

Review of the revised manuscript 'Characterizing clouds with the CCCLim dataset, a machine learning cloud class climatology'

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Dear editor and authors,

I would like to thank the authors for addressing my comments. I have a few remaining small comments, after which I recommend the manuscript for publication.

Kind regards,

Dr. Peter Kuma

Comments

L88: 'While these classes are defined to be consistent with the WMO definitions, misclassifications can occur, caused for example by the small footprint of the active sensors.': I think this is still overstating the consistency between the CC-L classes and WMO genera. The CC-L classes are defined based on a set of relatively synthetic (rule-based or fuzzy logic) thresholds. They are not expected to be matching statistically when compared to ground-based observations of clouds which are defined relatively vaguely based on a set of features determined visually by a person. Therefore, misclassifications are expected purely because the definition and the viewpoint are not the same. Also on L327: 'Using multiple cloud properties to define the classes makes them physically consistent and well-aligned with the morphological WMO genera.' And on L114: 'comparable': I am not sure if this is a good term to use. It would suggest that one could for example compare the CC-L RFOs with WMO cloud genera RFOs from a ground station and expect them to have comparable statistics. But that is not the case because the definition is different. It might be better to say 'analogous' or 'similar'.

One reason why training on daytime samples and applying the algorithm on nighttime might lead to biases is because nighttime passive retrievals are based on the infrared spectrum bands only, and lack any information provided by the visible spectrum bands. Therefore, there could be limitations on the minimal detectable cloud optical thickness and so on, and the results could have statistical biases compared to the daytime retrievals. The Cloud_cci nighttime products are considered of experimental quality, and they use different thresholds for day, night and twilight, according to Stengel et al., 2020: 'Night-time COT and CER retrievals are considered to be experimental products and only included in Level-3U products.', 'Please note that retrievals of CER, COT, CWP and CLA are also provided during night-time, although as experimental products.'

L106: 'high temporal resolution': It is not clear what high resolution means. It is better to be more specific.

Fig. 4: 'daily mean RFO': As mentioned previously, I think that this is misleading because it is not representative of a daily temporal mean, but rather is a daily composite with an incomplete diurnal coverage.

Fig. 7: It might be good (but not necessary) to mention in the caption that the dashed line is SW CRE = LW CRE. 'Latitude Range: 0°N/S-90°N/S' is a bit unclear to me, but I guess it simply means global (?).