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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurements of UV Aerosol Optical Depth in the French Southern Alps" *by* J. Lenoble et al.

Anonymous Referee #2

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Review of the paper: Measurements of UV Aerosol Optical Depth in the French Southern Alps by J. Lenoble, C. Brogniez, A. de La Casinière, T. Cabot, V. Buchard, and F. Guirado

The authors present a three year dataset of Aerosol optical depth measurements at the Briancon station. The presentation of the results and the methodology used are clear. However, there is no additional information from the Lenoble et al., 2004 paper concerning an explanation of the reasons of the annual variations of AOD. So, it does not present any novel concepts, ideas or tools. The uncertainty analysis is rough and it is not linked with the results provided. I recommend the paper publication with major revisions.

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Discussion Paper

General Comments

1. The introduction is short. The readers of this work would be interested to know the reasons for carrying the two objectives mentioned and answer to questions: Why an AOD climatology over this station can be considered an interesting study for the scientific community? Are there any climate change links or other issues related with climatology of the Alps? Is this the only site carrying out this kind of research? If no what are the results that other stations reported? As for the second objective: Are there any other studies that have detected such AOD variations and have they analyze the causes of them ?

2. I can not see any analysis of the causes that are responsible for the AOD variability. There are just some speculations of the reasons for the high AOD values in the conclusion section. But if the Authors would like to fulfill their second objective they have to use (as they also say): air mass trajectories, complimentary satellite data, additional measurements if existing. So the results as they are are not sufficient to support the interpretations and conclusions that rise from the second objective.

3. Stations and instruments. The uncertainty analysis is estimated. It would be interesting to see a comparison of the two instruments for the direct irradiance since there is plenty of data to use for this purpose. The 5% uncertainty mentioned is only for the global irradiance measurements. Are there any corrections for the shadowing disk (wavelength, aerosol, solar zenith angle) dependent effect of the diffuse radiation intercepted by the disk?

4. AOD retrieval. I dont see why formulas 5 and 6 can be considered as a separate method.

5. Is there any cosine correction applied for the instruments? If no how big is this error and how can affect measurements at high solar angles? If there is a cosine correction method applied, the authors could explain how they are correcting the diffuse irradiance measurements.

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6. Page 165 line 20. The authors suggest that 310nm are more problematic due to ozone and 330nm are not. Then they state that lower limit for their analysis is between 310nm and 330nm. A lower limit can be stated or individual uncertainties have to be reported for both wavelengths.

7. Page 167 line 10. If this 3% agreement is for the direct irradiance by the two instruments then a number for AOD or a scattered plot of AOD from the two instruments synchronous measurements would strengthen the backbone of the work which is the measurement data, by proving their quality.

8. The authors chose 12 UT measurements for their AOD climatology. Since data are available every half hour it would be better to use them in order to have a larger data set that is helping to interpret better climatology issues.

9. The spectral variation of figure 2 has very high spectral noise. As the ET spectrum is convoluted with the instrument slit function and the measurements are corrected for wavelength shift the authors state that the oscillations are of the order of the AOD uncertainty. Various peaks differ more than 30% from the smoothed AOD so the author should state if only smoothed values could be used for the study.

10. As a reader I would be interested to understand the physical explanation about the aerosol annual variability. What is the dynamics in this Alpine station that causes high AOD in the summer. Has the European heat wave of 2003 an impact on this?

11. The AI index of TOMS is a qualitative parameter as the authors suggest. The comparison is risky as they say. So if the authors do not suggest to absorbing aerosols in this station during summertime the plot can be left out.

12. The Angstrom parameter is introduced in the end of this work. Figure 7 is using this alpha for conclusions about aerosol size. A proper uncertainty analysis of this parameter in the data section have to be included. For example: several papers suggest that high angstrom values are related with low AODs. I would like to know if that is true for

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the Alps but the uncertainty of the angstrom parameter especially for so low AODs as the ones analyzed in this work, is unknown (most probably too large) for such results.

13. It would be essential for the authors to describe the method that you are using for avoiding cloud effects during one (half hour) aerosol retrieval measurement.

14. NO2 is neglected from formula 2 and from the analysis. The impact on AOD for this site is perhaps small but it should be stated.

Minor comments

Page 162, line 3. …by difference” – by their difference

Page 163, line 24 the direct irradiance in the absence of clouds.

Figure 5. AOD wavelengths have to be reported to Y axis, or legend or figure caption.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 161, 2008.