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Interactive comment on "Improving cloud information over deserts from SCIAMACHY O_2 A-band" *by* N. Fournier et al.

Anonymous Referee #1

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- General comments

This paper presents an interesting work on the improvement of an algorithm (FRESCO) providing cloud information from SCIAMACHY, such as cloud fraction and cloud top pressure. These information are important for accurate retrievals of ozone or other trace gases from SCIAMACHY data. The FRESCO algorithm has been validated, but it overestimates cloud fraction retrievals over the Sahara region. Especially, this problem is due to the presence of desert dust aerosols. Consequently, a methodology is proposed in this paper, using the Aerosol Absorbing Index (AAI) deduced from GOME data. Comparisons with retrievals from the SCIAMACHY algorithms (OCRA and SACURA) show a global improvement of the FRESCO results.

I believe the results of this paper are valuable and useful for the readers. The objectives of this paper are then relevant and the paper is appropriate to ACP. The paper is logically organized and the context of the study is well introduced. The algorithms used in this study are well presented. The methodology is described in a straightforward manner. This study focuses on the problem for the FRESCO code to retrieve cloud fraction and cloud top pressure over desert areas. A correction is proposed by the authors, with consequences for SCIAMACHY retrievals. This study is then valuable for users of SCIAMACHY measurements and for potential applications with these data. Even though the methodology presented in this paper is not new, this study will make an interesting contribution to improve the knowledge about this research field.

I think that the main shortcomings are related to the analysis of results. In order for the article to be ready for publication, some points should be improved:

- Specific comments

1. Figure 9 shows the improvement of the FRESCO algorithm using the AAI of GOME. This improvement seems efficient for cloud fractions higher than 0.2. However, this improvement is not clear for lower values? Especially, there are a lot of FRESCO cloud fractions near 0. Could you comment on these deviations? Is it due to the choice of the correction of 20% (deduced from a series of sensitivity tests)?

2. The improvement has been obtained with a series of sensitivity tests, using the amplitude of the correction of 20%. Is this correction valid for all conditions ? Did the authors perform additional case studies for the validation? It would be valuable to include additional comparisons to show that conclusions on cloud fraction retrievals are still valid with an improved validation.

3. Figure 4 shows comparisons of the retrieved cloud top pressures from FRESCO and SCIAMACHY Level2 products with MODIS values. Is the cloud top pressure obtained with the NEW FRESCO algorithm? If not, is there an improvement using the new FRESCO algorithm? Is the SCIAMACHY Level2 product calculated with the SACURA

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algorithm ? If yes, this point should be noticed in the text and in the legend of the figure 4.

4. Figure 4 also shows large deviations on the retrieved cloud top pressure between the SCIAMACHY operational product and the FRESCO or MODIS products. Could you comment on these deviations? Could you also comment on the dispersion between MODIS and FRESCO products? It is due to the spatial resolution between products? due to the time lag? or also to the correction of 20% used in the new FRESCO algorithm? Indeed, surface reflectance can have a significant impact on the cloud top pressure retrieved from the O2 A band.

5. Figure 13 shows a global agreement between the retrieved cloud top pressure from the new version of FRESCO and from SACURA. However, the Figure 4 also shows important deviations with the MODIS product. Could you include the MODIS product in this figure for comparisons?

- Additional comments

Figures 10, 11 and 12: I think that it is difficult to distinguish deviations and colors in these three figures. It would be useful to modify the figures to improve their legibility.

Section 4.1: it is written that "OCRA results match well what can be seen from a co-located MODIS image showing a low cloud cover at this time over the Sahara ..." I did not well understand this point? Is the MODIS image missing? If yes, could you include these data in the paper ?

Section 4.2: Could you define in a few words the Aerosol Absorbing Index, for the comprehension of the method?

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 6013, 2005.