

## ***Interactive comment on* “Observations of ozone-poor air in the Tropical Tropopause Layer” by Richard Newton et al.**

### **Anonymous Referee #1**

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Newton, Vaughan, et al: Observations of Ozone-Poor Air in the Tropical Tropopause Layer [TTL]

The essence of the paper is that by combining aircraft and sounding observations from Feb-March 2014, it can be shown that SH (southern hemisphere) ozone in and below the TTL over the TWP (tropical western Pacific) is lower (approx. half) the concentrations over the corresponding NH (northern hemisphere). Evidence is presented for the lower ozone in the SH TTL (less than 10 ppbv) as due to deep convection of low-ozone air in the marine boundary layer below 300 m. Above that level to about 200 hPa ozone is not less than 10 ppbv in either NH or SH. Although limited in the amount of SH data, reactive halogenated hydrocarbons of biogenic origin and sampled by aircraft, are suitable tracers for implicating deep convection as the mechanism for transporting

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the low-ozone air from surface to TTL. The study is of interest and should be published with modifications that acknowledge a number of other papers that describe NH-SH ozone gradients (from surface and aircraft) and/or very low ozone in the upper troposphere and TTL throughout the tropical Pacific. The latter include PEM-Tropics (1990s) and TC4 (2007). In other words, the CAST-CONTRAST-ATTREX analysis is illuminating but does not show any surprises. The very important, motivating question posed on page 2, namely, “do enough reactive species penetrate the lower stratosphere to perturb the composition?” is not really answered. It is recommended that the authors conclude the paper with summarizing how their findings address this issue.

Relevant papers:

Avery, M. A., et al: Convective distribution of tropospheric ozone and tracers in the central American ITCZ Region: Evidence from observations during TC4, *J. Geophys. Res.*, 115, D00J21, doi: 10.1029/2009JD013450, 2010. Petropavlovskikh, I., et al: Low ozone bubbles observed in the tropical tropopause layer during the TC4 campaign in 2007, *J. Geophys. Res.*, 115, D00J16, doi: 10.1029/2009JD012804, 2010. Pickering, K. E., et al: Trace gas transport and scavenging in PEM-Tropics-B SPCZ convection, *J. Geophys. Res.*, 106, 32591-32608, 2001. Thompson, A. M., et al: Convective and wave signatures in ozone profiles over the equatorial Americas: Views from TC4 (2007) and SHADOZ, *J. Geophys. Res.*, 115, D00J23, doi: 10.1029/2009JD012909, 2010.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2017-970>, 2017.

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