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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.

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Thanks for your review. Regarding your comment:

One way to make these limitations well understood is by using ground-based observations to validate CATS results. Although there is one figure for this purpose, it is not enough. Tropical observations and over oceans are needed. ARM observations are available for the validations.

We have tried locating a well-documented, 24/24 dataset of cloud layers covering the

period 2015-2017 based on measurements from a ground-based lidar operating in the Tropics, preferably close to the ocean. We have contacted several observatories (e.g OPAR) but it appears cloud layer products are often unvalidated and/or suffer from irregular or non-diurnal sampling. Deriving robust cloud statistics based on those, while possible, is an involved and long process that often requires its own study, and we could not use those. We understand that validation of CATS detections through comparison with an external dataset would in theory require that external dataset to be validated itself, perhaps by being used in a published article.

We investigated ARM data from https://www.arm.gov/data and found several datasets based on Tropics measurements and promising cloud layer information. We found that

- Datasets from Nauru Island and Darwin Australia did not overlap with CATS time-frame

- Datasets from Brazil and Ascension Island cover the CATS timeframe but only contained profiles of Attenuated Backscatter (without cloud detection) - doing the cloud detection ourselves would require validating the obtained cloud dataset first (as explained above)

- Only datasets from the ARM Eastern North Atlantic (ENA) atmopheric observatory - https://www.arm.gov/capabilities/observatories/ena - are close to our criterias above. This site provides cloud layers derived from ground-based lidar measurements made in an oceanic environment, unlike the SIRTA and ARM-SGP datasets considered in the initial article. Our initial exploration of the enaarsclka-zrbnd1kolliasC1 dataset (based on a combination of lidar and radar data) showed problems during the 2017 summer due to issues with lidar cloud detections. We contacted ARM people, who suggested rebuilding the cloud layers based on the cloud mask source product and ignoring the lidar-only detections, which resolved the problem but in effect turned it into a radar-based product. Moreover, the ENA observatory is located at 39°N, i.e. its latitude is too high to make it Tropical.

In conclusion, our search for ground-based lidar observations has so far only turned up a single dataset that is located outside the Tropics and suffers from instrumental issues. So far we have been unable to locate an appropriate dataset.

Would you consider the ARM-ENA cloud mask dataset to provide a satisfactory basis for CATS comparison? If not, could you suggest a more appropriate and robust dataset?