

Atmos. Chem. Phys. Discuss., referee comment RC1  
<https://doi.org/10.5194/acp-2021-302-RC1>, 2021  
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## Comment on acp-2021-302

Anonymous Referee #1

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Referee comment on "Methodology to determine the coupling of continental clouds with surface and boundary layer height under cloudy conditions from lidar and meteorological data" by Tianning Su et al., Atmos. Chem. Phys. Discuss.,  
<https://doi.org/10.5194/acp-2021-302-RC1>, 2021

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### Summary:

Using long-term observations at the U.S. Department of Energy's Atmospheric Radiation Measurement Program's Southern Great Plains site, this study developed a first-ever lidar-based method (DTDS) to automatically identify coupled and decoupled low clouds over land. The coupled states determined by the DTDS method compared considerably well with that derived from radiosondes. In the meantime, with the ability to provide high-quality retrievals of the PBLH under cloudy conditions, the proposed DTDS method also helps address a long-lasting problem in the PBLH retrieved from lidar. In general, the manuscript is written pretty well with the evidence presented by the authors supports their conclusions. I only have a few minor comments below that I would like to see addressed before the manuscript is accepted for publication.

### Minor comments:

- Line 107-108: The radiosonde data provides the PBLHs retrieved from four different algorithms. Is there any specific reason why you only select the PBLH retrieved by the method of Liu and Liang (2010)? Based on my personal experiences, the PBLH retrieved from different algorithms can vary a lot from each other for some cases.
- Figure 2. It would be nice if the information of the data sources for each variable are also included in the figure caption. For example, the PBLH is derived from the RS profiles using the method of Liu and Liang (2010), the cloud layer is obtained from the CLDTYPE/ARSCL data, etc.
- Line 354: change "a relatively low biases" to " a relatively low bias"
- Line 432-435: Get confused about this part. Do you mean that the correlation coefficient between the DTDS-derived PBLH and RS-derived PBLH under cloudy conditions is much higher compared with that under clear-sky cases? Why is this kind of comparison important here?

- Please keep your reference formatting consistent throughout the manuscript, for instance, Ek and Holtslag (2004) vs. Zheng & Rosenfeld, (2015).