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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Differing responses of the QBO to SO_2 injections in two global models" *by* Ulrike Niemeier et al.

Anonymous Referee #1

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General Comments

This is a nice study of one of the problems associated with stratospheric geoengineering via SO2 injection, namely how certain aspects of stratospheric dynamics are affected. Overall the paper is well written, though as indicated below there are a few points where more clarity is needed.

Specific Comments

Page 4, line 15: An approximate altitude for 60 hPa would be useful.

Page 4, line 17 (and Table 1): Which years are used to calculate the time averages - presumably the final "n" years in each case?

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Discussion paper

Page 6, line 2: This line makes no sense to me.

Page 8, lines 1-6: You show that the LW heating rate is larger in WACCM than in ECHAM but then say that this difference is not the cause of the larger temperature anomaly in WACCM. I think I understand what you're saying - that because the radiation codes are the same, the difference in LW heating rate must come from the inputs to the radiation scheme, but it still sounds odd. It's like saying "this heats up more but that's not why it's warmer". I suggest a re-write.

Page 10, lines 19-20: You say that the QBO vanishes in WACCM at an injection rate of 2 Tg[S]/yr but Figure 8 shows the vertical profile of omega_star in WACCM for 2 Tg to be very similar to the 2 and 4 Tg profiles in ECHAM, which you imply further on (Page 12, paragraph beginning line 3) are profiles characteristic of the presence of a QBO (which doesn't disappear in ECHAM unti 8 Tg). So if the WACCM 2 Tg omega_star profile looks like the ECHAM 2 & 4 Tg profiles which still have a QBO, why is the QBO absent at 2 Tg in WACCM despite it having a similar omega_star profile?

Page 12, lines 3-5 and Figure 8: In trying to see the impact of the absence of the QBO on the profile of omega_star it would be helpful to have the profiles from the Control simulations also plotted (perhaps in black) on Figure 8.

Page 14, line 11: "...a slight increase on omega_star" - only from 60 to 30 hPa: above that T63 has smaller values.

Technical Corrections

Page 9, Figure 5 (and Fig. 9[lower]): the intervals on the colour scale are very odd: first the interval is 3 ppb (up to 15 ppb), then it reduces to 2 ppb (to 17 ppb), then increase to 9 ppb and finally to 10 ppb. I've no problem with intervals which gradually change but I don't think one should use intervals which begin being constant, then decrease and then increase.

Page 10, line 8: "proxy" not "proxi".

Page 10, fig. 7: A vertical line to differentiate positive from negative values would be helpful.

Page 10, line 20: "lay" not "lie".

Page 15, line 15: Insert "in WACCM" before "is 70% larger".

Page 16, line 12: "simulating" not "simulation".

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