

Review of Deshler et al., AMT, 2016. Prepared 10 Feb 17

OVERALL COMMENT & RECOMMENDATION. Transfer functions (“TF”) are important for the re-processing of thousands of ozonesonde records and this paper is the first to provide them based on extensive analysis. The paper overall is clearly written and with a few exceptions mentioned below, well-organized, giving TF that the sonde community will accept and use. There is one major short-coming in the paper that needs to be remedied before the paper can be published. There is no uncertainty analysis in the TF, which will propagate to the adjusted ozone reading (refer, for example, to Table 3).

OTHER COMMENTS.

Abstract. Needs an Intro/motivating sentence. Although this is a technical paper in a “measurements” journal, every Abstract needs a “why it matters” opening sentence or two to give context to the study for some of this paper’s readers.

Line 25 – goal of “this study”

Lines 39-40: Although ENSCI and SPC are spelled out in line 21, the abbreviations SP and EN are not yet clearly defined at this point. Please fix.

End of Introduction. An excellent job in describing the motivation and goals but there is not a user-friendly road map of the upcoming Sections at the end. Please add! The prose gets very specialized very fast.

Line 199: All these factor(s) – plural. “superpose” ?

Consider that the last two paragraphs of section 2.1 and section 2.4 seem to talk about the same thing i.e. stoichiometry. Can they be merged or revised? It gets confusing coming back to this topic.

Section 2.5 should be in the Introduction section. It is actually major motivation and important for putting the study into context. Further, Sec 2.5 is not relevant to this section entitled ‘ECC ozonesonde description’. Note: Line 307 – besides Smit et al. 2007; Deshler et al., 2008 – the Thompson et al., 2012 paper also shows improvement in sonde precision due to re-processing. The paper was also cited on Line 597. Add the reference. Thompson, A. M., S. K. Miller, S. Tilmes, D. W. Kollonige, J. C. Witte, S. J. Oltmans, B. J. Johnson, M. Fujiwara, F. J. Schmidlin, G. J. R. Coetzee, N. Komala, M. Maata, M. bt Mohamad, J. Nguyo, C. Mutai, S-Y. Ogino, F. Raimundo Da Silva, N. M. Paes Leme, F. Posny, R. Scheele, H. B. Selkirk, M. Shiotani, R. Stübi, G. Levrat, B. Calpini, V. Thouret, H. Tsuruta, J. Valverde Canossa, H. Vömel, S. Yonemura, J. Andrés Diaz, N, T. Tan Thanh, H. T. Thuy Ha, Southern Hemisphere Additional Ozonesondes (SHADOZ) ozone climatology (2005-2009): Tropospheric and tropical tropopause layer (TTL) profiles with comparisons to OMI-based ozone products. *J. Geophys. Res.*, **117**, D23301, doi: 10.1029/2010JD016911, 2012.

Section 3 title: Transfer function’s’ – plural – there is more than one equation derived.

Section 3.1: Be clear up front that only JOSIE data are in controlled environments. The rest of the comparison data came from experiment flown under real atmospheric conditions.

SOPs during these varied dual/gondola flights in space and time must have been different. Is this not an important source of inhomogeneity? Please address clearly. How do you justify using these data to come up with unified transfer functions when SOPs have varied? You mention in Section 2.2, line 20 that “ECC ozonesondes prepared according to the SOPs provide very reproducible (<2-3%) measurements.” A section on the impact of varying SOPs should be added, if only to justify the quality of the datasets used.

Section 3.1.1 Were all JOSIE measurements used (including the tropical simulations)? All other dual/gondola flight were flown in mid to polar latitude locations so the assumption here is that one would use similar latitude profiles.

Figure 1: Why are there negative background currents at Wallops? Is that an error? Please explain. The latter background currents show large variations from negative to -0.05uA to close to 1.0. Isn't the legitimacy of the transfer functions affected by variations on background current? Why do you not use one background current for all the data to remove this artifact and recalculate the transfer functions? What is the dependence of background current on solution, manufacturer, and ground-station equipment to produce zero-ozone? It is understood that backgrounds are poorly understood and that there is a dearth of literature that focuses on this very topic.

Figure 5: ‘DP’-- is that data points?

Table 2 – Add the sample size whether by profile number or data points - It is worthwhile to add that information here, more so than to the figure: one can save space and increase the font size for clarity(?) Since you refer in detail to this table in term of ‘boxes’ - suggest adding another column numbering them.

Section 4.1

Were the outliers observed and noted in Figure 6 included in developing the transfer functions? If so, why? Outliers denote error or responses outside the norm. By how much would the transfer functions change if outliers were removed? If it is negligible, it should be calculated and noted, even if not included.

Paragraph on line 511. This sentence is long, convoluted, and unclear. The meaning comes across but the sentence (s) can be written better.

Line 628. The Logan references (appropriate on Line 302) do not belong here.

Figure 8 – Use the same x-axis scale as Figures 6 and 7.

Section 4.4 Are you are applying the ENSCI/1.0% to ENSCI/0.5% transfer function and this is equation 6? This is mentioned nowhere in this section. The error bars should not change as you are merely shifting the profile. The key is that the distribution now centers closer to zero.

Line 756. After SHADOZ stations [Thompson et al., 2012; Witte et al., 2016] where Witte et al is: J. C. Witte, A. M. Thompson, H. G. J. Smit, M. Fujiwara, F. Posny, G. J. R. Coetzee, E. T. Northam, B. J. Johnson, C. W. Sterling, M. Mohammed, S-Y. Ogino, A. Jordan, F. Raimundo daSilva, Z. Zainel, First reprocessing of Southern Hemisphere Additional OZonesondes (SHADOZ) profile records (1998-2015) 1: Methodology and evaluation, *J. Geophys. Res.*, submitted, 2016.