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Interactive comment on “Nonlinear response of modeled stratospheric ozone to changes in greenhouse gases and ozone depleting substances in the recent past” by S. Meul et al.

Anonymous Referee #1

Received and published: 16 April 2015

General comments

The authors have analysed ozone changes between 1960-2000, using simulations from a coupled chemistry-climate model. They show that ozone loss through the late 20th century due to ozone-depleting substances was offset by greenhouse gas increases over the same period. They have undertaken a detailed analysis of all processes contributing to such non-linearities, to identify the chemical mechanisms and transport processes responsible. The paper is very thorough, both with respect to the literature cited and the analysis undertaken. I recommend publication in ACP after the comments below have been addressed.

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Specific comments

P. 9259 L9. How long was the spin-up period used?

P. 9260 L3. What is meant by solar-mean conditions? More information is needed.

P. 9261 L24/25. Do GHGs cause the ozone increase below 100 hPa or is it rather the increase in ozone precursors? I suspect it comes from increases in NO_x and CH₄. Regardless, it should be made clear what is behind the increase.

P. 9268 L26. Why is ClO_x-catalysed O₃ loss reduced? More CH₄ equals a faster rate of the CH₄+Cl reaction?

P. 9269 L7-9 could do with some re-writing to make it clear what is going on. E.g. Why does increased photolysis of N₂O equal less NO_x? I assume because less N₂O reacts with O(1D) to form NO? Why does increased halogen loading increase the photolysis rate of N₂O? Is it because halogens deplete overhead column ozone?

P. 9272 L1. You should say why your results differ to those of McLandress et al. (2010). Is this expected, because of different approaches used?

P. 9276 L22-26. This is an important/interesting point and I think it should be included in the abstract, which finishes rather abruptly.

Technical comments

P. 9254 L8/9. The use of a double negative (reduction of ozone decrease) is confusing, such that it is unclear what the 1.2% maximum refers to. Please clarify this.

P. 9255 L7. Change 'is' to 'was' as ODS concentrations are no longer increasing in the stratosphere.

L19. You could clarify that you mean the Chapman O₃ loss reaction.

P. 9256 L3/4. I assume you mean the chemical production of ozone; please clarify this.

L26. Correct 'effect' to 'effects.'

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P. 9264 L25. Correct the spelling of 'increasing.'

P. 9273 L3. Correct the spelling of 'strengthening.'

Figure 1. Label panels with (a) and (b).

Figure 3. Add '30N' to title of (c) and '60N' to title of panel (d).

Figure 9. Replacing 'SP' and 'NP' on the x-axis with 90S and 90N would be more consistent with other figures.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 9253, 2015.

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