

## ***Interactive comment on “Uncertainty characterization of AOD for the AATSR dual and single view retrieval algorithms” by P. Kolmonen et al.***

### **Anonymous Referee #1**

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**General Comments** The paper is a very good paper, it is well structured and organized. In general it presents good descriptions of the algorithms used to retrieve the AOD and its uncertainty. The results are presented clearly.

**Specific comments** 1.-The last sentence of page 4043 and the first of 4044 it is written: “The mixing ratio can have any value in the range of  $\pm 0.3$  from the AEROCOM climatology value.” Please explain it better (here or in page 4048 line 8). Why is this value selected?

2.-In section 2.3 it is first said that the uncertainty come from the aerosol model decision

C1437

parameters, and from modelling (first two paragraphs of the section). Latter in line 7 of page 4050 it is written that “The formulation could take into account the effect of a priori information for  $b_{\text{fine}}$ ,  $b_{\text{naf}}$  and  $L$  but this is neglected as the only error is assumed to come from the measurement”

3.- In section 2.3  $C_X$  and  $C_T$  are not defined in page 4050.

4.-In Fig.1 increase the size of the text as in Fig.3, it is easier to read.

5.- Fig. 4, increase the size of the text

6.- Page 4061, lines 21 to 23, “Therefore, the AERONET AOD at  $0.555 \mu\text{m}$  has been obtained by interpolation from the AODs at  $0.440$  and  $0.670 \mu\text{m}$ ” Ångström equation should be used instead of linear interpolation.

7.- Page 4061, line 16 and 17, comment that the validation of the retrieved AOD is done considering the superpixels not the normal  $1 \times 1 \text{ km}^2$  pixels.

8.- In the Results section, page 4062, Fig 2 is described, Australia shows a big overestimation, could you explain why?

9.-Page 4064, line 7 to 9, “The uncertainty is affected not only by the reflectance of aerosols but also by the reflectance of the underlying surface whereas the discrepancy can have various reasons” Please cite some of them.

10.- In the paper only the uncertainty due to the measurements is considered (see page 4050, line 8, page 4051 lines 17 to 19, page 4062 lines 23 to 25. . .). The uncertainty due to the aerosol model decision parameters, and the modelling is not discussed in this paper, thus the uncertainty caused by possible differences between real and modelled aerosols is not commented. Please include some comments. The uncertainty estimate for AOD in the last part of section 2.3 (page 4052) is not clear

**Technical corrections** 1.- In the second line of the introduction “they can act as cloud. . .” can be written as “they act as cloud. . .”

C1438

2.- In the text the paper referenced as Veefkind et al 1999 is wrong, the correct reference is Veefkind et al 1998, also in the Reference section.

3.- Page 4047, line 13  $\sigma$  is written twice.

4.- Eqs. 11 and 28 cannot be properly seen, the  $\Sigma$  and the [ ] are not visible.

5.- Page 4051, line 21, "very parameters"

6.- Page 4052, line 9, "qestimate"

7.- Page 4058, line 7 "the superpixel are is computed"

8- Sayer et al., is cited in the text as Sayer et al., 2009 and in the Reference section as 2010.

9.- Page 4061, lines 21 to 23, "Therefore, the AERONET AOD at at 0.555  $\mu\text{m}$ "

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