

Interactive comment on “Increasing the spatial resolution of cloud property retrievals from Meteosat SEVIRI by use of its high-resolution visible channel: implementation and examples” by Hartwig Deneke et al.

Anonymous Referee #1

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Summary:

My operational satellite sensors, such as MODIS, VIIRS, SEVIRI and ABI, have different spatial resolution for different spectral channels. For example, the SEVIRI has a 1 km x 1km (nadir) high-resolution visible (HRV) band, in addition to other spectral channels at 3 km x 3 km. This paper presents a method, partly based on Werner and Deneke (2020), to combine the HRV with other low-resolution bands to achieve cloud property retrievals at 1 km x 1km. The paper documents the algorithm implementations, presents a comparison with collocated MODIS cloud productions, and also

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demonstrates the scientific applications of the improved high-resolution retrievals.

Overall, it is a well-written, well organized paper, with an excellent balance of technical details and scientific applications. The documented methods can be applicable to many other instruments with similar features, e.g., VIIRS (I-band vs. M-band) and ABI. I think it is well suited for AMT and can be accepted largely as is, although a few minor comments/suggestions are listed below for the authors to consider to further improve the method/paper.

Minor comments:

Line: 19: MODIS team has an updated paper Platnick et al. 2017. Please update or add the reference

S. Platnick et al., "The MODIS Cloud Optical and Microphysical Products: Collection 6 Updates and Examples From Terra and Aqua," in IEEE Transactions on Geoscience and Remote Sensing, vol. 55, no. 1, pp. 502-525, Jan. 2017, doi: 10.1109/TGRS.2016.2610522.

The footnote about the numbers of Google scholar hits is very interesting! I guess the factor that Aqua-MODIS is part of A-train helps.

Page 4 around line 20: How well are the HRV band and other narrow bands spatially collocated, especially off the nadir region? For example, does a 3 x 3 km narrowband (e.g., 1.6 μm) pixel always contain 9 x 9 HRV pixels? If not, how are they collocated?

It is mentioned in Section 3.1 that, the cloud mask from NWC SAF is used. What is the spatial resolution for this cloud mask? Then it is also mentioned that a HRV-based cloud mask is also used. How are the two cloud masks reconciled or combined?

Page 9 about LUT downscaling: There seems another way to do the downscaling, which is to assume the cloud effective radius remains invariant within the 3x3 km pixel. This seems to be easier than the slope-based Eq. (5). Can you comment on whether such method is feasible/practical or not and why?

On page 11, it is a little disappointing to see that the new method does not improve the CER retrievals. Nevertheless, some results of CER retrieval (e.g., a scatter plot or histogram) should be shown here. It is hard to picture the difference between SEVIRI and MODIS based on the description between line ~20 to ~30.

In addition to correlation, some more statistics should be added and discussed here, e.g., whether there is any systematic bias in CER? How about the extreme values?

One aspect missing in the discussion of COT and CER retrievals is about failed retrievals. As shown in Cho et al. 2015, MODIS retrievals frequently fail in broken cloud regions and/or at special angles (low sun, sunglint etc). Does the SEVIRI retrieval product also suffer from failed retrieval problems? If so, whether and how does the HRV alleviate the problems? Some discussions here would make the paper more interesting and useful.

Cho, H. M. et al. (2015), Frequency and causes of failed MODIS cloud property retrievals for liquid phase clouds over global oceans, *Journal of Geophysical Research-Atmospheres*, 120(9), 2015JD023161–n/a, doi:10.1002/2015JD023161.

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