

## ***Interactive comment on “The effect of interactive ozone chemistry on weak and strong stratospheric polar vortex events” by Jessica Oehrlein et al.***

### **Anonymous Referee #1**

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#### General comment:

The paper investigates the effect of interactive ozone chemistry on the state of the polar vortex and downward coupling to the surface during Sudden Stratospheric Warmings (SSWs) and Strong Polar Vortex events (SPVs). The study is based on WACCM simulations using either interactive or specified chemistry. In particular, the analysis differentiates between mid winter (December-February) and late winter (March) events. It is found that in simulations with interactive chemistry the polar vortex is stronger. For mid winter warmings, a stronger and more persistent downward coupling occurs, characterized by more persistent NAO anomalies, in agreement with previous studies. For March warmings, and as well for SPVs, no significant changes occur. I regard this an interesting study, emphasizing the impact of interactive chemistry for simulations

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of coupling between stratosphere and troposphere. The paper is well written and the presentation quality is good. I only have a few minor and technical remarks and do recommend the paper for publication.

#### Minor comments:

1. There is some inconsistency in the terminology to describe the two simulations. In Sect. 2 it is defined that WACCM=CHEM and SC-WACCM=NOCHEM. However, in some figures (e.g., Fig. 2, 3) again the terms WACCM and SC-WACCM are used, or even together with CHEM/NOCHEM. This is not a big issue, but I would recommend to stay with one clear terminology throughout the paper.
2. The referencing to the sub-figures (in the caption, and also in main text) should be made with a/b/c labels, not top/middle/bottom (e.g. for Figs. 4, 5, 6).
3. Overall, the paper has a lot of figures (15) with many of them showing insignificant differences. I think the presentation could become even clearer and more focussed on the main messages if the number of figures was somewhat reduced. E.g., Fig. 14 shows mainly insignificant differences (for case of SPVs), and in my opinion could be removed and related results just mentioned in the text. But I would leave it open to the authors to address this comment or not.

#### Technical comments:

P1, L20: ... tend to correspond to a ...

P2, L47: ... as their surface effects ...

P4, L116: ... 60°N ... The N is in italics.

P6, L170: ... temperatures ...

Figure 2: This is a case where there is some inconsistency in the terminology: The figure legend says SC-WACCM, WACCM, the caption says CHEM, NOCHEM.

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Figure 4: This is a case where the referencing in the caption to the subfigures is not made with a/b/c labels.

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