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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Anthropogenic changes in the surface all-sky UV-B radiation through 1850–2005 simulated by an Earth system model" *by* S. Watanabe et al.

Anonymous Referee #3

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Review of "Anthropogenic changes in the surface all-sky UV-B radiation through 1850–2005 simulated by an Earth system model" by Watanabe *et al.*, submitted to *Atmos. Chem. Phys.*

The manuscript is a short study of changes in UV radiation at the surface, as represented in the CMIP5 Historical simulations by the MIROC model. The authors conclude that historical UV changes due to stratospheric ozone trends are compensated by changes due to tropospheric ozone and aerosols in some regions, mainly the north hemisphere.

The first concern is the overlap between the results and conclusions presented in this

paper (1850-2005) and those in Watanabe, JGR, 2011 (1960-2100). Both studies show the same trends and comment on the compensation between the effects of stratospheric ozone and tropospheric ozone and aerosols. The manuscript does not bring much. The appendix is out of scope and only reproduces the results of Watanabe, JGR, 2011. It can be removed.

However, the manuscript does bring two new simulations, the first with natural forcings only, the second with greenhouse gas forcings only. This helps making clearer the attribution of changes to tropospheric ozone and aerosols. So there are some new results here, but by a small margin.

I recommend publication after the authors have addressed the comments below.

1 Main comments

- The effect of aerosols are isolated by AERO = HIST - GHGo (page 4226, line 7). According to Table 1, shouldn't that be AERO = HIST - GHGo - NATo? At the moment, the authors also attribute changes from natural forcings to aerosol and land use changes. It would be worth mentioning in the text that effects of climate change on aerosol and ozone concentrations, and of ozone chemistry on aerosol formation, will break the linearity implied by the authors' method.
- Discussion of model skill is currently in the conclusion (page 4231, line 23 to page 4232 line 20), but it should really be in section 2.1, when the model is described. Also, it is difficult for the reader to get an idea of the model skill in simulating ozone and aerosol distributions: Watanabe 2011a and 2011b do not contain much validation of those elements. A discussion of the strengths and weaknesses of the simulation of UV-absorbing gases and aerosols, on a global scale, is needed to bring confidence in the results presented here.

2 Technical

Minor editing will be needed, for example “diffusive” should read “diffuse”, and “ozone containing air” should read “ozone-containing air” throughout the paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 4221, 2012.