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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Performance of the meteorological radiation model during the solar eclipse of 29 March 2006" *by* B. E. Psiloglou and H. D. Kambezidis

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We would like to thank Referee #1 for his/her constructive and helpful comments. Our response follows point by point.

Comment 1: "Why DELTA(beta)=-0.04 in eq. (13) ? A justification should be added."

According to NOA's records, similar weather conditions prevailed on both 28 and 29 March, namely unaltered wind speeds and directions. As no measurements of the Ångström's turbidity parameter, beta, were available, the 28th of March 2006 (an almost clear-sky day, one day before the eclipse) was selected as reference. Given that from eq. (12), using ASNOA's altitude of 107 m, the value of (beta)' was found equal to 0.09, a lot of tests were carried out changing the value of DELTA(beta) in the variation

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range of 0.02-0.06 as proposed by Yang et al (2001). The best results from MRM estimations for the 28th of March, for both total and diffuse components, were found using the value of DELTA(beta)=-0.04. So the value of Ångström's turbidity parameter, beta, equal to 0.05 was finally chosen for the Mie scattering transmittance function in eq. (10). The model was applied to the following eclipse day, 29 March 2006, using the same value of parameter beta too. Also, in the revised version of our article a comment for DELTA(beta) is added in Section 3 about the validation of MRM v5.

Comment 2: "Comments on Figures 4 and 5 and the use of the factor 1-EM."

It is true that the MRM cloudless sky sub-model uses in general a daily mean value for water vapor, ozone content, atmospheric pressure, Angstrom parameter beta, and ground albedo; therefore, a symmetry around local noon must be observed with perfect bell shaped estimations for the total and diffuse components. It is also true that the MRM cloudy sky sub-model generally uses the total daily measured sunshine duration where, again, a symmetry on the model results must appear in the same sense as for the cloudless sub-model. Nevertheless, to get as high accuracy as possible for the simulation of the radiation components on the specific event of the eclipse, 1-min values of air temperature, relative humidity and atmospheric pressure were used instead. That resulted in fluctuating (not smooth) total and diffuse estimations, but with a symmetry around local noon. Furthermore, the accuracy of the MRM simulations in both the total and diffuse components, was enhanced by considering the 1-min ratios of the measured to best-fit total solar radiation values. The procedure of obtaining the ratios is described in Section 3.1 of our revised manuscript. This methodology was developed in order to simulate the appearance of clouds in the best way during the second half of the eclipse in particular. During the eclipse day, the factor 1-EM was indeed used to modify the solar constant value in order to reduce the incoming solar radiation in the MRM calculations during the eclipse phenomenon. Figures 4 and 5 are re-named to Figures 4a and 4b in our revised manuscript.

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