

## ***Interactive comment on “Determining Cloud Thermodynamic Phase from the Polarized Micro Pulse Lidar” by Jasper R. Lewis et al.***

### **Anonymous Referee #2**

Received and published: 15 September 2020

This paper presents new measurements from a micro pulse lidar (MPL) with a depolarization channel and stationed at Goddard Space Flight Center, Greenbelt MD. The objective is to demonstrate that volume depolarization can be used to infer the water phase of clouds when used in conjunction with cloud top temperature from the GEOS-5 model. The paper is well written and presented with sound justification for its conclusions. I believe this paper should be published after addressing the minor points below.

I do not see the wavelength of this lidar. I think a table with the instrument specs would be useful.

Line 114 – 116. This sentence makes no sense: The cloud layer observed between 8 – 9 km CTT = -32.1 °C) exhibits NRB near the cloud top in both the co-polar and cross-polar signals compared to the signals nearer the cloud base.

Lines 120 - 124 Have the authors considered how signal attenuation may affect the depolarization measurement?

Figure 6. I cannot see any unknown phase clouds in this figure. The legend says they are pink, However, Magenta (used for mixed phase) is close to pink, so a different color should be used for unknown.

Figure 9. You show the CALIOP spatial distribution of SLF for the -20 C isotherm. It shows only a slight latitudinal dependence. Is that true for other temperatures? The area used for the comparison may be too large despite the spatially uniform data. When comparing a satellite measurement to a ground based measurement, you should not exceed  $\sim 2 \times 2$  degree. What happens to the comparison if you cut down considerably on the area used? Also it would be nice to have state boundaries on that map. It is a little hard to get one's bearings as it is.

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Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-298, 2020.

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Discussion paper

