

Interactive comment on “Modelling the residual mean meridional circulation at different stages of stratospheric warming events” by Andrey V. Koval et al.

Anonymous Referee #3

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The authors describe a numerical study on the change of the residual mean circulation during sudden stratospheric warmings (SSW). This is in principal an interesting topic as SSW events cause important changes in the circulation for both the middle atmosphere dynamics and chemistry as well as for the troposphere. After the presentation of an overall agreement of the MUAM model with the MERRA reanalysis, the authors go on in calculating the EP Fluxes of the Ensemble members for the RMC and the ozone fluxes during several SSW events. They find a transitional behaviour of these fluxes and in general a weakening of fluxes after such events. I think, such an analysis makes sense in general but needs to be described more carefully. – The motivation, why should one care about this, besides the usual academic curiosity? Are there im-

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portant observed impacts of SSWs on the ozone distribution in the stratosphere that has not yet been understood so far? Are there missing details in the description of the MA dynamics during SSWs where this method can improve or support the understanding? Are there dramatic changes in ozone distribution observed that need to be explained? Please elaborate more on your motivation. • The ensemble setup, how strong is the ensemble spread, e.g. in the 10 hPa wind? Does an SW event really appear in every member for every run? • Comparison with reanalysis. It is a really nice result that MUAM as a mechanistic model comes so close to the MERRA reanalysis in terms of the RMC analysis. This comparison should be extended to the fluxes during SSW events as well. • Conclusions: what do we learn qualitatively about this changed circulation, what effect should be taken into account in future when studying such events? • Finally, this might not apply to the current manuscript, however, I noticed, that the forcing of the SPWs at the lower atmosphere in MUAM comes from a relatively old reanalysis from 1994. An update of this climatology or a change to MERRA or ERA5 or both would be desirable. It could even serve itself as a source of generating an ensemble by changing characteristics in these SPWs. Minor issues are: L. 45: which ARE not compensated L. 51: reverseS its direction L. 70 ff. How many model levels has MUAM? L. 78 according to recent knowledge . . . this is relative as you quote papers from 1991 and 1994, which are already 30 years old. L. 180 in Figures2c and may reflect (?) L. 205 which correspondS TO our results L. 214/215 Vertical transport . . . sentence is incomplete, please rephrase

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