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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Technical note: a new day- and night-time Meteosat Second Generation Cirrus Detection Algorithm MeCiDA" *by* W. Krebs et al.

**Anonymous Referee #1**

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This paper describes a new algorithm for the detection of cirrus clouds from SEVIRI/MSG imager using measurements in the 6 thermal infrared channels. It is well written and the algorithm description and performance are well presented. However a few points need to be addressed before publication.

A review of the approaches used for detecting cirrus is presenting a good summary, although the authors should also refer their work to the paper from Derrien and Le Gleau : MSG/SEVIRI cloud mask and type from SAFNWC (International Journal of Remote Sensing, 26, 21, 4707-4732), on the same topic. These authors have developed an algorithm which is different between daytime and nighttime, which is not the objective

of the present paper, but relies on a similar approach for nighttime.

The algorithm relies on a threshold analysis using a classical approach based on the analysis of the brightness temperature difference between two IR channels, and the structure of clouds as obtained from differentiation after a masking of the lower layer contribution by water vapor absorption. It is not clear how these two approaches complement each-other and especially how much information is brought by the different tests at the different wavelengths. More details should be given on the performance of each test independently.

The temperature thresholds used in the analysis are defined using radiative transfer simulations. The variability of the atmospheric parameters as well as surface temperature is considered. However the surface properties are poorly considered in this paper. This is an important issue, as a large part of the clouds is viewed by SEVIRI over land. Surface emissivity is considered to be equal to one, but over desert and semi-arid regions frequently observed in Africa, the emissivity is varying from 0.6 to 1, with significant differences in the infrared wavelength domain (Salisbury, J. W. and D'Aria, D. M., 1992, Emissivity of terrestrial materials in the 8-14 $\mu$m atmospheric window: Remote Sensing of Environment, v. 42, p. 83-106). A consideration of such variations should thus be accounted for in the simulations.

This would impact the threshold values defined, although it may imply a regional differentiation. This has to be discussed. Also variability of the cloud environment is considered as a whole (10000 different combinations) to define threshold, and not separating latitudes.

In the simulations, ice clouds are considered in a single layer which base is above 6 km and top below 12 km. If the base altitude seems reasonably corresponding to observations at mid-latitudes, the top one is much below observations which show altitudes reaching 16 to 18 km even for optical depths of the order of 0.1. Authors should take this into account.



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Simulations are made referring to an ideal instrument. Noise in the measurements should be discussed with respect to the threshold values chosen.

Detailed comments In the introduction - it is written “The four solar channels as well as the mixed solar/thermal channel at 3.9 $\mu$m were not used, … they are obviously only available during daytime.” This sentence should be modified with respect to availability of mid IR channel, and the objective of coherence between day and night analyses, as written further.

In section 2.2 - reference is made to the use of parametrisations of hexagonal crystals from Fu et al., (1998). More recent calculations exist (Yang et al., 2005, Applied Optics, 44, 26, 5512-5523), and due to crystal shape variability and a short discussion of the impact of shape needs to be included. - surface emissivity assumed to be 1 in all cases : see the comments above.

In section 2.3 - take into account emissivity in the equations - a different formulation of the “corrected BTD” taking into account cloud transmission would allow to obtain curves which would be zero at low and high optical depths. This would be simpler to use. - BTDs are analyzed to define a threshold (for example 0.6 K). Consider instrumental noise impact. - it is the horizontal distribution of the integrated water vapor path which can be considered as smooth with respect to the cirrus cloud radiative properties

In section 3 - give more information on what is improved using the two combined tests with respect to the use of a single one in test 1 - give more information on what is improved using the different combined tests (1 to 6) with respect to the use of a single one - why not combine more the different tests ?

In section 4 - it may be also useful to discuss the differences in the number of pixels detected for MODIS and SEVIRI cirrus fields in terms of radiance or brightness temperature of the scene with respect to the background.



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