

Atmos. Chem. Phys. Discuss., referee comment RC1  
<https://doi.org/10.5194/acp-2021-177-RC1>, 2021  
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## **Comment on acp-2021-177**

Anonymous Referee #1

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Referee comment on "Microphysical process of precipitating hydrometeors from warm-front mid-level stratiform clouds revealed by ground-based lidar observations" by Yang Yi et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-177-RC1>, 2021

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Review for the AMT-Discussion paper - <https://doi.org/10.5194/acp-2021-177>

### **1) general comments**

The paper deals with lidar measurements to improve the understanding of microphysical process of mid-level stratiform clouds. The results of this study are based on two case studies observed in 2017 and 2019. The authors also highlight, that lidar observations of precipitating cloud systems where the whole precipitation process can be studied are rare but needed to understand the process from origin till rain hits the ground

The data are obtained by two lidar systems, a depolarization and a water vapor Raman lidar. The radar systems are designed to be able to measure also during light rain – optics of the systems are protected by a glass window in the roof of the institute.

The measurements depict two warm front cloud systems overpassing the measurement site. These lidar observations are described and related to precipitation formation processes. While the liquid microphysical processes seem to dominated the analysis.

Generally, the structure in the paper is not clear enough. The result section 3 is missing a red line to follow. It might be helpful to make more paragraphs and structure them better. It is not always easy to connect the information with the actual microphysical processes observed. So having more explanation of what process is happening and explain the resulting observation signatures would help. Perhaps use a sematic sketch? If this could be improved the quality of the paper would rise for sure.

## 2) specific comments

- Section 2.1. line 73-75 and section 2.1.1 line 111-114

Are there data or plots available to show the results of the water splashing experiment? From my site the performed technique is new, so results of it should be presented or at least citations given to similar performed experiments.

- Section 2.1.1 line 103-108

The explanation of the dark band is hard to follow. Could you split the sentence into two or 3 parts and extend the explanation a bit so that it is better to read?

- Section 3.1. Figure 1

The text below the Figure is too long. Describe what the graphs show, do not give any interpretation or highlight things the graphs show the caption. All interpretations or highlights that can be seen have to be in the main text of the article

- Section 3.1.1 sentence line 160-160 and following sentences

I had a hard time to follow the text here and connect the information you give to the story you want to tell. Please structure this paragraph clear. What can be seen in the graph and what do you follow from your observations. Perhaps make some paragraphs to give the text more structure.

- Section 3.1.2 line 201-204

This explanation has to be given when you explain the water splashing experiment! So move this up in the section above!

- Section 3.1.2 line 210-211

Can you explain these in more detail or give a citation? Is there a relation to the signature and the distance to the 1km or higher origin layer of the initiation? Can signatures be used to identify the high of initiation?

- Section 3.1.2 paragraph 4 (234-243)

Can you explain this in more detail? Are there other observations done showing the same, give a citation? It would be nice to get a bit more explanation for people not so familiar with lidar measurements

- Section 3.1.2 line 306

Does this comparison make sense here? 1 mm large super cooled droplets? Could you comment on this please and give a reference!

- Section 3.1.2. line 313-325

This part was hard to follow. It might be one of the mature parts of the paper. Please, describe what you observed and in a second step what process might be behind. Perhaps it makes also sense to make a summarizing sketch of the processes observed and relate them to the measurements you would expect. Then it is easier to follow for the readers.

### **3) Technical corrections**

- Line 216-218: Please reformulate this sentence
- Please have a clearer structure in your sections and paragraphs
- Make more paragraphs
- Shorten you captions of the figures; some are quite long. Put the information into the text or make more figures