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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Relations between erythemal UV dose, global solar radiation, total ozone column and aerosol optical depth at Uccle, Belgium" *by* V. De Bock et al.

Anonymous Referee #2

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General comment: The data sets produced by Royal Meteorological Institute are of high standard and of great value to the scientific field of ozone and UV research. These data sets have been used in many papers and many interesting results are shown. In this paper, long time series are analysed for the occurrence of so-called change-points and regression models are set up. However, the overall goal of the paper is a bit obscured, and a bit confusing. Reading the paper the "question where is the physics?" comes to mind. Is the goal of the paper to validate regression models, or are these models a tool to analyse long-term changes in the available data sets? Why are three analysing methods used? What is the benefit of this does the next analysing method

builds upon the results of the pervious method? The reviewer does not think that the authors are presenting a new way of modelling UV monthly values; it would also be not an improvement to what already is presented elsewhere, or improve the understanding of UV-radiation transfer through the atmosphere from a physical point of view. Still many pages are used to describe the different regressions techniques. Additionally, all coefficients found for the multiple regressions equations are only valid for the Uccle location and possible to stations at the same latitude as Uccle, as the seasonal range of the solar elevation angle is build-in in the type of equations derived in this paper.

Remarks P10L16 reads: "For the multiple linear regression analysis, daily values will be used instead of anomaly values." This appears to be in disagreement with Eq. 6 and figure labels: UV has a unit W/m2, hence a dose rate. RAD has a unit W h/m2 (please convert to J/m2) Is Eq. 6 really a regression for daily UV-values? How can this be without reference to either the solar elevation angle or day of the year? Are not the anomalies addressed here? The next sentence on p23, 7-9, reads as if the authors have never been in this particular field of work. This remark is a rather trivial one.

Only the AOD is discussed. The single scattering albedo (SSA) is only discussed briefly. To the reviewers' opinion, an analysis of the AOD is quite limited without an elaborate discussion on the SSA, and on the size distribution of the aerosols.

What means "adjusted" with respect to R2?

Is "total column ozone" meant with "total ozone", ea. title of par. 2.3? Does that also applies to "...total and UV radiation can be either positive or negative." (p. 25, L29)?

'TOC' is used only once; hence no need to introduce this abbreviation.

The use of the abbreviation is not consequent. Please use one meaning for 'UV' and write the definition. Now it is in the title of the paper and in the abstract without out reference.

It appears that the authors refer to the regression coefficients (Eq. 7 -10) as being

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trends. As what the reviewer understands from the paper, the seasonal variability of the seasonal means is described by Eq. 7 -10. So where does the trend (which means linear change over time) comes from? It might be that the reviewer completely missed the point here, but in that case, a better explanation should be given on what is actually done.

The first line of the conclusion section is not what has been analysed in the paper; the paper does not support the remark that in recent years the focus of atmospheric research has shifted towards the variability of surface UV.

Term 'Monthly anomalies' is used prior to an explanation.

A scatter plot showing the result of Eq. 6 versus the actual UV-measurements would help to grasp the idea.

P26, L 2-3: "These small particles would enhance the multiple scattering and reflection of UV radiation, which in turn would increase the UV radiation observed at the surface of the Earth." The reviewer has strong doubts here. This would only apply if the source of radiation is located at the surface of the earth. The total transmission of solar radiation through the atmosphere is always reduced when more scattering particles are present, independent on their SSA and size. Scattering of radiation (waves), deals with amplitude, while reflection is an amplitude-squared property of a scattering medium. Hence, writing "the multiple scattering and reflection of UV radiation" is a bit too compact.

Presentation details Axis labels are often too small or not easily readable. Different ways to label should be sought. Fig2 to 4: a legend is missing or text should be added to the caption Fig 8 can hardly be read as a validation figure; it does not convince the reader that a validation is carried out there. In addition, season borders are not as normally defined: winter does not end on Dec 31 as this figure suggests.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 16529, 2014.