Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
https://doi.org/10.5194/amt-2021-219-RC1, 2021

Comment on amt-2021-219

Anonymous Referee #1

Referee comment on "Impact of second-trip echoes for space-borne high-pulse-repetition-frequency nadir-looking W-band cloud radars" by Alessandro Battaglia, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-219-RC1, 2021

General comments:

This is a straightforward paper that identifies fake cloudiness in the CloudSat radar data record due to mirror echoes and multiple scattering tails. The author identifies that the effect is relatively small in the CloudSat record and is located at very high altitudes where it can be easily identified due to the specific PRF of CloudSat. EarthCARE however will have a much higher PRF in order to enable reasonable Doppler performance. The author shows that as a result of the increased PRF a non-negligible impact of these second trip echoes will both create fake cloudiness and occasionally artificially increase the single-scattered reflectivity value in real clouds. The methods are well described and appropriate for the study. The relevant papers have been cited where appropriate. The study is timely ahead of the EarthCARE launch and has immediate specific implications for the CloudSat data products. I only have a few minor comments below.

Specific Comments:

Page 1, line 22: phase 0 -> pre-phase A

Page 5, Line 6: The two sentences beginning with 'The folding' are not clearly written. I Suggest: '*The folding mechanism is further explained in Panel b for the reflectivity profile at -32 latitude (corresponding to the red line in Panel a). The Level-1 CPR product reports the satellite height is 715 km and the PRF is 4.37 kHz which corresponds to an unambiguous range of 34.3 km. By distributing an integer number of these 34.3 km long unambiguous ranges from the satellite height downwards, the folding window'*

Page 6, Line 5: It isn't labeled in the legend which percentage goes with each latitude band.

Page, Line 11: It's also pretty straightforward to use CALIPSO to identify these clouds.

Page 16, Line 21: could you elaborate on how you think the mirror echoes add any information. I think the fact that you can predict the magnitude and location of the mirror echoes with some accuracy suggests that there isn't much additional information