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Interactive Comment

Interactive comment on "Actinic flux and O^1D photolysis frequencies retrieved from spectral measurements of irradiance at Thessaloniki, Greece" *by* S. Kazadzis et al.

S. Kazadzis et al.

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Response to the reviewer #2.

Special comments The citations were revised and the missing literature citation was included. (Bais et al, 2003 and Vasaras et al., 2001).

Introduction Page 3. Text corrected, as recommended.

Page 7, 3.1 The description of the method was revised to give a more clear view of the data and the mathematic formula's in use. One of the aims of the work was to use the methodology that was introduced at Kazadzis et al., 2000 as an application to the radiation data that are available at Thessaloniki. The authors tried not to repeat as far as it was possible the details of the method described in the above paper. However the data and the methodology used for the applications were described in the paragraph 3.1 .The parameters A(λ) and Fag (λ) were used as a wavelength dependent parameter through the whole text.

Page 7, Paragraph 3. A graphic was added as recommended. All figures were rearranged in order.

Paragraph 4. The parameter A(λ) is defined as the ratio of the diffuse actinic flux to the diffuse global irradiance. The global irradiance describes the irradiance weighted by the cosine of the incident angle. For the UVB wavelength band: Comparing an overcast sky (case 1) and a clear sky (case 2), the radiance coming from the part of the sky near the zenith or generally from low zenith angles becomes bigger (in per cent of the total) than the one coming from the horizon when comparing cases one and two. So as radiance coming from high zenith angles (the angles that are more affected by the cosine weighting) becomes relatively smaller, A(λ) becomes smaller for case 1. For both cases the radiance distribution is not isotropic. The isotropy (A=2) is approached in a clear sky case when the solar angle becomes high and for higher wavelengths where scattering processes close to the horizon optical path are not so strong as in lower wavelengths. [As seen also in figure A below]

Page 8. The citation for Vasaras et al and Bais et al., that were missing were included.

Paragraph 4. The cases without any significant solar zenith angle dependence are the ones corresponding to overcast conditions. The cases with the pattern similar to figure 2 correspond to the clear sky (sun visible and clouds less than 2/8). The mixed cases correspond to broken cloud situation where the direct to global ratio is not insignificant [see mathematical formula 5]. For a constant solar zenith angle the direct to global ratio and the A(λ) parameter determines the actinic to global ratio.

Section 3.3. The instrument was provided by METCON for the ADMIRA campaign purposes. It was operated by the stuff of the Laboratory of Atmospheric Physics involved in the publication.

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Page 10. The retrieval method depends only on the Brewer spectroradiometers' measurements and not any METCON measurements. The Brewer measurements are corrected for this non ideal cosine response, so this error does not affect the retrieval method. METCON has provided the given (in the text) number ś10% uncertainty including angular response, absolute calibration and stray light problems.

Page 11. The section describing the parameter A(λ) was re-written. Radiative model for clear sky calculations for the parameter A(λ) were analyzed. Results showed that for higher aerosol optical depth this parameter A(λ) is lower for every wavelength and solar zenith angle. The isotropy (A = 2) is reached only for low aerosol optical depth cases and for higher wavelengths. The deviation from A=2 becomes larger with increasing AOD.

Page 12. Paragraph 2: corrected Paragraph 3: The web page of the project was cited to the instrumentation and data section of the paper. Paragraph 4: The Brewer in use in this work is a double monochromator, so there is no straylight problem. The METCON stray light problem is included in the ś10% uncertainty that is reported. However, the agreement among the UV-B and the UV-A wavelength range seen in figure 4 does not show any systematic overestimation of the METCON instrument in the UVB comparing with the UVA ratios.

Page 14. The date and location of the INSPECTRO campaigns are described in table 1 and more details were added at the instrumentation and data section. It is a 17-day campaign but the figure has an erroneous XX' label. See last comment.

Page 18.Paragraph 2: Added to the text. "Thessaloniki is a location with relatively high aerosol load and with much bigger possibilities of clear sky measurements than in Weybourne." The polynomials presented depend on the location conditions. The Weybourne campaign example was used to see the effect of this parameter to the retrieval method.

The zenith angle dependence in the UVA is related with the actinic flux retrieval. There

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is an effort to work on deriving JNO2 using the same basic ideas, but choosing a UVA wavelength as an independent parameter. There are two additional problems: Ţ The Brewer instrument stops measuring at 365nm Ţ The A(λ) variability in the wavelength region of interest is higher than in the UVB Some preliminary results are available and promising but still require further work.

Figures

Figures were harmonized in the graphic layout.

Fig 8.(Now Figure 9) The XX' axis label was erroneous. The labels refer to solar zenith angles and not days of the year 2002. The error was corrected.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 4191, 2004.