**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "

Retrieval of temperature and pressure using broadband solar occultation: SOFIE approach and results" *by* B. T. Marshall et al.

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We thank referee #2 for these most helpful comments. First, we address the general comments made by this reviewer.

1) Other sources of error: Yes, we agree we need to say more about other "real world" error sources. We will include more discussion of this in the final version of the paper.

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Specifically, the 4.3 μm channel has no significant molecular contributions above 20km but, as the referee suggests, PMCs do contribute significantly. Since we also measure PMC extinction and infer total particle density and mean particle shape and size, we are able to largely correct for these contributions. We'll discuss this in the final revision and add a reference for the PMC measurements. Regarding isotopologues of CO2, we include all isotopologues contained in the HITRAN 2000 spectroscopic database in our analysis and we use the isotopic abundances implicitly contained in the HITRAN line strengths. Our analysis assumes that these abundances do not vary significantly over the altitude range of interest (stratosphere, mesosphere, and lower thermosphere). Of more concern are the non-LTE effects. The SOFIE code does include a non-LTE model as discussed in the Gordley et al 2009 reference. In section 7 of this paper we mention possible sources of error related to error in parameters used in the non-LTE model. We will add more discussion of the non-LTE issues in sections 4 and 6. We may also update figures 29 and 30 (or add additional figures) in section 7 to show preliminary results from the next version of SOFIE data. This version includes a number of significant corrections and modifications to the analysis, including correction of inputs to the non-LTE model that have significant impact around the polar summer mesopause.

2) SOFIE instrument: An overview of the SOFIE instrument is given in the Gordley et al 2009b reference but for the final version of this paper we will include details for the two bands used in this study. Specifically, HgCdTe detectors are used for these bands. The 4.3 μm bandpass is 2259 – 2370 cm-1 (50% maximum transmission points) and the 2.7 μm bandpass is 3555 – 3626 cm-1. FOV at a 50 km tangent point is about 1.2 km vertical by 4.1 km horizontal with oversampling to about 0.2 km in the vertical. The retrievals operate on a 2 km vertical grid with multiple interleaves of the data combined to achieve final results. SNR varies with time, location, and altitude. It is nearly 100000 for these bands in the lower stratosphere and about 100 for the 2.7 μm band and 500 for the 4.3 μm band at 100km.

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Next, we address specific comments.

P.5753, l.11: We will change the text as suggested.

P.5753, l.20: We will add details on the specific bandpasses used in the simulations (see SOFIE instrument discussion above). Regarding guidance, it is important that the bands have different sensitivities to temperature. Specifically, over the altitude range of interest, the absorption of one of the bandpasses should have substantially more temperature sensitivity than the other.

P.5756, l.9: Atmospheric and Environmental Research Inc. (AER) is the source of the line mixing parameters. These were calculated using the Hitran 2000 line database and the procedure described by Niro et al. (2005). We will include the appropriate references in the final revision.

Regarding CO_2 VMR - We use CO_2 from a version of the WACCM model. The appropriate reference will be included in the final version of the paper.

Finally, we address technical comments and corrections.

P.5748, l.8-9: Yes that is correct, we will clarify this in the final version.

P.5756, l.1: We will correct as suggested.

P.5761, l.2: We will correct.

Figures 8 and 10: The pressure results shown in figures 8 and 10 are due to recalculation of hydrostatic pressure at all altitudes, including below z0. So, for pressure, the only fixed point is at z0. We will clarify this in the text.

Figure 17 caption: We will correct as suggested.

Figure 20: We will correct the plot annotation.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 5743, 2010.