Atmos. Chem. Phys. Discuss., 8, S105–S108, 2008
www.atmos-chem-phys-discuss.net/8/S105/2008/


Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Proposal of a new erythemal UV radiation amplification factor" *by* A. Serrano et al.

**Anonymous Referee #2**

Received and published: 6 February 2008

General comments The paper aims to the quantification of changes of erythemal ultraviolet irradiance derived from changes in total ozone amounts using the Radiation Amplification Factor (RAF). This parameter is calculated without any limitation on the variability of solar zenith angles and it is analyzed taking into account changes in total ozone and cloudiness. The title reflects the contents of paper and the abstract well summarizes the study. The topic is of scientific relevance and the paper would be of considerable interest to the readers of ACP and it is suitable for publication on ACP with the revisions outlined in more details below. The language is some sessions is not fluent and precise and it requires a revision.

Specific comments The authors use UVER (ultraviolet erythemal radiation) in the text. This radiometric quantity should be better specified and replaced by the more appro-

priate “erythemal ultraviolet irradiance between 280 and 400 nm, i.e. the dose rate” What does "ozone slant" mean? Is it the”slant ozone column (ratio of the total ozone column and the cosine of the solar zenith angle)? Although Mckenzie (1991) derived the RAF taking into account the erythemally effective UV radiation, a wider definition of RAF, without specifying the biological process is provided and suggested : “The Radiation Amplification Factor (RAF) is defined as the percentage increase in the biologically effective UV irradiance that would result from a 1% decrease in the column amount of atmospheric ozone”(Madronich et al. .(J. Photochem. and Photobiol. B: Biology 46, 1998, 5-9). It could be more appropriate to define the RAF as an useful parameter and not as “standard index” because there is not any scale. Values of RAF for various biological processes are reported in Madronich et al. (1998)

The authors should pay attention when they use stratospheric ozone instead of total ozone as they should use.

Abstract. Results of analysis taking into account cloudiness changes should also be included.

Introduction More updated references should be included

Page 1090, 25: The authors should include some references about “the reduction in ozone and consequences in UV increases”. (see for example Diffey BL. Climate change, ozone depletion and the impact on ultraviolet exposure of human skin. Phys Med Bio 2004; 49: R1-R11). Page 1091, 5: The authors should cite that “Several short and long term health diseases deriving from UV radiation can be found in WHO (World Health Organization) Public Health and the Environment 'Solar Ultraviolet Radiation. Global burden of disease from solar ultraviolet radiation' Environmental Burden of Disease Series, No. 13-R. Lucas, T. McMichael, W. Smith, B. Armstrong. Editors A. Prüss-Üstün, H. Zeeb, C. Mathers, M. Repacholi 2006; and in Gallaghera R.P., T.K. Leea, Adverse effects of ultraviolet radiation: A brief review,



ACPD
8, S105–S108, 2008

Prog Biophys Mol Bio 92, 119–131, 2006”. Page 1091,1-3: The authors should include the new findings reported in the last WMO Scientific assessment of ozone depletion, 2006. The only well-established beneficial effect of solar UV is the production of vitamin D3 required for skeleton health [B.Diffey, Phys. Med. Biol. 49 (2004) R1-R11], should also be mentioned in the text. Page 1091, 9: the last UNEP(2006) report should be mentioned. Page 1091,21: The degree of effectiveness of UV radiation in producing biological effect depends not only on the incident weighted irradiances on a given surface but also on the time period of exposure (“Reciprocity Principle. A given photobiological effect can be due to low intensity radiation for prolonged time exposure or high intensity radiation for short time exposure”). What are the “notable effects”? Page 1091 -25: See above the general definition of RAF. Page 1092 -10 total ozone should replace “stratospheric ozone” Page 1092, 18: The station and the period of analysis should be also indicated in the introduction.

Data Page 1092, 21: Country of the station should be indicated. Broad-band UV-S-E-T erythemal radiometer (Kipp&Zonen, The Netherlands) should replace “broad-band UV-S-E-T erythematic radiometer” in the whole text. Page 1093, 10-14:Which version of the TOMS processing algorithm was used in the study? TOMS data are total ozone amounts. Page 1093, 23-29: “total irradiance” should be replaced by “global irradiance”. Page 1093, 23: the following reference should be included “Brogniez, C., M. Houët, A. M. Siani, P Weihs, M. Allaart, J. Lenoble, T. Cabot, A. de la Casinière, and E Kyrö (2005), "Ozone column retrieval from solar UV measurements at ground level: Effects of clouds and results from six European sites", J. Geophys. Res., 110, D24202, doi:10.1029/2005JD005992, 1-14, 2005”. Page 1094, 1: the manufacturer of CM-6B pyranometer should be included. Page 1095: The authors could explain when the different RAF expressions are used (small or large ozone changes). Page 1096,1 -4: add "Kerr J B 2003 Understanding the factors that affect surface UV radiation Proc. SPIE, Ultraviolet Ground and Space based measurements, models and effects III, San Diego August 2003, 5156 1-



ACPD
8, S105–S108, 2008

14" and the last WMO Scientific Assessment of Ozone Depletion:2006 . Page 1096, 5-10: what was the criterion to select cases “with constant values of atmospheric factors (aerosol and troposheric ozone)”? Page 1096, 7-10: A characterization of site in terms of climatological, atmospheric features and environmental factors (including albedo), if available, should be quoted or it should specified which kind of site is Badajoz (urban , highly polluted etc ). Page 1096, 21: Total ozone should replace “stratospheric ozone concentration” Page 1097, 4: [O3] should be defined.

Results and discussion Page 1097, 23: ozone concentration should be replaced by total ozone Page 1098, 1-7: Did the authors investigate on the ozone variability in previous studies? If yes references should be added. Page 1099, 4: The RAF value (1.31)quoted in the legend of Fig.4 should inserted in the text. Is this calculated using eq 5? Page 1099, 7: The increase of 27% derives from eq.6, what about the increase of 35%? In this case the RAF is 1.75. Page 1099, 27-30 it is not clear at that point of session the comment about Fig.6 that should be inserted later. Page 1100, 5: what is N in Table 1? This should be specified in the text and in the legend.

Conclusions Page 1101: the seasonal behaviour was not discussed in results and discussion as it should be done. The erythemal weight function is more sensitive to the shorter wavelength and hence to ozone changes.

References

Lopez –Abente is not the right alphabetic order; WMO: the year is 2002 as indicated in the text

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 1089, 2008.