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"A new OCO-2 cloud flagging and rapid retrieval of marine boundary layer cloud properties" by Mark Richardson[1,2], Matthew D. Lebsock[1], James McDuffie[1], Graeme L. Stephens

The manuscript documents a new cloud flagging and retrieval pre-processor for OCO-2 marine boundary liquid cloud retrieval algorithm. This new pre-processor contains two steps: step one uses a machine learning perceptron network to classify low liquid cloud, and step two that simultaneously retrieves optical thickness (t), effective radius and cloud top pressure (Ptot) with a three-parameter LUT using CO2, and O2 continnum radiances and A-band absorption to continuum ratio. The new retrievals and throughput are compared with MODIS and CLIPSO retrievals and original CLD-LIDAR-AUX as needed. In general, the new classifier/retrieval without CLIPSO show promising results. The residual biases in optical thickness, effective radius and cloud top pressure are discussed that could be potentially linked to spatial variability and in-cloud vertical structure. I would like to see how changes in pre-processor retrieval of tau, Re and Ptot affect the eventual OE retrieval beyond the impact of qualifying throughput. But that could be another major undertake, if the authors are planning to change the cloud model within the OE retrieval system and that could be content of the next paper.

The paper is well written and the addition of Table 1 is very helpful. I have a few more minor comments as follows:

P1L25-33. The description of the first paragraph is a bit misleading as if A-band alone allows all the retrieval, i.e., Tau, Ptop, H and Nd. But A-band only helps with cloud flag and cloud top height, other channels are needed to retrieval Tau, Re, and H.

P3L83. Why do you limit to nadir only orbits?

Figure 3. A-band ratio will be less sensitive for low clouds. The 403 hPa cloud shown is way above the boundary clouds. More relevant to the retrieval of low clouds is whether you are able to separate clouds from 827 hPa to something like 750 km.

P7L221: Are you sure the middle parameter is *Ic,st/Ic,O2,* not Ic,st? In Figure 4a, LUT shows Ic,o2 and Ic,st as controlling parameters.

Table 1. It is better to spell out that the input to machine learning classifier includes both radiances and radiance ratios.

P7L220. Not clear if you process all pixels with LUT, or only pixels that identified as cloud from classifier to further process with LUT. If so, please mention here.

P9L280. Could the asymmetric bias of Ptot be related to truncation of LUT, i.e., the same A-band ratio could occur in higher cloud but smaller optical depth? How will the retrieval change if you have LUT that covers more pressure levels, i.e., from 500hPa to 1010 hPa?

Figure 7. I would rename the “passed”, “failed LUT”,”old but not new” into “passed both”,”passed classifier”,”failed both”.

P13L380 Do you mean “inhomogeneity”?

P13L384. You have previously scaled the *Ic,st* channel by 0.9804. Is this scaling sufficient? If you scale by a smaller value, the mean bias of Re might be reduced.