

## *Interactive comment on* "An algorithm to retrieve ice water content profiles in cirrus clouds from the synergy of ground-based lidar and thermal infrared radiometer measurements" *by* Friederike Hemmer et al.

## Anonymous Referee #2

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## **General Comments**

To be brief, I agree with Reviewer 1's assessment. In particular, with their last point 7. To this point, I would further note that I could not find the fov of the lidar used nor the laser divergence. Such parameters should be listed as they directly impact the magnitude of the multiple-scattering effects in the lidar signals.

To play devil's advocate, it could be supposed that the important results presented in this paper all depend on the accuracy of the microphysical model used in the optimal

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estimation retrieval. Specifically, if the extinction at the lidar wavelength for a given IWC predicted by the model is inaccurate then the inversion results will be inaccurate, leading to wrong values of the retrieved lidar-ratio. However, the authors should point out that this is not quite the case. What is important is the combined lidar+radiometer retrieval is the relationship between the TIR absorption optical depth profile and the lidar extinction profile implied by the microphysical model. One of Platt's earlier papers discussed this important relationship. This relationship is expected to be robust for a large range of particle shapes and sizes. So I believe the results presented in this paper are likely at least robust with respect to inaccuracies in the microphysical model (at least with respect to the relationship between the extinction, IWC and temperature). This point should be covered in the discussion section of the paper and likely mentioned in the conclusions.

## **Specific Comments**

See the attached marked up pdf file.

Please also note the supplement to this comment: https://www.atmos-meas-tech-discuss.net/amt-2018-320/amt-2018-320-RC2supplement.pdf

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-320, 2018.