



*JGR atmospheres*

Supporting Information for

**Refining Planetary Boundary Layer Height Retrievals from Micropulse-lidar at Multiple ARM Sites Around the World**

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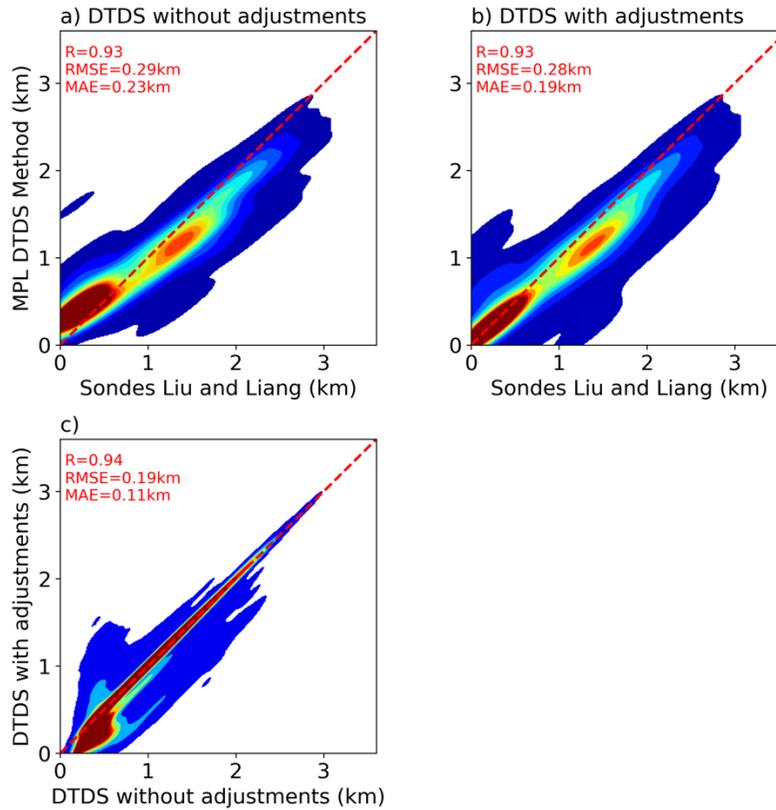
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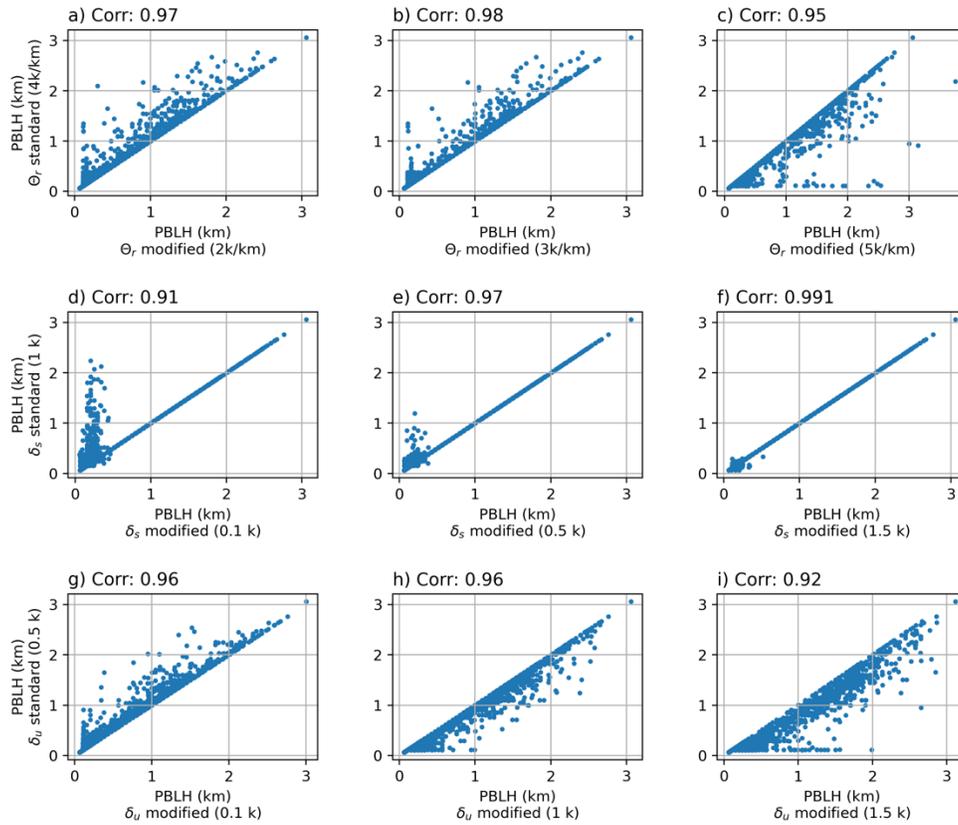
Figures S1 to S3

