Atmos. Meas. Tech. Discuss., 8, C4664–C4667, 2016
www.atmos-meas-tech-discuss.net/8/C4664/2016/

Atmospheric Measurement Techniques Discussions
Open Access

Interactive comment on "OCRA radiometric cloud fractions for GOME-2 on MetOp-A/B" *by* R. Lutz et al.

Anonymous Referee #1

Received and published: 5 January 2016

General comments

The authors have presented the OCRA algorithm and the degradation correction of the GOME-2 A/B PMD data in detail. It is an interesting paper. I think the paper fits the scope of AMT. The comparison of OCRA radiometric cloud fraction and AVHRR geometric cloud fraction is very helpful for users to understand the OCRA cloud product. However, the authors have not given enough explanations about the theoretical background (physics) of the OCRA algorithm. It would be more convincing if the authors could perform some radiative transfer model simulations for the OCRA algorithm. For example, simulate the reflectances of the RGB PMDs for cloudy cases over different surface types, then apply the OCRA algorithm to derive the radiometric cloud fractions. From the simulations, users will know exactly what to expect from the OCRA radiomet-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

ric cloud fraction. I think a clear explanation of the concept of the OCRA radiometric cloud fraction is also missing in the paper although it is defined in Eqs. 6-8. This simulation can also contribute to the understanding of the white point [1/3, 1/3]. Is it exactly [1/3, 1/3] in reality?

The GOME-2 L1 data include an effective cloud fraction product derived from the O2 A band. This effective cloud fraction has been used in trace gas retrievals for cloud screening or cloud correction (together with cloud height). The paper would be more complete if the authors could compare the OCRA radiometric cloud fraction with the GOME-2 L1 effective cloud fraction.

Specific comments:

1) P13475, lines 5-10

Could you simulate the reflectances of the RGB PMDs? As shown in Fig. 14, the reflectances of R and G are not the same for fully cloudy scenes, otherwise the Pr and Pg should be equal to 1/3. What are the reasons for the difference?

2) p13476 lines: 19-24

Why PMDs 2-14 are used in the definition of the RGB colors? In principle it is possible to use 3 PMDs to make a RGB image. There are ozone, water vapor and O2 absorption in the PMD wavelength bands. Will the gas absorptions influence the determination of the cloud free points?

Are there any advantages to use both PMD P and S polarization to determine the radiometric cloud fraction? Fig. 25 shows the differences of P and S based radiometric cloud fractions, they are quite small even over snow/ice.

3) Fig. 11 cloud-free maps Are the cloud-free reflectance maps actually derived from the minimum reflectances of the PMDs? In the GOME-2 LER surface albedo product, there are minimum LER albedo and mode LER albedo. The large differences between the mode and minimum surface albedo are over deserts and sea ice. Is it possible to

introduce a bias if using the largest distance of the measurements to the [1/3, 1/3] point to determine the cloud-free cases?

4) Fig.12

In some months the cloud-free reflectances for the alpes abd Hudson Bay surface types are very close to the [1/3, 1/3] point. Will this cause mis-identification of cloudy scenes?

5) 2.5.2 Eqs. 6-8 Could you explain why the OCRA cloud fraction is an radiometric cloud fraction? Why the cumulative histogram value of 0.99 is used to determine '\alpha'? Does it suggest that a very bright cloudy scene has a radiometric cloud fraction of 1?

What is the physical meaning of the \beta? Should beta be 0 in an ideal situation?

Have you tried to use Eq. 5 to determine a geometric cloud fraction? The distance from the measurement to the white point is part of the distance between the cloud-free point and the white point, which could be linked to the geometric cloud fraction.

6) Table 3 Why the \alpha and \beta values are different for P and S pol for GOME-2B but quite similar for GOME-2A?

7) Fig. 14 In the derivation of the cloud-free map, Eq. 5, the white point is assumed to be fully cloudy. In Fig. 14, for the cloud fractions close to 1.0, the Pg values are close to 0.33 but the Pr values are mostly between 0.34-0.36. This indicates the reflectances at R band are slightly larger than the reflectances at G and B bands. How to interpret this feature?

8) Section 3 is very helpful to understand the OCRA radiometric cloud fraction. Why not compare with GOME-2 L1 effective cloud fraction? By definition, the GOME-2 L1 effective cloud fraction would be more close to the OCRA radiometric cloud fraction than the AVHRR cloud fraction.

AMTD

8, C4664–C4667, 2016

9) Section 3.1 It is a good idea to apply the cloud optical thickness filter to remove thin and very thick clouds. Actually the filter removed most OCRA radiometric cloud fractions close to 0 and 1. In sect. 3, The authors attribute the mean difference between GOME-2 and SEVIRI cloud fraction to the insensitive of GOME-2 to the optically thin clouds. In section 3.1, the authors show that the cloud optical thickness filter does not improve the systematic offset of the cloud fraction. I suggest that the authors give more explanations about the results, for example the difference between thegeometric cloud fraction and the radiometric cloud fraction.

10) Fig. 16 The sunglint detection works well. I wonder if some real clouds are removed after the sunglint removal. The cloud fraction difference map has some large values, say 0.4-0.5, these might be real clouds. Will it help if a maximum cloud fraction threshold is included in the sunglint removal?

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 13471, 2015.