Atmos. Chem. Phys. Discuss., 8, S621–S624, 2008
www.atmos-chem-phys-discuss.net/8/S621/2008/

Atmospheric Chemistry and Physics Discussions

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

L. Alados-Arboledas (Referee)

alados@ugr.es

Received and published: 7 March 2008

The manuscript deals with the proposal of a new radiation amplification factor (RAF) for erythemal irradiance. This new RAF is applied to a data set of UVER irradiance measured in South-Western Spain during five years. Both title and abstract reflects the main content of the manuscript. The topic is appropriate for Atmospheric Chemistry and Physics Discussions. The results presented in the manuscript are worthy to be published although some revisions, detailed below, are needed.

Particular comments: The use of the term radiation through the test is far from appropriate in some cases. The authors must use irradiance to describe the measurements performed with their radiometers and the variables used in the equations.

Stratospheric and tropospheric ozone, that is the total ozone contained in the atmospheric column, is responsible of the attenuation in UVB irradiance (1091-14).

Section “Data” requires additional information on the experimental uncertainty in the UVER and total horizontal irradiance measurements.

The authors define the term clearness index and indicate that this index could be used to characterize cloudy conditions (1093-23:28), nevertheless in the remaining of the text they use the term cloudiness index, a term that has not been defined.

Equation 1 presents some dimensional problems unless the quantity [O3] be normalized in order to be a dimensionless quantity.

It is not easy to follow the link among the different equations in section 3.1. In fact my concern is with equation 2, because equation 4 and previously equation 3 can be easily derived from equation 1: by applying logarithm to eq 1, and assuming the constancy of C a simple differentiation leads to 3, while the consideration of finite differences leads to 4. Nevertheless, if as the author indicated (1095-10) UVER/UVER* is the relative increase in UVER and [O3]/[O3]* is the relative change in the ozone column, equation 2 is not coherent with equation 4 that involves also relative variations of both quantities.

The constancy of C in equation 1 is contradicted by the initial statement in section 3.2, unless the influencing factors enumerated in this statement were more or less constant or present a reduced variability.

The criterion proposed to select cloudless conditions based on a fixed threshold of the clearness index (the authors used the term “cloudiness index” that has not been defined (see above)). Previous studies (Alados-Arboledas et al., 2000) have shown that this threshold depends on solar zenith angle and that the proposed threshold could bias the “cloudless skies” conditions to situations with rather low aerosol load.

Clear and cloudless conditions must not be considered equivalents. (1096-14)

ACPD

8, S621–S624, 2008

Interactive Comment

The authors must explain why the use a different approach for the formulation of their new RAF. In fact Eq 5 formulates a relationship between flux transmissivity and slant ozone column while Eq 1 formulates a relationship between UVER irradiance and total ozone amount. Concerning this equation it is advisable to use a different symbol for the constant C (C in equation 1 is not the same as C in equation 5).

Page1098. The term “ Maximum and minimum UVER values” in line 11 is not appropriate, because this statement refers to figure 2 is more appropriate to write: “Maximun and minimum UVER irradiances averaged between 10:30 and 11:30 UTC hours”. In this sense, in the figure caption of Figure 2 the term “values” must be substituted by “irradiance”.

Concerning the statement on Figure 3 (1098-18:19): “The inverse correlation between these two variables (monthly average of slant ozone column and UVER transmissivity) is quite striking” , it is worthy to note that this is clearly a result of the seasonal behaviour of the cosine of the sun zenith angle that has been used to define the slant ozone column. In fact this variable, slant ozone column, is mainly controlled by the inverse of the sun zenith angle, that can be considered equivalent to a simple estimation of the optical air mass.

Concerning Figure 8 the authors must be aware that the dependence shown is a result of the definition of slant ozone column and the strong dependence of this variable on the inverse of the cosine of the solar zenith angle, i.e the optical air mass. Previous studies (Alados-Arboledas et al., 2003) have shown that the UVER flux transmissivity that they defined presents a clear dependence with the optical air mass (see Figure 2 in Alados et al., 2003) where ktuver has the same meaning as T).

The statement: “.., there is an important increase of RAF parameter when high total ozone values are considered” (1101-13:14) is not coherent with results shown in Figure 5.

Can be related the increase in RAF with cloudiness with cloud enhancement of UVER

ACPD

8, S621–S624, 2008

due to scattered clouds?.

Aladós-Arboledas et al., Agricultural and Forest Meteorology (2000) 101, 187-201.
Alados-Arboledas et al., The Influence of clouds on surface UV erythemal irradiance, Atmospheric Research (2003) 66, 273-290

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