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Interactive comment on "Projecting ozone hole recovery using an ensemble of chemistry-climate models weighted by model performance and independence" *by* Matt Amos et al.

Anonymous Referee #2

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"Projecting ozone hole recovery using an ensemble ofchemistry-climate models weighted by model performance and independence"- Review

Authors use Chemistry Climate Model (CCMI) data to estimate Antarctic ozone recovery. They use newer weighting methodology to investigate evolution of Antarctic ozone depletion and subsequent recovery from 11 CCMs. Estimated ozone recovery dates are 2056 (2052–2060), that is about 4 years earlier than Dhomse et al., 2018. Matrices used to construct weighted means are total ozone column gradient, lower stratospheric temperature, lower stratospheric temperature gradient, breakdown of the polar vortex, ozone-temperature gradient, ozone trend- temperature trend gradient, and hydrogen

chloride.

Overall, this is well written concise paper and I think this is somewhat revised version of the manuscript. I would recommend it for a publication if authors can incorporate some of the following comments.

Major comment: Line 359 "The free running CCMI hindcast simulations (refC1) have a large...."

A) Which should be true for refC2 simulation as well, hence estimated ozone recovery dates should have much large uncertainty. I think authors should give some clearer and better explanation for the selection of refC1SD over refC1 or first part of refC2 to calculate the weights. It is odd that weights are calculated for completely different dynamical space as ozone evolution would largely determined by the changes in the stratospheric dynamics. For me higher weights to CNRM model over WACCM is really odd. Simple October TCO time series comparison (as well as ozone profile comparison) suggests CNRM being bit outlier. So I am wondering high weightage to CNRM might be due to stronger nudging parameters. I think authors tried to explain in the paragraph starting at 353, but it is confusing and better explanation would help the readers.

B)Section 3.2: Please provide some more details about which pressure levels are used for lower stratospheric temperature, ozone. Also what does HCl averaged over whole stratosphere means? That does not make sense. Do you convert it in number density and calculate stratospheric column. Chlorine activation in the lower most stratosphere determines springtime ozone loss and mid-stratospheric or upper stratospheric HCl values are not that important.

Minor comments: i) Line 25: [e.g. Gillet, 2015, ..) ii) Line 34: Ball et al., 2018 is not really good reference for that sentence. iii) Table 2. Reference NIWA data V3.4 should be Bodeker et al., (2018) url = {https://doi.org/10.5281/zenodo.1346424} iv) line 327: that is not correct. In MMM, if model has more than one realization then genreally individual model time series is created by calculating ensemble mean. If there is only

one realization then mot of the studies use 3 box-smoothing window.

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