

## ***Interactive comment on “Analysis of 3D Cloud Effects in OCO-2 XCO<sub>2</sub> Retrievals” by Steven T. Massie et al.***

### **Anonymous Referee #1**

Received and published: 18 October 2020

The manuscript describes 3D cloud effects in OCO-2 XCO<sub>2</sub> retrievals. This is done using both measurements (TCCON, OCO-2 and MODIS) and 3D radiative transfer simulations. The presence of such effects are clearly demonstrated and their importance discussed. Various mitigation methods are presented and discussed.

The manuscript is well-organised and include detailed description of the results. It is recommended for publication after consideration of the minor comments below.

### Comments

- **Table of acronyms:** The manuscript contains numerous acronyms. Some are self-explanatory, some common and some rather unusual in this context (like

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- DWS which made this reviewer think about deep water soloing). To help the reader, please include a table of all acronyms and their explanations.
- **Page 2, line 47:** Rayner and O'Brien (2001) is missing in the References.
  - **Page 4, lines 140-183:** Please specify the OCO-2 pixels size. And please provide a rough number of how many MODIS pixels cover one OCO-2 pixels.
  - **Page 6, lines 249-251:** This sentence is hard to read. Please rephrase.
  - **Page 6, line 263:** Please explain what is meant by “eight OCO-2 observation footprints”.
  - **Page 8, lines 354-368:** Please include information about cloud phase (liquid or ice water cloud, I presume the former, but it should be written in the manuscript). How was the optical properties of the cloud calculated? What is the cloud effective radius and how was it estimated?

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