Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-214-RC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "The diurnal cycle of cloud profiles over land and ocean between 51 S and 51 N, seen by the CATS spaceborne lidar from the International Space Station" *by* Vincent Noel et al.

Anonymous Referee #1

Received and published: 2 April 2018

This is a review of "The diurnal cycle of cloud profiles over land and ocean between 51°S and 51°N, seen by the CATS spaceborne lidar from the International Space Station"

This paper presents the cloud detection statistics from the CATS lidar that was operating on the ISS. Because of the non-sun-synchronous orbit of the ISS, these statistics sample all hours of day and night. This creates a unique dataset. This data is presented very well in the paper. I believe this is an excellent paper that will be cited a lot. I certainly recommend publication of the paper in ACP. There are a few minor issues

Printer-friendly version

Discussion paper

that I recommend the authors to consider. Those are discussed below.

Like any lidar, CATS probes the first ∼3 optical depths of a cloud, as discussed in the paper. In the case of thin cirrus clouds, the full extent of the clouds will be sampled, but in many cases essentially only the top height will be detected. However, the authors confuse this sampled vertical cloud fraction with statistics of vertical extent. For example, the abstract states “the high clouds geometric thickness increases significantly from 1km near 5PM to 5km near 10PM”. However, it could also be that the cloud top altitude is more variable later in the day, while the geometrical thickness is staying the same. The data could be analyzed in other ways to include transparent clouds only, which will allow a study of statistics of geometric thickness, but this is not done in the current study. I am not asking to change the study to include this analysis, but the authors should discuss the fact that real geometric extent is not always sampled here. Especially in the tropics a substantial part of the high clouds would be tops of convection that may have vary throughout the day. Other parts of the paper that refer to geometric thickness of clouds are at lines 340-344, 444, 492, 629, 636, and 642. There may be other instances. Please go through the paper and discuss this interpretation of the data correctly.

Line 172: If I understand correctly, lidar depolarization information is used for cloud classification. If so please briefly discuss this in the paper.

Line 372: It seems that a reference to Johnson et al. (1999; J. Climate, 12, 2397–2418) about the tri-modal nature of tropical convection is in place here.

Line 515: Another thing to note is that, besides cloud detection, retrieving a cloud top height from passive instruments is not as straightforward as it is for lidar measurements, especially for thin clouds and in multi-layered situations.

Figure 5 (and A7): I would suggest to add a vertical scale to the Africa-North plot, or maybe to all of the plots.

Figure 6: Because of the ISS orbit, CATS samples between 51 degrees north and south, as explained in the paper. However, figure 6 and the discussion are not consistent with this geographical limitation and include statistics supposedly from latitude bands of 30-60 degrees north and south. This choice is made to be consistent with previous studies, but hides the fact that CATS is only sampling to 51 degrees, making the data not completely consistent with previous datasets. It is important to be consistent about the sampling region throughout the paper. Also, I find the labels of the latitude bands on the right side of figure 6 rather confusing. It makes it seem like vertical axis are latitudes in addition to cloud amount deviation somehow. I would propose adding the latitude bands on top or inside the figure as a label or legend.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-214, 2018.

Printer-friendly version

Discussion paper