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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Validation of cloud property retrievals with simulated satellite radiances: a case study for SEVIRI" *by* L. Bugliaro et al.

**Anonymous Referee #3**

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This paper describes a useful technique that will increasing be utilised to evaluate cloud algorithms and thus is suitable for publication.

The technique is important as the evaluation of effective radius and optical depth cloud properties in particular are difficult to evaluate with current satellite, ground based or flight measurements either because of the scarcity of measurements or the uncertainty in measuring it. Cloud mask and height/temperature validation is also important.

The paper is well written and the structure is appropriate, some minor English grammar to be corrected.

However the authors do not explain clearly enough the limitations of the technique



which I see as being primarily the dependence of the agreement between 'real' and retrieved properties on the input values used to model the cloud fields. The most obvious (although probably not the only) of these is the ice crystal scattering properties which are consistent with the APICS retrieval and not with the CMSAF retrieval. This is mentioned too briefly by the authors when explaining better agreement between with the optical depth retrievals of the APICS retrieval with the simulated measurements, but they fail to mention clearly enough that this may also impact on the level of agreement between the other cloud properties ( to a lesser or greater extent)

This line of argument then implies a limitation of the technique where the input parameters into the models are well known with high accuracy then the cloud properties such as CTT are reasonable well validated. However where the accuracy of the input parameters is not well characterised i.e ice crystal optical properties then the techniques can only be used to evaluate algorithms sensitivity to the input parameter and not the accuracy of the retrieval.

This is not to say that the technique is useless just that it is would be most useful assessing different algorithms consistently when they use the same optical properties and input data as the model used to simulate the radiances.

The comparison between APICS and CM_SAF is complicated by these factors and it is difficult to definitively say which is better. However by using the 2 different cases the strengths and limitations of the technique are illustrated!

A number of minor comments follow.

Add reference to Khokanovsky paper ( Kokhanovsky et al. The inter-comparison of major satellite aerosol retrieval algorithms using simulated intensity and polarization characteristics of reflected light Atmos. Meas. Tech., 3, 909–932, 2010) which has validated aerosol algorithms in a similar (but not identical) manner.

P21933 line 24 not always to not all p21935 line 8 remove exemplarily p21936 line

1 is inherited really the right word? P21944 line 12 remove exemplarily P21951 line 1 remove paradigmatic P21952 line 9 remove Anyway Line 15 replace quantity with statistics P21955 discussion on CTT differences is confusing.

I do not see why effective radius cannot be compared in a similar manner to the optical depth although the conclusions with regards to internal consistency will be similar. The effective radius is as mentioned sensitive to the vertical structure but so other cloud properties to a greater or lesser extent depending on the retrieval technique used, you already mention this with regards to CTT and this is an interesting aspect gained from the comparison.

It would be interesting to see regional maps of differences between real and retrieved effective radius, optical depth and cloud water path as per Figure 7. In case the differences are associated with particular cloud structures, for example, cloud edges, optical depth, snow etc as well as with multi phase clouds ( in which case thin cirrus over water cloud is a particularly interesting example).

The CMSAF cloud water path is calculated simply using equation 2 surely the APICS cloud water path can be calculated similar and the results compared to be consistent with the rest of the comparison.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 21931, 2010.