

Response to RC2 on egusphere-2023-1953

The Chalmers Cloud Ice Climatology: Retrieval implementation and validation
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Text from the Anonymous Referee is presented in gray and ours in black.

We thank the reviewer for the nice and concise summary of the paper and for the overall review. We are convinced that the comments helped us to improve our manuscript. As the reviewer noticed, the stability of the retrieval will be assessed with a follow-up work. We address the specific comments below.

Changes to the manuscript

While the manuscript was in review we discovered a mistake in the radar retrievals from the Palaiseau cloud radar, which used a tropical instead of a mid-latitude PSD parametrization. For the revised manuscript, we have updated the results of the ground-based TIWP retrievals. This did not change the results considerably. We have also corrected a number of smaller mistakes in the figures included in the manuscript.

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.

As suggested by the reviewer, we will add a remark regarding the limited latitudinal coverage of the CCIC retrievals to the paragraph starting in line 65 of the revised manuscript.

Moreover we will add a paragraph of to the discussion section in which we discuss the prospects of applying the CCIC retrieval to high-latitude and polar regions.

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- The datasets apply inter-satellite normalization. ” This is not obvious. One method of ”normalizing” the geostationary satellites is to use spectra 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

While we do not apply any normalization ourselves, we used the GridSat and CPCIR data as is, which have been already normalized. We updated the text in question to provide a high-level summary of the normalization applied by these datasets.

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.

We will add this information to the revised manuscript.

- 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.

We will add the information regarding the particle habit and PSD used by 2C-ICE to the discussion section.

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

The Norunda radar at 60.0860° , unfortunately, is right outside the latitude covered by the CCIC CPCIR retrievals. We only looked into latitudes covered by both datasets. From these, the radar in Palaiseau can be considered to be the Cloudnet site with the most complete and high quality W-band radar data record, in particular for 2019, the year used (2023 is complete as well, but it is when the manuscript was written). Furthermore, we did not want to overload the paper with figures and restricted the validation to one radar. An additional reason for this is that running the radar-only retrievals for a full year computationally expensive. Hence the choice of Palaiseau.

We will add a sentence summarizing this motivation to Sect. 2.2.3.