Atmos. Chem. Phys. Discuss., 15, C1011–C1013, 2015
www.atmos-chem-phys-discuss.net/15/C1011/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Unusual stratospheric ozone anomalies observed in 22 years of measurements from Lauder, New Zealand" *by* G. E. Nedoluha et al.

Anonymous Referee #2

Received and published: 24 March 2015

This paper presents analyses aimed at highlighting and explaining some unusual ozone anomalies in the middle stratosphere from a 22-year set of observations from Lauder, NZ. The unusual anomalies consist of (1) one month of high ozone in June 2001, and (2) relatively high ozone at the end of the record during 2009-2013. The objectives of the paper are to point out these ozone anomalies and demonstrate that they are related to large-scale dynamical variations. While the authors do infer some circulation changes for these periods, the results are hand-wavy and (in my opinion) do not provide fundamentally important new results of a standard appropriate for ACP. Some specific comments are below.

The analysis of the June 2001 event is quite superficial. The authors show some anomalous circulation behavior in Fig. 4 (postage-stamp figures which are difficult to see; why are 15 panels needed?), but this result begs for more substantial analysis. Why is there an anomalous anticyclone near 10 hPa in this month? What are its horizontal and vertical characteristics, and dynamical origin? Is this tied to some anomalous circulation in the troposphere? Why is this important?

Regarding the 2009-2013 event: the agreement with MLS ozone data in Fig. 5 is impressive, but the construction of Fig. 6 is misleading (norming the individual satellites to separate segments of the MOPI data). Note that as a result of this construction there is a significant mismatch between the SAGE, HALOE and MLS results for the overlap during 2004-2005. I think the overall agreement of MOPI with satellite data would look less impressive if the satellite data were merged consistently using the overlap period. Alternatively, it might be useful to use one of the merged ozone datasets that are available in the community for this comparison (e.g. GOZCARDS or the SPARC Data Initiative data sets).

I like Fig. 7 as arguing for a link with global-scale circulations, but the following discussions in Section 4 regarding links to tropical ozone, N2O and the QBO seem unfocused, and arrive at a conclusion that the anomalies are 'caused by the rate at which N2O moves from the tropics to southern midlatitudes'. This is quite hand-wavy, as these patterns in Figs. 7 and 9 could easily be associated with changes in overturning circulation (given the decreasing vertical gradient of N2O across the globe). But more importantly, these results strongly overlap the findings recently published in Nedoluha et al, ACPD, 2015; hereafter N15), including the large-scale coherence between ozone and N2O over much of the globe (shown in their Fig. 4) and out-of-phase changes (or trends) between the tropics and SH midlatitudes (Fig. 9a is copied from N15). What is the additional novel information here? Overall I do not appreciate that there are important new results in this paper that enhance our fundamental understanding of ozone or large-scale circulation beyond the results of N15.

ACPD
15, C1011–C1013, 2015

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 5241, 2015.

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15, C1011–C1013, 2015