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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Clear sky UV simulations in the 21st century based on ozone and temperature projections from Chemistry-Climate Models" *by* K. Tourpali et al.

K. Tourpali et al.

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Response to the comments of Reviewer 1

We would like to thank the reviewer for the valuable comments and suggestions which helped us to improve the manuscript. In the following we provide our response to the specific comments of the reviewer, numbered according to their sequence.

1. The title has been revised.

2. The text has been revised in response to the reviewer's comment.

3. Indeed we have used total ozone columns on each surface model grid point to calculate the erythemal irradiance and then from the irradiance data we computed the

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zonal means. The text wrongly suggests that we used zonal averages of total ozone, and has now been revised (see paragraphs 2 and 4 of section 2 - Methodology and data of the revised manuscript).

4. In the UV spectral region aerosols are very important scatterers of solar radiation resulting in important spectral modification of surface irradiance. In principle there is no place on earth without aerosols (even in small quantities), therefore we believe that including a standard aerosol profile in the calculations would be certainly closer to reality than a "no aerosol" assumption. For clouds the situation is different because they do not result in significant spectral attenuation of UV radiation. Therefore the attenuation of erythemal irradiance by "standard clouds" would be practically a constant factor which would be eliminated when calculating relative changes between different years.

5. The ten years average is considered less uncertain when dealing with climate model results.

6. The sentence has been rephrased to satisfy the reviewer's suggestion.

7. Although the IPCC (2007) states that cloud feedbacks are unclear (mainly with respect to radiative forcing), the same report presents predictions of cloud cover based on different scenarios. One of these scenarios we have used here in order to discuss the possible modifications of surface UV irradiance in the future and to demonstrate that the effects might be of different direction in different regions. In this sense we believe that this section does not contradict with the discussion in the introduction where it is basically stated that at this stage it is difficult to use quantitatively cloud information in the radiative transfer models.

8. In this paragraph we do not refer at all to the exposure of subjects lying beneath the snow or ice covered areas. Our main concern is the enhancement of radiation received either by organisms living on the snow or ice, or by those on neighbouring locations which are not covered by snow/ice but still receive more radiation. Surface reflectivity

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enhances the upwelling radiation, part of which is backscattered by air molecules towards the surface, thus increasing the irradiance at the surface not only on the area from where it has been reflected but also over areas within several kilometres.

9. A figure with the total ozone changes as used here has now been added (new figure 2). The total ozone changes have been published (and extensively discussed) in Eyring et al 2007 and in the 2007 WMO /UNEP assessment of ozone depletion.

10. This has been done in response to the reviewer's comment. Please see the revised manuscript

11. This has been done in response to the reviewer's comment. Please see the revised manuscript

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 13043, 2008.