**Introduction**

Knowledge of the Planetary Boundary Layer Height (PBLH) is crucial for various applications in atmospheric and environmental sciences. Lidar measurements are frequently used to monitor the evolution of the PBLH, providing more frequent observations than traditional radiosonde-based methods. However, lidar-derived PBLH estimates have substantial uncertainties, contingent upon the retrieval algorithm used. In addressing this, we applied the Different Thermo-Dynamic Stabilities (DTDS) algorithm to establish a PBLH dataset at five separate Department of Energy's Atmospheric Radiation Measurement (ARM) sites across the globe. In this supplemental material, we use the PBLH-DTDS retrievals from the Green Ocean Amazon - GoAmazon (MAO) site with and without adjustments to the blind zone. This dataset highlights the importance of adjusting DTDS to the specific lidar instrument configuration. We also analyze the sensitivity of the Liu and Liang algorithm to various threshold parameters using radiosonde PBLH retrievals at the MAO site. Finally, we present an example of Micropulse lidar backscatter information to demonstrate the enhancement in PBLH-DTDS retrievals when the lidar instrument operates correctly.



**Figure S1.** a) Comparison between the DTDS-PBLH without adjustments to the blind zone and the radiosonde PBLH based on the Liu–Liang method. b) same as a) but for DTDS-PBLH with adjustments to the blind zone. c) Comparisons between the DTDS-PBLH without and with adjustments.



**Figure S2.** Scatter plots showing the sensitivity analysis of the effect of the threshold values on PBLH determination of convective and neutral boundary layers based on the MAO dataset. (a-c) Sensitivity analysis of  $\hat{\Theta}_r$ . (d-f) Sensitivity analysis of  $\delta_s$ . (g-i) Sensitivity analysis of  $\delta_u$ .

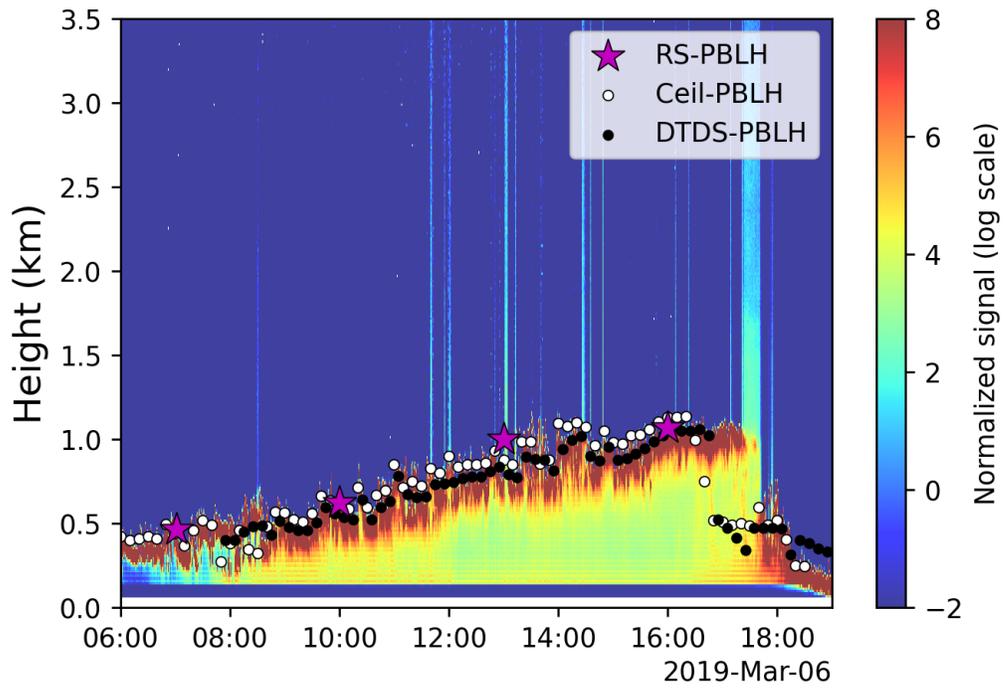


Figure S3. PBLHs at COR using the DTDS algorithm (black dots), the ARM Ceil-PBLH product (white dots), and radiosonde estimates (magenta stars) after the replacement of the MPL.