Dix and co-authors describe in this paper their parameterization retrieval of volume mixing ratios (VMR) from differential slant column density (dSCD) measured by airborne multi-axis differential optical absorption spectroscopy (AMAX-DOAS). They exploit the fact that spectra recorded in limb view geometry (0^o elevation angle) are mostly sensitive to atmospheric layer at instrument's altitude. Careful choice of reference spectra helps to remove contributions from above and below instrument altitude.

To convert limb dSCDs to VMRs they use an iterative scheme that corrects for trace gas profile shape effects. They calculate box Air Mass Factors for a Rayleigh atmosphere and a scaling factor constrained by O_4 dSCDs to account for aerosol extinction. They perform sensitivity studies using simulated dSCDs for bromine moxide (BrO), iodine monoxide (IO) and nitrogen dioxide (NO_2) and compare optimal estimation and their parameterization retrieval for measurements from the Tropical Ocean tRoposphere Exchange of Reactive halogen species and Oxygenated VOC (TORERO) experiment. The authors conclude that the parameterization retrieval is accurate with an uncertainty of 20 % for IO, and 30 % for BrO and NO_2.

The paper is well written and provides convincing arguments to support the quality and efficiency of the iterative scheme presented here. The contents of the paper are well suited for AMT. I suggest the publication in AMT after addressing these comments:

General comment:

Selection of zenith reference spectra, calculation of *dBox-AMFs* and definition of sensitive range *S*. Since the method described here depends on the selection of the reference spectra it will be interesting if the authors could provide some extra information to what is shown in figure 1. Could Figure 1 be expanded, maybe in the supplementary material, showing the thickness of *S* in function of instrument altitude and zenith spectra height? How does the shape of *dBOX-AMFs* change with these 2 factors? Why is S lower boundary, n_L, defined 1km below instrument altitude? How does it change when instead a zenith reference spectra a reference spectra with EA 10 is used?

Specific comments:

Page 3, line 12. It will be interesting if the authors could provide a quantification of the speed up factor to be expected between parameterization retrievals vs. optimal estimation.

Page 9, line 12. Is it there a publication presenting BrO and IO TORERO measurements? Please cite.

Page 9, line 17. Please provide information about the origin (model, measurements) of stratospheric columns and aerosol profiles for the sensitivity studies.

Page 10, line 12. Please provide information about source of atmospheric profiles.

Page 11, line 9. Figure 1 shows dBOX-AMF for EA 90^o zenith reference however for O_4 and IO EA 10^o zenith reference is used. It will be interesting to see a similar plot to 1 for EA 10^o. Similar to point to the general commnet.

Page 11, line 26. Please include reference for typical fit uncertainties for the University of Colorado (CU) AMAX-DOAS instrument.

Page 25, line 21. Why parameterization retrieval is using pressure, temperature and water vapor data averaged over each full flight instead of each profile as the OE?

Page 26, lines 7. How well compares the cloud information obtained by the ratio of modeled and measured O_4 dSCDs and HSRL observations?

Section 5.3. It will be nice to explain the reasons why some flights are excluded from OE vs. parameterization comparison. Are these flights linked to specific trace gases, aerosols or clouds conditions?

Conclusions, page 29 line 24. Retrieval duty cycle is mentioned in the conclusions but never explained anywhere else.

Conclusions, page 30 line 1. What are the numbers for the removal of NO_2 data? How can the data removed due to cloud filtering be different for different species (BrO and IO)?