Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2019-320-AC2, 2020

Atmospheric Measurement Techniques Discussions

Interactive comment on "Model-based Climatology of Diurnal Variability in Stratospheric Ozone as a Data Analysis Tool" *by* Stacey M. Frith et al.

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Received and published: 20 February 2020

Review of: Model-based Climatology of Diurnal Variability in Stratospheric Ozone as a Data Analysis Tool Stacey M. Frith1, Pawan K. Bhartia2, Luke D. Oman2, Natalya A. Kramarova2, Richard D. McPeters2, Gordon J. Labow The study is very detailed, and the results are convincing and new. For the first time, the authors demonstrate a feasible way how the effects of the diurnal ozone cycle in satellite and ground observations can be considered and partly removed. Thus, the article is of high interest for the readers of AMT. Future application of a related analysis to other diurnal cycles in other atmospheric parameters might be possible.

** We thank the reviewer for their comments and address each point individually below,

as indicated by the bold text. We note that during the review process a model error was identified and a new simulation was run. We reanalyzed the new output, but found for ozone the differences were very small, and did not warrant producing a new climatology at this time. We will periodically update the climatology and include all model updates at that time.

I only found minor corrections which are listed below, and I have one question: I would be interested in the dependence of the diurnal cycle on longitude. Did you investigate if topography, convection or land-sea contrast have an influence on the diurnal cycle in the simulation data? Maybe you can add 1-2 sentences about this topic to your article.

** Based on comments of another reviewer, we made a good faith effort to establish reasonable error estimates for GDOC, and in doing so did some analysis of the variability going into the averages, including variability in longitude. We found that the variability is quite large and complicated, and unpacking the sources of the variations will take some time. We cannot comment on this yet, but work is ongoing analyzing the model run. We note in the revised version of the manuscript that the uncertainty is largest in the high latitude winter, when the variability is greatest, which we associate with higher dynamical variability.

p.1, line 15 what is the meaning of GEOS-GMI?

** The acronym has been expanded (and explained) in the abstract

p.2, line 4 Rowland instead of Roland

** corrected, thank you

p.2, line 27 plural? Satellite data provide....

** corrected

p.4, line 15 0.01 hPa instead of .01 hPa

** corrected

p.4, line 20 please inform how the midnight value is defined, e.g., 23:00-1:00

** The time resolution of GDOC (and the model output used to construct GDOC) is 30 minutes, thus the midnight time bin is 23:45-00:15. We have added this to the text.

p.8, line10 why did you change to the daily mean as reference?

** In general, the reference point can be defined as any time in the cycle (or the daily mean), as is appropriate for the analysis. In this case the measurements are noisy, so normalizing to the daily mean demonstrates the similar structure in each data source but does not rely on the agreement at any single time. This was not made clear in the text and has been expanded upon.

** In section 2.1 we added: “We note that GDOC can be re-normalized to any reference time as is most appropriate for a given analysis.”

** In Section 3.2 we added: Here we normalize to the daily mean rather than to values at a specific time in order to highlight the overall structure of the variability rather than differences at a single time.

p.8, line 19...measured by the satellite instruments.

** corrected

p.11, line 3 line of sight?

** Yes, corrected

p. 14, line 2...because no observational data source...?

** corrected

p. 14, line 14 The sentence is not so clear. Perhaps "transits“ instead of "transition“?

** Thank you, we changed the wording to “shifts”

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-320, 2019.