Climate
of the Past
Discussions

CPD

Interactive comment on "Role of the stratospheric chemistry-climate interactions in the hot climate conditions of the Eocene" *by* Sophie Szopa et al.

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I am a MSc student at Uppsala University with an interest in past climate and past climate research. The potential role of stratospheric ozone chemistry was evaluated in this study with a stratospheric chemical-climate model in the case of the Eocene hot conditions ($4 \times CO_2$ climate and high concentrations of tropospheric N_2O and CH_4). Their results show that the ozone layer is significantly different under those conditions, with enhanced ozone column at mid-high latitudes and more or less unchanged on tropical latitudes. Their result suggests that using calculated stratospheric ozone by the model (instead of preindustrial ozone distribution) can change the global air temperature by 14% and highlights the sensitivity of ozone to hot climate conditions and the chemical composition of the atmosphere. Their result is significant since the cli-

mate sensitivity to stratospheric ozone feedback differs largely between models and need to be constrained better for both modelling of past climates as well as futures climates.

The aim and purpose of the study is clearly defined, and why the subject is important in this day and age are clearly formulated. Necessary information about atmospheric chemistry and the conditions in the different parts of the atmosphere, as well as the modelling are provided with relevant studies and references. The introduction gives good information on atmospheric chemistry interactions, and what studies haves been done before including their limitations. The method (the modelling) to address their aim is well stated and described. The parameters and limitations are also thoroughly described with relevant references included. The table of the settings for the simulations could however be good to have connected to the text to enable the reading flow. Their findings are clearly coupled with their method with high transparency (uncertainties, assumptions etc.). Their interpretations seem logical and reasonable, and coupled to the relevant atmospheric conditions and feedbacks. It would have been easier to follow their results and interpretations if accompanied by tables and figures, instead of having them in an appendix, where you have to go back and forth to get the whole picture of the results, interpretations and how they differed from the different simulations. The figures themselves are easy to read with the uncertainties clearly outlined. The arguments for why stratospheric ozone and distributions are important in modelling for past and future climates are well formulated and stated in their discussion, coupled with relevant similar studies and references. I would like to see more references in the conclusion, especially when the results are compared with other studies to support their conclusions.

The article is well-structured and with clear separation of the different sections with a distinct and logical link between them. These sections are also very detailed. It is easy to follow how the team has performed their study and what components has been taken in count, and why those is important and how they affect each other.

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The language used is appropriate and scientific without being hard to follow. Some sentences could be very long, which made it a bit harder to follow the reasoning. My suggestion is to see if some sentences could be shortened or divided into two or more sentences.

Over all a very detailed study poorly understood component of the atmosphere linked to climate and climate feedbacks. The potential role of stratospheric ozone chemistry and distribution show indications of having a significantly impacts on the climate, especially regarding feedback mechanisms, and as suggested should be constrained better in models to further investigate it's importance and affects. Especially, since its often neglected in today's climate models. I think this was a good quantitative study on the ozone layer's role and dynamic with climate, with a clear structure, necessary complementary information and logical and reasonable interpretation of their result. With some minor corrections the transparency and reasoning could be even easier to follow, e.g. to place the tables and figures with the section of text where they are referred instead of in an appendix.

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