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Interactive comment on "Assessment of global total column water vapor sounding using a spaceborne differential absorption radar" *by* Luis Millán et al.

Anonymous Referee #1

Received and published: 24 June 2020

The paper investigates the value of DAR for retrieving integrated water vapour (IWV). The paper is concise, well written and generally clear. The topic is very important and timely given the recent technology advance for G-band radars. I have few major points that I would like to be addressed.

Major comments:

1) The paper provides a good idea about the performance of the proposed DAR system globally. However the strength/novelty of the methodology to me is to provide IWV in cloudy conditions (in clear sky conditions we can probably be satisfied with current observations), where also I expect to see larger IWV spatial gradients (and so where the

fine resolution of the method could be really useful). So it would be great to see the performances conditioned to cloudy conditions (maybe defined by some LWP thresholds). Also it would be interesting to see a scene (maybe a Stratocumulus or a convective scene from LES) with strong IWV gradients where the retrieval performances can be shown in detail.

2) Just to give an idea to the reader it would be good to know the single-pulse sensitivity for the radar specs tabulated in Tab.1. I expect 30 dB difference between the different powers? Is that correct? Is there any issue with the dynamic range of the surface reflectivity measurements?

3) For Multiple scattering you state: "In all scenarios simulated here, the surface return dwarfed the multiple-scattered component of clouds and rain." Well I am sure this is true everywhere but in deep convection. CloudSat surface return sometime is indeed dwarfed by multiple scattering in deep convection (several examples are provided in literature, e.g. Battaglia and Simmer, IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING,VOL. 46, NO. 6, JUNE 2008) I am sure that, when increasing the frequency, such instances will be more. It would be good this is quantified (maybe having a scene like suggested at 1) could help). Also what do the authors mean with "coarse" resolution of Cloudsat hydrometeors ?(I am still confused why the authors need to under-sample Cloudsat (computational time?)

Minor comments: 1) In the abstract I do not think that the auhors actually mean "pulses will reach the surface" (for radar the pulses must also go back to the receiver to be detected!) 2) Sect.3: not clear what scattering model has been used for ice. 3) Sect.3: "we only used every 50 CloudSat measurement" (you mean one out of 50?)