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Atmospheric Measurement Techniques
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Discussions

Interactive comment on "The feasibility of water vapor sounding of the cloudy boundary layer using a differential absorption radar technique" *by* M. D. Lebsock et al.

Anonymous Referee #1

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Review of the article titled "The feasibility of water vapor sounding of the cloudy boundary layer using a differential absorption radar technique" by Matt Lebsock and co-authors for publication in Atmospheric Measurement Techniques.

The authors have used sophisticated forward model simulator to explore the feasibility of retrieving column water vapor and profile of water vapor from Differential absorption Radar (DAR) observations. They have used LES model simulations from RICO and DYCOMS field campaign for this purpose. The main conclusion of the article is that it is feasible to retrieve profile of water vapor from space-borne radars. The authors have gone in to details of uncertainties in the retrieved water vapor caused due to beam

filling, cloud microphysics, thermodynamic profiles, and sampling. The article will be very useful for general meteorological community and especially to researchers in the satellite field. I recommend this article for publication after they address the following minor concerns.

1) It is rarely that a satellite will see the boundary layer un-interrupted by high clouds. I believe that ice clouds and the attenuation due to them will also affect your retrievals of water vapor. Moreover the backscatter cross-section from ice clouds will be highly different for the frequencies in consideration (140-170 GHz), making it tougher to retrieve water vapor. This issue need to explored or at least discussed in the article. 2) You have used a sophisticated forward model that takes in to account Mie effects. Now in the article, you knew the micro-physics from the LES model simulations, while in reality they will be unknown. There are significant undulations in the backscatter cross-section in the Mie regime due to slight changes in microphysics. What if the microphysics causes the backscatter to increase at one frequency and to decrease in the other frequency? The Mie undulations especially for precipitating cloud conditions can be quite significant.

Minor Points: 1) Figure 9: I believe the y-label should be g/m2 not g/m3? 2) Table 3: One of the columns (probably the third and the fifth) should be delz/delp * delta(p). Currently columns 2 to 5 have the same denominator. 3) The terms "integrated vapor path" and "column vapor path" have been used in the article, I think maybe the authors should just use one of them for clarity.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 5973, 2015.