Response to Referee #1

We thank referee's helpful and constructive comments and review. The referee's comments are listed in *italics*, and our responses in black with revised texts in **bold black**.

Overview:
The authors have produced a carefully determined retrieval of ozone profiles, SOCs, and TOCs for over 10 years from an OMI profile retrieval algorithm (SAO). They compared retrieved SOC, TOC, and profile measurements extensively with global ozonesondes. These ozonesonde comparisons included filtering the OMI measurements for nearly clear-sky scenes, SZA < 75 degrees, and cross-track positions least affected by OMI row anomaly. The authors show from differences between pre and post-row anomaly periods that the current 10-year profile product (and derived columns) does not appear to be useful for evaluating decadal trends; however, the product at shorter timescales including daily from the analyses appears to be a useful C1 science product, particularly from the tropics to mid-latitudes. The paper appears good in current form and publishable with mostly just a few small comments that are listed below.

General comments:
** Lines 116-118: You might include in this reference list the paper by Yang et al. [2007] which used OMI and MLS to derive tropospheric ozone columns: Yang, Q., D. M. Cunnold, H. –J. Wang, L. Froidevaux, H. Claude, J. Merrill, M. Newchurch, and S. J. Oltmans, Midlatitude tropospheric ozone columns derived from the Aura Ozone Monitoring Instrument and Microwave Limb Sounder measurements, J. Geophys. Res., 112, D20305, doi:10.1029/2007JD008528, 2007.*

Done.

** Line 165: Were the NCEP tropopause pressures for getting TOCs and SOCs determined from a PV-theta definition, or a lapse rate definition, or something else?*

The tropopause pressures are defined by the lapse rate. We have added "**(defined based on the lapse rate)**" after the tropopause.

Section 4.1.3.: Is your derivation of cloud optical centroid pressure and your effective scene pressure the same as Joiner et al. (2009, ACP)? Is there any major difference with your effective cloud fraction and their radiative cloud fraction for determining effective scene pressure? Is effective scene pressure determined the same?
Joiner, J., M. R. Schoeberl, A. P. Vasilkov, L. Oreopoulos, S. Platnick, N. J. Livesey, and P. F. Levelt (2009), Accurate satellite-derived estimates of the tropospheric ozone impact on the global radiation budget, Atmos. Chem. Phys., 9, 4447-4465, doi:10.5194/acp-9-4447-2009.

Yes, we use the optical centroid cloud pressure (OCCP) from the OMI Raman cloud product by J. Joiner (Vasilkov et al., 2008), i.e., same as in Joiner et al. (2009). We directly use cloud pressure values meeting all the recommended quality flags. For pixels without qualified OCCP values, they are filled in by spatial interpolation on an orbital basis. Remaining empty values after the interpolation are filled in by a climatology derived from 7 years of OMI OCCPs. We use pixel-independent approximation for partial cloudy conditions, i.e., Lambertian clouds with OCCP and clear-sky conditions with surface pressure, and thus we do not use effective scene pressure. We use the effective cloud fraction from the same cloud product as initial value. We re-derive the effective cloud pressure from radiances at a weakly-absorbing wavelength (~347 nm) similar to the Raman cloud product. Typically, the effective cloud-top pressure is used in the radiative transfer calculation. Radiative cloud fraction, ratio of cloud radiance to total radiance, is derived from the effective cloud fraction.

We have added "**from the OMI Raman cloud product (Vasilkov et al., 2008)**" after "Our OMI ozone algorithm assumes clouds as Lambertian surfaces with optical centroid cloud pressure"

** Line 257: This appears to be a dead link.*
The address is correct. But the line number of 258 is added between "discover-" and "aq" when copying the link or clicking it directly. We have corrected it the updated version.

** Line 274: There are more error sources than just the pump efficiency for the ozonesondes, but correct that pump efficiency errors are largest in higher altitudes.*

We have changed "uncertainties in pump efficiency" to "**uncertainties mainly from pump efficiency**"

*** Where "SOC" is first mentioned (including the Abstract) it might be useful to state clearly that SOC is not the generally inferred total stratospheric ozone column but instead the ozone column from the tropopause up to balloon burst pressure. In your second submitted joint validation paper that uses MLS, "SOC" probably refers to total stratospheric ozone column?*
The SOC is first mentioned in the Abstract. We have revised it as:

"The MBs of the stratospheric ozone column (SOC**, the ozone column from the tropopause pressure to the ozonesonde burst pressure**) are within 2% with SDs of < 5% and the MBs of the tropospheric ozone column (TOC) are within 6% with SDs of 15%.**"**

In addition, we have described the SOC as the ozone column from the tropopause pressure to the corresponding ozonesonde burst pressure in the Sect. 3. But to make it more clear, we have changed "The TOC is integrated from the surface to the tropopause and the SOC is integrated from the tropopause pressure to the ozonesonde burst pressure" to "The TOC is integrated from the surface to the tropopause**. And** the SOC is **not the total stratospheric ozone column, but the**

ozone column integrated from the tropopause pressure to the ozonesonde burst pressure."

** Line 343: Should be ". . .stratosphere (UTLS). . ."*
Done.

** Many of the figures, if intended as single column will have figure text that will be too small to read. The authors might specify to the journal that these figures should be printed double column, or perhaps instead increase some of the figure text.*

Thank for the suggestion. We will contact the journal about this during the production process.

References:

Vasilkov, A. P., J. Joiner, R. Spurr, P. K. Bhartia, P. F. Levelt, and G. Stephens: Evaluation of the OMI cloud pressures derived from rotational Raman scattering by comparisons with satellite data and radiative transfer simulations, J. Geophys. Res., 113, D15S19, doi:10.1029/2007JD008689, 2008.