

Interactive comment on “Evidence for the effectiveness of the Montreal Protocol to protect the ozone layer” by J. A. Mäder et al.

J. A. Mäder et al.

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We thank the referee for his/her valuable comments and suggestions on the paper.

R1 formulated questions regarding the chosen EESC scenario and asks for further details on the EESC definition.

Following the suggestions of the reviewer we changed the EESC used in the study to the EESC time series “standard” WMO A1_2010A scenario (see Fig. 1). We also tested another version of EESC also described in Newmann et al (2007). These modifications had no significant influence on the results and conclusions of the manuscript, which can be viewed as evidence for the robustness of our approach (see also sensitivity analysis, see line 311 ff and tab. 2 in the revised manuscript).

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We also considered (as suggested by the reviewer) to include a third scenario assuming constant EESC after the 1990s. However, we did not introduce such a scenario because (i) we believe that the EESC scenarios are basically robust and reliable, at least concerning the basic shape of the curve, which is most important in the context of the study and (ii) an “in-between” scenario makes communication more complicated.

We agree (as pointed out by the reviewer) that a linear temporal evolution starting at 1970 as used in the LT is indeed a simplified scenario; following the suggestion of the reviewer we made an additional sensitivity run using the shape of the EESC curve prior to 1992 followed by a linear trend which also did not change the main conclusion of the paper (see lines 316-319 and tab. 2).

R1: “The authors should consider referring to papers on the world avoided ...”

The following paragraph was included in the introduction of the revised manuscript (see lines 59-64):

“Several other studies (e.g., Prather et al., 1996; Velders et al., 2008; Morgenstern et al., 2008; Newman et al., 2009) reported on the positive effect of the Montreal Protocol, relating the expected development to “the world avoided”, had the Montreal Protocol not been ratified. As its successful ratification prohibited the steady increase in the atmospheric burden of ODSs, very severe ozone depletion and subsequent increase in erythema UV were avoided.”

Minor comments:

Equation 3 is explained in more detail in the revised manuscript (see lines 179-181)

The definition of EESC and equivalent latitude is more carefully described in the revised manuscript (see footnote to line 70 and lines 223-227).

Eliassen Palm Flux is not included in the regression models as it was not selected as important variable during the backward elimination procedure (see Mäder et al., 2007), probably because at least part of the information of Eliassen Palm Flux is covered by

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the variable of EL.

All other comments have been included.

We hope that these comments and the changes in the revised manuscript improve the quality of the paper and clarify the points raised by R1.

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