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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Fingerprints of a riming event on cloud radar Doppler spectra: observations and modeling" *by* H. Kalesse et al.

Anonymous Referee #1

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Overall this manuscript is well written and well structured. The aim of the study is two-fold: (1) determine how well highly-detailed process studies that utilize radar Doppler spectra can be used to evaluate parameterizations of riming efficiency and (2) determine if such observations can truly be used to constrain numerical models. The conclusion is that realistically remote sensing observations alone can give reasonable input to microphysical models but to truly constrain such models additional information from in-situ observations is required. The method and results are novel and should certainly be published.

The only notable criticism of the paper is that only one event, which lasted less than an hour, was studied. The authors do attempt to justify this and do state this type of data represents a "golden sample". This fact could be made more evident to the reader, for

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example, adding it to the abstract.

Below I list a few other minor comments which if addressed would certainly improve the manuscript.

Abstract. “reasonably well” This could be more quantitative.

Introduction, p28622 line 6. “the level of effort required to analyze...” The suggests that it is very demanding to do this type of analyze but this could be more quantitative. Is this task just time-consuming or technically challenging?

Section 2.2, p28623, line 24. “as well as the two-channel MWR”. Previously in this paragraph it is state “an MWR”. If the detail “two-channel” is needed it should come at the first mention of the MWR unless there were 2 different MWR?

Section 3. The description of the some-what complicated frontal / cloud structures is difficult to follow. There are 2 inversions (a boundary layer inversion and I assume a frontal inversion) but are there 2 or 3 cloud layers? It is clear there is a low-level BL top cloud and then the main frontal cloud band, but the mention of a “mid-level cloud” (p 28626 line 23) confused me. Since the situation is quite complicated, an schematic diagram may help the reader. The cloud layers and SLW layer and the inversion could be marked. It would also help to label the “seeder” and “feeder” clouds which are referred to else where in the manuscript.

Section 3, p28626 line 5. Fronts are not just advected by the wind. They often travel at a different speed to the mean wind speed and thus propagate. I suggest this is re-worded.

Section 3, p28626, line 9. “Upstream”. Should this be downstream? It might be clearer to use East / West here. i.e. On 21 Feb 2014, two warm fronts were located over southern Finland, farther to the East, than the occluded front which is the focus of this study”. Alternatively, if these 2 additional warm fronts did not produce any cloud / precipitation at Hyytiälä during the times that are presented here, it may be easier to

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omit any mention.

Section 3.2 p28627, line 9 “maximum observed diameters”. Is this the length of the longest axis of the particles or the area-equivalent diameter?

Section 3.3, p28630 line 20-21 “The observed reduction in the LWP can partly be attributed to..” Is “partly” used here just because there is SLW elsewhere in the profile that cannot be effected or is there some additional processes occurring?

Section 3.3.1 p28631, line21. “trad” rad should be a subscript.

Section 3.3.1 p28632 line 4 “the uppermost SLW layer at...” This is one example where the upper or lower layer of something is referred to. It is difficult for the reader the remember all of these layers. Hence I strongly encourage the inclusion of a schematic diagram.

Section 3.3.3 p28633 line 19 “based on all simulated fall streaks”. How many fall streaks were simulated?

Section 3.4.1 p28636, line 11. “The rimed fraction of snow particles at the model’s uppermost layer is set to 0”. How good an approximation is this?

Section 4, p28640, line26. Punctuation – there is a en-dash at the start of a sentence.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 28619, 2015.