

February 4, 2025

Comments by Owen R. Cooper (TOAR Scientific Coordinator of the Community Special Issue) on:

**Natural and anthropogenic influence on tropospheric ozone variability over the Tropical Atlantic unveiled by satellite and in situ observations**

Sachiko Okamoto, Juan Cuesta, Gaëlle Dufour, Maxmim Eremenko, Kazuyuki Miyazaki, Cathy Boone, Hiroshi Tanimoto, Jeff Peischl, and Chelsea Thompson

EGUsphere [preprint], <https://doi.org/10.5194/egusphere-2024-3758>

Discussion started: 20 Dec 2024

Discussion closes: 7 Feb 2025

This review is by Owen Cooper, TOAR Scientific Coordinator of the TOAR-II Community Special Issue. I, or a member of the TOAR-II Steering Committee, will post comments on all papers submitted to the TOAR-II Community Special Issue, which is an inter-journal special issue accommodating submissions to six Copernicus journals: ACP (lead journal), AMT, GMD, ESSD, ASCMO and BG. The primary purpose of these reviews is to identify any discrepancies across the TOAR-II submissions, and to allow the author teams time to address the discrepancies. Additional comments may be included with the reviews. While O. Cooper and members of the TOAR Steering Committee may post open comments on papers submitted to the TOAR-II Community Special Issue, they are not involved with the decision to accept or reject a paper for publication, which is entirely handled by the journal's editorial team.

**Comments regarding TOAR-II guidelines:**

TOAR-II has produced two guidance documents to help authors develop their manuscripts so that results can be consistently compared across the wide range of studies that will be written for the TOAR-II Community Special Issue. Both guidance documents can be found on the TOAR-II webpage: <https://igacproject.org/activities/TOAR/TOAR-II>

*The TOAR-II Community Special Issue Guidelines:* In the spirit of collaboration and to allow TOAR-II findings to be directly comparable across publications, the TOAR-II Steering Committee has issued this set of guidelines regarding style, units, plotting scales, regional and tropospheric column comparisons, and tropopause definitions.

*The TOAR-II Recommendations for Statistical Analyses:* The aim of this guidance note is to provide recommendations on best statistical practices and to ensure consistent communication of statistical analysis and associated uncertainty across TOAR publications. The scope includes approaches for reporting trends, a discussion of strengths and weaknesses of commonly used techniques, and calibrated language for the communication of uncertainty. Table 3 of the TOAR-II statistical guidelines provides calibrated language for describing trends and uncertainty, similar to the approach of IPCC, which allows trends to be discussed without having to use the problematic expression, "statistically significant".

### **General comments:**

This analysis evaluates three chemical reanalysis products above the tropical North and South Atlantic Oceans, with a focus on February 2017. Some discussion needs to be provided to state why the analysis only focuses on February 2017, when plenty of in situ observations are available for other seasons and years. For example, why not provide additional analysis of in situ observations for the months of September-October-November? This is the time of year when the well-known ozone maximum occurs above the South Atlantic (Thompson et al., 2021).

A paper recently published in the TOAR-II Community Special Issue (Gaudel et al., 2024) provides an extensive evaluation of several satellite products across the tropics. This paper takes advantage of 25 years of in situ observations, including several ATOM flights, 8 ozonesonde sites, and thousands of IAGOS aircraft profiles above five regions. These same data sets can be applied to your study. In particular the NASA SHADOZ ozonesonde station on Ascension Island reveals the seasonal ozone variability in the center of the South Atlantic ozone maximum (Thompson et al., 2021). This station also has several years (2016-2019) of surface ozone observations. The SHADOZ data archive is here: <https://tropo.gsfc.nasa.gov/shadoz/Archive.html>

Finally, ozone production and transport above the tropical Atlantic has been studied for decades (Fishman et al., 1986, 1991; Thompson et al., 1996, 2000; Moxim and Levy, 2000), and it is important for the authors to describe their findings in relation to previous work, and to clearly state what is new about their findings.

### **Specific Comments:**

Lines 640-641

I don't understand the caption to Figure 16 as the sentence seems to be missing a verb.

Fishman et al. 1983 appears in the list of references, but I don't see this paper cited in the main text

### **References**

- Fishman, J., Minnis, P. and Reichle Jr, H.G., 1986. Use of satellite data to study tropospheric ozone in the tropics. *Journal of Geophysical Research: Atmospheres*, 91(D13), pp.14451-14465.
- Fishman, J., Fakhruzzaman, F., Cros, B., & Nganga, D. (1991). Identification of widespread pollution in the southern hemisphere from satellite analyses. *Science*, 252(5013), 1693–1696. <https://doi.org/10.1126/science.252.5013.1693>
- Gaudel, A., Bourgeois, I., Li, M., Chang, K.-L., Ziemke, J., Sauvage, B., Stauffer, R. M., Thompson, A. M., Kollonige, D. E., Smith, N., Hubert, D., Keppens, A., Cuesta, J., Heue, K.-P., Veefkind, P., Aikin, K., Peischl, J., Thompson, C. R., Ryerson, T. B., Frost, G. J., McDonald, B. C., and Cooper, O. R. (2024), Tropical tropospheric ozone distribution and trends from in situ and satellite data, *Atmos. Chem. Phys.*, 24, 9975–10000, <https://doi.org/10.5194/acp-24-9975-2024>

- Moxim, W. J., & Levy, H. (2000). A model analysis of the tropical South Atlantic Ocean tropospheric ozone maximum: The interaction of transport and chemistry. *Journal of Geophysical Research*, 105(D13), 17393–17415. <https://doi.org/10.1029/2000jd900175>
- Thompson, A. M., Pickering, K. E., McNamara, D. P., Schoeberl, M. R., Hudson, R. D., Kim, J. H., et al. (1996). Where did tropospheric ozone over southern Africa and the tropical Atlantic come from in October 1992? Insights from TOMS, GTE TRACE A, and SAFARI 1992. *Journal of Geophysical Research*, 101(D19), 24251–24278. <https://doi.org/10.1029/96jd01463>
- Thompson, A.M., Doddridge, B.G., Witte, J.C., Hudson, R.D., Luke, W.T., Johnson, J.E., Johnson, B.J., Oltmans, S.J. and Weller, R., 2000. A tropical Atlantic paradox: Shipboard and satellite views of a tropospheric ozone maximum and wave-one in January–February 1999. *Geophysical Research Letters*, 27(20), pp.3317-3320.
- Thompson, A. M., Stauffer, R. M., Wargan, K., Witte, J. C., Kollonige, D. E., & Ziemke, J. R. (2021). Regional and seasonal trends in tropical ozone from SHADOZ profiles: Reference for models and satellite products. *Journal of Geophysical Research: Atmospheres*, 126, e2021JD034691. <https://doi.org/10.1029/2021JD034691>