

## ***Interactive comment on “Liquid marine cloud geometric thickness retrieved from OCO-2’s oxygen A-band spectrometer” by Mark Richardson et al.***

### **Anonymous Referee #2**

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Review comments on manuscript “Liquid marine cloud geometric thickness retrieved from OCO-2’s oxygen A-band spectrometer”

Authors: M. Richardson et al. MS No.: amt-2018-387 MS Type: Research article

General comments:

This paper introduces the new OCO2CLD-LIDAR-AUX product and its algorithm theoretical basis. The algorithm adopts the optimum estimation principles to retrieve cloud properties, including optical thickness, cloud top, and geometrical thickness for marine boundary layer clouds using the OCO-2 hyperspectral A-band measurements. Performance evaluation is also conducted. The paper is well written and this new product

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provides new information for further understanding the properties of marine boundary layer clouds. The topic is suitable for publication in AMT. I recommend publication after some minor revisions. Some concerns for the authors to consider:

1) I actually don’t find the physics of cloud phase detection method used here straightforward. What is the general value range for  $I_{wk}/I_{o2}$ ? How strongly does it depend on other factors in addition to cloud phase (e.g., cloud optical depth, height etc)? 2) The differences in performance for thin and thick clouds (Fig. 6) makes me wonder the role of surface reflectance. How is the sea surface reflectance handled?

Specific comments:

P8 L19: It is mentioned that the L2RTM input includes meteorology. I assume this include temperature profile?

P9 L8: Cloud phase determination is brought up here, but the details are given in P11; suggest either move the details here or add something like “detailed discussion in Section5.1”.

Figure 4: Does “&flag” in the legend mean “Quality\_flag =2”?

Figure 8: there are typos in the caption: there are two panel “c” descriptions (the second should be for panel d) but none for panel “f”.

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