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Atmospheric Measurement Techniques Discussions

Interactive comment on "Mind-the-gap part I: Accurately locating warm marine boundary layer clouds and precipitation using spaceborne radars" *by* Katia Lamer et al.

Anonymous Referee #2

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The paper (a) discusses the factors limiting CloudSat-CPR to detect warm marine boundary layer (WMBL) clouds, (b) quantifies the CloudSat ability to accurately estimate their characteristics (coverage, vertical distribution, top/bottom boundaries) using long-term ground-based measurements from the KAZAR–ARM radar, and (c) evaluates the performance of 7 alternative configurations for CloudSat, EarthCARE and ACCP CPR observations for an optimum characterization of these clouds (specifically the cloud reflectivity and the hydrometeor boundaries) by comparing forward simulations from the different configurations with the KAZAR forward simulations. This work improves our understanding on (a) the performance of CloudSat dataset on WBML clouds, (b) the performance of the future cloud radars onboard EarthCARE and ACCP

and (c) the differences of the performances of the 3 instruments. Additionally it provides recommendation for the next generation of space-borne radars targeting WMBL science. This is a very interesting aspect and the paper is well structured and clearly written, for that reason I believe that this paper is appropriate for publication in Atmospheric Measurement Techniques.

I have only one comment, in the statistics of hydrometeor layer properties estimated for days where CloudSat overpassed within 200 km of the ENA station, 4 hrs KAZR and ceilometer observations around the overpass are taken into consideration (Figures 3 and 4). Why do the authors use such a wide time window for their comparison when for cloud-comparison purposes, a length scale of a few tens of kilometers and a time scale of a few minutes is generally acceptable (e.g. Blanchard et al., 2014)? This question is more puzzling in the discussion of the limitations of CloudSat observations, highlighted in Figure 4, with cloud observations up to 1:30 hour time difference with the time of the overpass. I suggest that the authors use a smaller time window for the evaluation of CloudSat performance with KAZAR measurements and provide a justification for the use of this time window and the consequences on the homogeneity of the scene. Similarly, in the discussion of the differences of the statistics observed, it would be good if the examples/arrows pointing to the different CloudSat underestimations/limitations are given in cases that these limitations are visible in the clouds captured from CloudSat and KAZAR collocated cloud observations.

The rest of my specific comments are only to encourage more clarity in the presentation of the results or technical corrections.

1. Page 4, line 313 – 326: Although mentioned in the legend of Figure 5b, the CloudSat blue line in fig. 5b is not mention in the paragraph.

2. Page 11, line 391: There is a typo in the factor.

3. Page 15, line 510: Apart from a ceilometer, the synergy with the EarthCARE lidar (ATLID) could help correct the cloud top height.

Reference: Blanchard, Y., J. Pelon, E.W. Eloranta, K.P. Moran, J. Delanoë, and G. Sèze, 2014: A Synergistic Analysis of Cloud Cover and Vertical Distribution from A-Train and Ground-Based Sensors over the High Arctic Station Eureka from 2006 to 2010. J. Appl. Meteor. Climatol., 53, 2553–2570, https://doi.org/10.1175/JAMC-D-14-0021.1.

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