

Sensitivity of liquid cloud optical thickness and effective radius retrievals to cloud bow and glory conditions using two SEVIRI imagers

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General comments

The paper is well written and has an overall clear structure and figures. The topic is interesting and fits well to the aims and scopes of AMT. The authors identified two cloud features, bow and glory in the diurnal cycle of the cloud optical thickness and effective radius of stratocumulus clouds, which caused irregularities and could lead to misinterpretation by the user. The use of the two SEVIRI instruments onboard the Meteosat-8 and -10, which give the stereo perspective, is a great possibility to study these phenomena.

The sensitivity study focused only on the width of the droplet size distribution, which is important parameter and normally fixed for the cloud retrievals. The paper is valuable for people involved in cloud properties determination from image like SEVIRI measurements. The authors suggested two effective variance of the size distribution based on the sensitivity study. The whole study based only on two case studies. It is not shown that these two days are represented for a maritime and continual stratocumulus diurnal cycle, which should be included to make the results useful. Further the authors should discuss if this feature can be flagged for the user and include a suggestion how this cloud specific parameter could be used in standard retrievals as it mention in the abstract, but not discussed later.

In principle the approach the authors present in their paper is very valuable and have great potential to understand cloud glory and cloud bow effects on the diurnal cycle of the cloud properties retrieved from satellite measurements. It is interesting and suitable for publication in AMT. However, I suggest the following revisions:

General comments

Abstract

Future climate data record is not mention or discussed in the paper at all, should be add in the discussion summary part.

Introduction

p. 3, line 4:

“Another issue in cloud optical properties retrieval, which relates to the cloud glory effects ...”

The citation from Mayer et al (2015) should come here already to motivate the sensitivity to ve . (“ While under most retrieval circumstances the sensitivity of τ and re to ve is low, this is not the case for special illumination geometries, as was shown e.g. in Mayer et al. (2015) for the cloud glory conditions.”)

p. 3, line 24.

This is inconsistent to the abstract the authors mentioned: “ .. over different underlying surfaces (ocean/land) ..” and here “..over the southeast Atlantic and one characteristic day”

p.3 line 26-28.

Should be move to the summary: “ While ... properties.”

Data and Methodology

p.6 line 4-7. "It relies on ... illumination conditions." This have not to repeat again. I would suggest to shorten this part. (see p.2 line 22-27.)

p. 8 line 2. Why only two days? Please discuss.

It would be useful to have RGB images for the two days and two satellite on a time slot.

Results

For the spatially averaged reflectances it would be interesting to see the variation (max and min cloud glory and cloud bow effects) and the propagation to the CPP algorithm.

Figure 4: The dotted and dashed line are hard to distinguish. For example, dotted dashed line and dotted line, should be better.

p. 14, line 13. Expression "more natural output" , please rephrase.

p. 15, line 8. "this does not necessarily mean that the actual droplet size distribution is so narrow." Should be discussed how this could be verified in the conclusion.

Discussion and Summary

The authors should more discuss if this feature can be flagged for the user and include a suggestion how this cloud specific parameter could be used in standard retrievals as it mention in the abstract.

p. 19, line 12. How often do these irregularities happen?

Should be critical discussed that the finding depends on the optical thickness of the cloud and the cloud types.

Typo

p.4 line 9: Data and Methodology