

## ***Interactive comment on “How Does Downward Planetary Wave Coupling Affect Polar Stratospheric Ozone in the Arctic Winter Stratosphere?” by Sandro W. Lubis et al.***

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Dear Editor and Reviewers

We have seriously considered all minor comments from the three reviewers, and have made substantial changes to the manuscript. As we describe in our detailed responses to the reviewers, we have made numerous modifications that we hope have clarified our paper and improved it as a result.

These changes include:

1. Some new figures in the supplemental material to clarify some reviewer concerns regarding the life cycle of upward wave events (see Figs. S1 and S3) and their rela-

C1

tionship with transient ozone changes both in MERRA2 and CESM1 (WACCM) (see Figs. S2 and S4), the life cycle of downward wave-2 events and its relation to transient ozone changes (see Figs. S5-S6), the probability density function distribution and the frequency of extreme heat flux events during REF and ABS (see Fig. S7), evidence for symmetric (linear) response between REF and ABS winters (see Figs. S8-S9), and the time series of the final vortex breakup day in the NH in relation to REF and ABS winters (see Fig. S10).

2. As suggested by reviewer #1 and reviewer #3, we have modified Fig. 1 and Fig. 5 by adding the evolution of wave-1  $v'T'$  and the associated EP flux divergence into this figure. We have now combined the 2 line plots in the old Fig.1 with the line plot in the old Fig. 4, likewise for the model. Finally we have also combined Figs. 9 and 10, and Figs. 11 and 12, for a better comparison between reanalysis and model.

3. We have also modified the schematic figure (Fig. 12) in the manuscript to better highlight our suggested mechanism.

4. A new appendix that highlights the method used for calculating the statistical significance of anomalous values based on a 1000-trial Monte Carlo test is now provided in Appendix C.

We have also made a few changes to the manuscript that is independent of the reviewers' comments. We have uploaded the revised manuscript and new supplementary information along with this response. We hope that all referees find the revised manuscript to be significantly improved and suitable for publication in ACP.

Sincerely,

Sandro Lubis (on behalf of the co-authors)

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/acp-2016-558/acp-2016-558-AC4->

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