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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sunset–sunrise difference in solar occultation ozone measurements (SAGE II, HALOE, and ACE–FTS) and its relationship to tidal vertical winds" *by* T. Sakazaki et al.

Anonymous Referee #1

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Review of ACP-2014-369, "Sunset-sunrise difference in solar occultation ozone measurements (SAGE II, HALOE, and ACE-FTS) and its relationship to tidal vertical winds" authored by Sakazaki et al.

General comments:

This manuscript is very good and shows that much of the tropical SS-SR differences (or SSDs) in stratospheric ozone occultation measurements (SAGE II, HALOE, and ACE-FTS) can be explained by the related tidal and seasonal variations of the vertical

winds. Among the possible causes of the observed SSDs are (1) systematic instrumental/retrieval biases for SR and SS ozone, (2) natural diurnal variations, and (3) measurement sampling issues. Although item (1) was not addressed in any detail in this manuscript, items (2) and (3) were considered thoroughly and accounted for mostly with the aid of the SMILES (submillimeter) diurnal ozone dataset and with the model ozone output from SD-WACCM. I recommend that the manuscript be published, but I also urge the authors to correct the important omissions and respond to several of my questions as they relate to the occultation datasets themselves (see below).

Specific comments:

2.0 Data description: Of primary importance for all three datasets (SAGE II, HALOE, and ACE-FTS) is whether there could be any differences in how they acquire and track the Sun with altitude during SR and SS. As it stands, the reader must accept that all transmission profile measurements were taken, calibrated, and processed to ozone mixing ratios perfectly.

2.1 SAGE II: SSDs from this experiment are larger than those of the others, particularly in the upper stratosphere (Figure 5), and the authors speculate as to why. With regard to one of your points in Section 5, can you say already whether there are any differences in the diurnal densities between the MERRA and SD-WACCM output?

2.2 HALOE: SSDs from HALOE agree well with those from SMILES and SD-WACCM in the upper stratosphere but not so well below about 35 km (Figure 5a) or above 55 km (Figure 8). Therefore, HALOE ozone has anomalies, too. No appropriate reference was given for its Version 19 ozone; refer to Randall et al. (Validation of POAM O3, JGR, 2003) for a more up-to-date and complete discussion. The lack of agreement at 55 km (Figure 8) must be due to photochemical changes at SR and SS rather than to tidal vertical winds and may be correctable in the HALOE algorithm (refer to Natarajan et al., JGR, 2005). Please include a comment about these two anomalies to give a more balanced and fair assessment of the datasets.

2.3 ACE-FTS: Although seasonal sampling is a slight issue in the tropics for these data, I agree that ACE ozone profiles look very good based on the results in Figure 5.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 16043, 2014.