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Interactive comment on "Estimates of Ozone Return Dates from Chemistry-Climate Model Initiative Simulations" *by* Sandip Dhomse et al.

Anonymous Referee #3

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The manuscript uses the latest CCMI simulations to derive new estimates of the ozone layer return dates. The study is an important update of the existing CCMVal2 evaluations and will provide valuable input for the next WMO ozone assessment. The paper is clearly written and well-structured and I recommend publication after the following comments have been addressed.

1) The authors adjust the model results to avoid biases when comparing to historical data and to reduce the spread in the predictions of the ozone column. However, this method can introduce new errors if the bias is not constant over time but process-related and time dependent. The manuscript misses a discussion of possible shortcomings of this method. What do the return dates look like before the adjustment? Is the mean return date the same and only the spread is reduced or are the models

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on average over/underestimating the atmospheric ozone abundance? In this context it is not clear what the difference between Figure 1a and 1b is. From the text and the captions it sounds like, the only difference is the adjustment to the 1980-1984 values, but the lines look like the models have been smoothed as well. Furthermore, it is also not clear what the impact of excluding models outside the 1 sigma uncertainty range is. Is this only reducing the uncertainty or also changing the mean values?

2) The comparison of the modeled lower and upper stratospheric ozone columns with the BSVertOzone data set gives large differences for some regions (even after the bias adjustment). I miss a discussion of possible reasons for the over- and underestimation of ozone loss and possible implications for the projected return dates.

3) In parallel with the CCMI activities, the stratospheric ozone community has undergone large efforts to provide updates of the ozone profile trends from observational data sets (e.g. Steinbrecht et al., 2017). How do the models compare to these new results? Do they agree on the upper stratosphere ozone recovery quantified for the 2000-2016 time period?

4) How different are the chlorine comparisons if HCl+ClO instead of Cly is used in order to have a consistent comparison between models and measurements? How does the amount of stratospheric bromine differ from model to model and how do such differences impact the return dates? Why not use the EESC instead of Cly?

Page 8, line 41: Do you mean 2046?