Dear Reviewer,

Thank you very much for your valuable comments on our paper essd-2013-14 "Harmonized dataset of ozone profiles from satellite limb and occultation measurements". Below we present the detailed replies to your comments.

COMMENTS

Reviewer#2

Like the other reviewer, I think a bit more discussion of the conversion from instrument coordinates (e.g. number density vs. geometric altitude) to the HARMOZ coordinates (mixing ratio vs. pressure) is necessary. Most instruments seem to use ECMWF (operational?), so at least that is consistent. But this conversion can introduce errors / uncertainty, and change over time as the operational system changes (over the 2001 to 2012 period this is probably not as critical as, e.g. around 1978/79). It would be good to have some discussion of this.

Authors

In the revised version, we discuss the possible uncertainties that can be caused by unit conversion and interpolation. Since we preserve in HARMOZ the "native unit", ozone concentration, for three instruments, and since we use consistent (based on retrieved temperature) conversion for MIPAS and ACE-FTS, we do not expect considerable associated inaccuracies in HARMOZ. This discussion is now presented in Section 2.

In addition, in each instrument section, we have added details of data interpolation and unit conversion (when applied).

Reviewer#2

Different from the other reviewer, I had no problem accessing the data on the web. Looking around, I also found a level 3 HARMOZ data set (zonal monthly mean time series for all the instruments). I would strongly suggest to also include that dataset (briefly) in the current paper. For many users, the level 3 data are more relevant than the many single profiles in the level 2 data set discussed in the paper.

Authors: We have added a note that ozone_CCI web-page contains also Level 3 data. However, a detailed description of the Level 3 data is far beyond the scope of this paper. The description of the Level 3 data can be found in the corresponding Technical Notes linked to their web-pages.

Reviewer#2

pg 196: One thing that I am missing is a comment on the uncertainty in GOMOS signal background correction. That has become a problem in the last years of GOMOS data, and has resulted in increasing numbers of unrealistically low ozone profiles (Keckhut et al., 2010). Even if that might be resolved with version 6, I think it should still be commented on here.

Authors: You mean, probably, the dark charge correction. The background correction is not needed and not activated in dark limb illumination conditions.

In version 6, the dark charge correction scheme has been improved. In addition, all data from weak and cool stars, which were discussed by Keckhut et al. (2010), were excluded by the screening procedure. We stress this in the revised version. We also included a reference on the paper by Keckhut et al. (2010) and a short corresponding discussion.

Reviewer#2

pg 197: With MIPAS, it should also be mentioned that the instrument was working in high resolution mode for the 1st year (or so), encountered technical problems, and was then switched to low resolution mode, in which it worked ok since 2004/5. However, differences between the two modes result in a systematic difference of the retrieved ozone profiles. Currently this is not resolved (?) and only the consistent low-res mode profiles after 2004/5 are used.

Authors: In the revised version, we have added the information about the MIPAS full-resolution and optimized-resolution modes and their consistency.

Reviewer#2
pg 198: Like MIPAS, SCIAMACHY ozone profiles are also available from different processors. I think it would also be worthwile here, to mention the different processors and motivate the choice of using the IUP processor.

Authors: Besides the IUP Bremen algorithm there is also the ESA/DLR limb retrieval available. We added in the SCIAMACHY section the following:
An alternative retrieval of ozone profiles from SCIAMACHY limb observations is provided by the European Space Agency/DLR (Doicu et al., 2007). The original retrieval was based upon retrievals from visible wavelengths only covering the Chappuis ozone absorption bands. This limits the retrieved altitudes to below 40 km compared to about 65 km in the SCIAMACHY-IUP retrieval.

Reference: Doicu, A., Schreier, F., Hilgers, S., von Bargen, A., Slijkhuis, S., Hess, M. & Aberle, B. (2007). An efficient inversion algorithm for atmospheric remote sensing with application to UV limb observations, J. Quant. Spectrosc. Ra., 103, 193-208, ISSN 0022-4073, DOI:10.1016/j.jqsrt.2006.05.007.

Reviewer#2
pg 199: From what I remember, pointing accuracy was one of the main problems in generating the SCIAMACHY long-term limb data-set. Since it is an important issue (also for the other instruments?), it should be mentioned here.

Authors: We added the following in the SCIAMACHY section: Pointing uncertainty is a major error source (von Savigny et al., 2005). The accuracy of the pointing for the entire limb scan is about 200 m. The relative pointing error between different tangent heights, however, is negligible.

Reference: von Savigny, C., Kaiser, J. W., Bovensmann, H., Burrows, J. P., McDermid, I. S., and Leblanc, T.: Spatial and temporal characterization of SCIAMACHY limb pointing errors during the first three years of the mission, Atmos. Chem. Phys., 5, 2593-2602, 2005

Reviewer#2
pg 203, Eq. 3: I think it should be mentioned here that the sqrt(N) in the denominator is only valid for statistically independent samples. When N gets large, e.g. comparing MIPAS and SCIAMACHY, and the compared N profiles are correlated (e.g. because the use the same a-priori, algorithm, ECWMF input, ...) , the true uncertainty will be much higher than suggested by Eq. 3.

Authors: In the revised version, we clarify that Eq.(3) represents the standard error of the mean derived in assumption of uncorrelated randomly sampled measurement pairs. This assumption is appropriate for nearly all HARMOZ pairs due to the properties of data and the method for selecting the collocated measurements. We added a note that for MIPAS-SCIAMACHY collocations, some deviations from assumption are possible and gave the reference on the recently published discussion of this problem, (Toohey and von Clarmann, 2013).

Reviewer#2
Table 1: I think it would be good to add a few more colums: typical measurement uncertainty for each instrument (best in %), systematic errors (in %, e.g. using the info from the bias tables), number of profiles per day (for a quick idea about the sampling).

Authors: We have added the column with estimated precision.
Estimates of systematic errors cannot be simply inferred from bias tables. This is a separate and a complicated issue, and still estimates of systematic errors are very approximate. Therefore, we do not include these as a column in the table. The references in section 3 contain some estimates of systematic errors.
As suggested we also added the average number of profiles per day. Note that the average number of profiles per day is estimated from the average yearly volume, thus the number of profiles in each particular day can differ significantly from these average estimates. This note is added to the caption of Table 1.

Reviewer#2
Fig 6: I think it would be very helpful to also have line graphs showing the average bias (e.g. averaged of latitude) as a function of altitude, and some information about it's uncertainty (2 sigma error bars). The false color plots do not provide "hard" numbers easily, and also do not convey much information about uncertainty.

Authors: As stated in our paper, detailed bias analysis (including the analysis of its statistical significance) is outside the scope of our paper. All figures showing the biases in the paper are presented for illustrations only. We believe that Fig.6 serves well for the overall perception of differences and for the discussion in the paper. Related to uncertainties, the number of collocation with MIPAS is always large (in Figure 6, the mean over 2 years is presented), thus shown differences are statistically significant. We noticed this in revised version.

Other changes made in the revised paper and in the datasets

- A script for reading netcdf files also with IGOR Pro is added.
- Minor changes in file names are done (replacing underscores with hyphens etc), for full consistency with CCI guidelines
- Orbit_number is added to the list of GOMOS optional parameters, for consistency with other Envisat instruments
- Minor data issues are fixed in GOMOS, ACE-FTS and SCIAMACHY datasets
- DOI has been assigned to HARMOZ.