

## ***Interactive comment on “Decoupling the effects of clear atmosphere and clouds to simplify calculations of the broadband solar irradiance at ground level” by A. Oumbe et al.***

**A. Oumbe et al.**

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### ANSWERS TO REVIEWER 1

Comment 1. The paper could be published almost as it is but it has to be noted (in the title too) that it is not a scientific paper but a technical note.

We fully agree. The title has been changed and is now “Technical Note - Decoupling the effects of clear atmosphere and clouds to simplify calculations of the broadband solar irradiance at ground level”. In introduction, we also change “This article aims at holding...” by “This Technical Note aims at holding...” (page 2009, line 15). Title of section 2 is now “Objective” instead of “Objective of the article” (page 2009, line 20).

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Finally, the first sentence of the conclusion is “This Technical Note analyses...” instead of “This article analyses...”.

Comment 2. Page 3, line 11: the authors could consider to add or replace the papers about the cloud modification factor with two papers that provide more coherent descriptions about how this factor is being used in UV or PAR studies. These papers are from J. Calbo (Reviews of Geophysics, 2005) and den Outer et al. (Journal of Geophysical Research, 2010).

We fully agree. We have replaced the previous references (page 2010, line 5).

Comment 3. Figures 3, 4 and relevant text: the authors could provide some information about the behavior of  $rRm$  of variance of  $Kc$  for solar zenith angles greater than 60 degrees. Probably, this effect is related to the reduction (70, 80 degrees) and diminishing (90 degrees) of the direct component.

We made further analysis. We observe that for a given cloud optical depth  $\tau_c$ , and for  $\theta_S > 50^\circ$ , the RM of variance of  $Kc$ ,  $RM(v(Kc))$ , increases with  $\theta_S$  with a maximum at  $\theta_S=80^\circ$ . This happens for all studied  $\tau_c$ . As the direct component is extinguished for  $\tau_c > 3-4$ , it is believed that the decrease of the direct component is not the main cause of this behaviour. Changes in ground albedo  $g$  do not change this behaviour: it is observed for all studied  $g$ . Other sources of variability than the ground albedo and the cloud optical depth have a greater relative importance when  $\theta_S$  increases. We found that the increase in relative influence with large  $\theta_S$  is mostly due to the increase of the optical path in the atmosphere due to greater  $\theta_S$  and therefore a greater influence of  $Pc$  and notably the aerosols. The text has been changed accordingly to account for these additional findings.

Technical correction 4. Replace “Oumber” by “Oumbe”. Done

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Interactive comment on Geosci. Model Dev. Discuss., 7, 2007, 2014.

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