from the CPR”. Why not use the CALIOP here to determine the low cloud fraction?

Page 7002, line 20: “the differences are not found to be statistically significant”. If so, I think the first sentence in Conclusion 6 should be just removed from the Conclusions.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 6981, 2014.