

1 General Comments

Overall, this is a very well-written and impressive paper. Although the CCIC algorithm is a proof of concept, the results are pretty promising. For instance, this method is much more advanced and skillful than the brightness temperature-threshold approach to track deep convection.

The CCIC algorithm shows good skill in retrieving ice water path (IWP), and therefore, there is a good potential to create usable long-term day and night IWP datasets, that could help constrain clouds in climate models. Somewhat surprisingly, needing only 11 micron channel as input, the QRNN-based method shows some skill in retrieving vertically resolved ice water content. However, I expect the 3D retrieval to be very uncertain in unusual atmospheric situations. This comment pertains to the stability of the retrieval, which the authors indicate will be assessed in the continuation work.

For me, this is already a good paper and could probably be published as is, but I have a few comments on elements of the paper that should be clarified.

1.1 Specific comments

input data

- Since the input data is only tested on geostationary data with no input from polar-orbiting satellites, it is worth mentioning that high latitudes are not represented in the study/or something about the likely difficulties in retrieving IWP over snow-covered surfaces. This fact is pertinent since, as far as I understand, GridSat (or at least the new ISCCP-NG, another similar global geostationary dataset) may include polar-orbiting satellites to fill in the missing data at the poles in the future.
- The datasets apply inter-satellite normalization. ” This is not obvious. One method of ”normalizing” the geostationary satellites is to use spectral band adjustments to make all the satellite’s 11-micron channels look like a particular sensor, for instance, the SEVIRI 11-micron channel. Is this how it was done? Either way, more information is needed here.

training data

- The existence of the 2C-ICE equivalent dataset, DARDAR, should be mentioned somewhere, at least in reference, and possibly half a sentence on why 2C-ICE was chosen as the reference dataset here.
- The authors rightfully point out that the largest source of uncertainties in IWP retrievals is the assumed ice particle microphysical model. However, nothing is mentioned about which microphysical model the 2C-ICE IWP retrievals assume. This needs to be mentioned, especially as it is rightfully considered when retrieving IWP from ground-based Radar.

validation

- Cloudnet offers several years of W-band data and more sites than just the one, Palaiseau, in France. Why (only) this site? For instance, I don’t know if it is too far North, but Norunda in Sweden would add sub-arctic conditions to the validation. A comment would suffice here.