Interactive comment on "Optimizing UV index determination from broadband irradiances" *by* Keith A. Tereszchuk et al.

Anonymous Referee #2

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General comments:

The manuscript presents an interesting proposal on how to optimize calculations of UV Index forecasts by making use of the broadband irradiances produced by a specific numerical prediction model. UV Index is an essential tool in the promotion of sun safety and the attempts to minimize the adverse health effects of UV radiation on people. Production of UV Index forecasts on a global scale and yet in a useful spatial and temporal resolution is a computationally intensive task. Attempts to optimize the calculation procedures are therefore highly welcome.

The manuscript also provides a contribution to the current understanding on the differences between the surface irradiances obtained by radiative transfer model simulations vs. those measured in situ by Brewer spectrophotometers.

In general, the paper is well-organized and reads reasonably well.

Specific comments:

Page 1 Row 1: In its current form, the abstract is quite long. The reader would appreciate a more concise abstract where the main objectives and major findings are summarized.

Page 3 Row 3: As regards the action spectrum for erythema, which is the basis for the UV Index, you refer to McKinlay&Diffey (1987) and CIE Technical Report (2014). However, Eq. (1) does not exactly comply with either of these. In the formulation given by McKinlay&Diffey (1987), there are no "smaller than" ("<") signs, only "smaller than or equal" ("<=") signs. This would cause a small jump at 328 nm - which you do not have in your curve in Fig. 1, so probably you are not using the action spectrum of McKinlay&Diffey (1987).

CIE Technical Report (2014) refers to ISO/CIE1999 and gives a piecewise function where the signs are like in your Eq. (1). However, the equation for the range 328 < lambda < 400 includes a term (140 – lambda), not (139 – lambda) in the exponent, as does your Eq. (1).

Please check which erythemally weighted action spectrum you are using and give a reference for that. An excellent description on the differences between the different erythemally weighted action spectra may be found, for instance, in Webb et al. (2011).

Reference: Webb, A.R., Slaper, H., Koepke, P. & Schmalwieser, A.W. 2011. Know your standard: clarifying the CIE erythema action spectrum. Photochemistry and Photobiology 87: 483-486.

Page 4 Line 1: You refer to Long (2003) in the context of UV Index forecasting practices worldwide. More recently, Schmalwieser et al. (2017) has also reported on UV Index monitoring practices in Europe. That work could be also worth referring to.

Reference: Schmalwieser, A.W., Grobner, J., Blumthaler, M., Klotz, B., De Backer,

H., Bolsee, D., Werner, R., Tomsic, D., Metelka, L., Eriksen, P., Jepsen, N., Aun, M., Heikkila, A., Duprat, T., Sandmann, H., Weiss, T., Bais, A., Toth, Z., Siani, A., Vaccaro, L., Diemoz, H., Grifoni, D., Zipoli, G., Lorenzetto, G., Petkov, B.H., di Sarra, A.G., Massen, F., Yousif, C., Aculinin, A.A., den Outer, P., Svendby, T., Dahlback, A., Johnsen, B., Biszczuk-Jakubowska, J., Krzyscin, J., Henriques, D., Chubarova, N., Kolarz, P., Mijatovic, Z., Groselj, D., Pribullova, A., Gonzales, J.R.M., Bilbao, J., Guerrero, J.M.V., Serrano, A., Andersson, S., Vuilleumier, L., Webb, A. & O'Hagan, J. 2017. UV Index monitoring in Europe. Photochemical & Photobiological Sciences 16: 1349-1370. Page 4 Line 26: "the total (clear+cludy) sky analog". It is not very clear to this reader what this means. Could you please rephrase?

Page 9 Line 6: You have chosen to use weekly (7-day) averages. Could you please explain to the reader why you have chosen averages calculated for a period of 7 days? Why not 5 days – or 10 days?

Page 9 Line 24: You examine 5-day averages of Brewer measurements. Could you please justify the use of 5-day averages? Why not 7-day averages here?

Page 9 Line 23. You remind the reader that a boxcar averaging window was used for the OMI composite TOA spectrum and point out that the slit function of a Brewer spectrophotometer is trapezoid-shaped. The Brewer spectra can be purged from the effects of the slit function by performing a deconvolution. Could you please briefly discuss on how much the different schemes, averaging with a boxcar window vs. convolution with a triangular slit function, may be estimated to affect to the spectra.

Page 16 Line 2: "The simulated broadbands". I think it should be "The simulated broadband irradiances". There are some other instances in the body text with the same kind of formulation where the actual physical quantity is missing, like on Page 16 Line 28: "all sky broadbands" or Page 14 Line 8: "GEM broadbands". Please add the name of the physical quantity wherever it is currently missing.

Page 17 Line 33: What is a "spectral broadband"? Please explain the term.

Page 18 (Conclusions). The reader would be extremely interested in any estimate on how much your approach would save computer time as compared to the current operational UV index forecasting. Would you please be able to give an estimate on that?