

The manuscript “Discriminating Between Clouds and Aerosols in the CALIOP Version 4.1 Data Products” by Zhaoyan Liu et al. provides a detailed overview of how the new CALIPSO data product release separates clouds and aerosols. The extensive update to the development of the PDF for separating features based on the specified parameters were motivated well with previous version problems and overall improved science understanding since the previous data product release. The changes to both upstream development (e.g., calibration changes from V3 to V4) and potential downstream science (e.g., impact to science-related analysis) were also presented in the context of the improved data product for determining and interpreting CAD scores. Overall, the scientific significance/quality seemed in good shape. However, precision of the language could use some work to improve clarity, in particular for figure caption.

Below are some further technical comments:

- Figure 4: what are the diamond, red dots, square blue boxes? I'm guessing the ice cloud contours are at the same levels as the aerosols? Again guessing (k) is for all data?
- Figure 5: what are those contour for? Different colors from Figure 4.
- Page 17, line 3: “cirrus fringes with orange probability contour” alternatively, I think it would be easier to discern the figure as a reader by saying “cirrus fringes (left panel) and for adjacent cirrus layers (right panel). Orange probability contours for cirrus fringes and red probability contours are overlaid in both the left and right panel”
- Table 1: why is the occurrence frequencies outside the table description? Perhaps this is AMT style though.
- Page 24, line 7: is that  $CAD = 99$  or is it  $CAD = +/-99$ ? It is unclear if the discussion is for upper end confidence of clouds or both aerosols and clouds.
- Page 27, figure 12 caption: “The red curve in each panel is a column mean between 0 and 7 Km.” as in the column mean of the percentage? What are the green lines in (d-f)? What is the thin red line in (f)?
- Page 32, line 20: “Table3” to “Table 3”, space in between
- Page 34, Figure 15 caption: Caption refers to cloud fraction which typically ranges from 0 to 1 but then plots in  $\log_{10}(\text{percentage})$ , I was confused at first and I think this could be clarified in the caption.
- Page 35, Figure 16: label (b) clou  $\Rightarrow$  cloud
- Page 37, line 9: word choice of vis-a-vis, considering changing to a more common phrase
- Page 43, Figure 23: What are the other features detected at single shot resolution that do not show up in 23c? I'm guessing it is the surface if it is not cloud/aerosol? Might be nice to point this out so readers do not focus on this when it is not the point of the figure.
- Page 45, Figure 25: So are those mean CAD scores and at what latitude-longitude resolution are those grid boxes?
- Page 46, line 8: word choice of gradation, considering changing to a more common phrase
- Page 47-48: so is the table confusion for all available data or for 2008 or some other time period?