Atmospheric Measurement Techniques Discussions

Interactive comment on "Solar Backscatter UV (SBUV) total ozone and profile algorithm" *by* P. K. Bhartia et al.

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1   Summary

This paper describes the total ozone and ozone profile algorithm V8.6 applied to the series of BUV and SBUV instruments. The SBUV ozone data set is very unique as it spans now more than thirty years and is invaluable for long term trend and variability studies. It is widely used in the scientific community including myself. However, when we used the data I always came up with the problem what is the proper citation or reference to a peer review publication to the actual data version. As the other reviewer already pointed out the various data versions of the SBUV ozone data have not been

well documented. The last peer review publication is the paper by Barthia et al. (2006) with respect to Version 6. Two major upgrades, Version 7 and 8, have not been described in detail so far. This paper tries to fill this gap and in addition introduces the latest version 8.6. In this regard, this paper is a very important contribution. However, I believe that this paper does not live up to the expectation.

First, in the summary of the various data versions, the Version 7 data version is not described at all. Even though, there may be no algorithm changes in V7 few words should be mentioned here, e.g. the setting changes. A description (at least in brief) how the various data versions (V7, V8) improved SBUV ozone successively, should be given.

Secondly, no quantitative evaluation is provided how the changes made in version 8.6. i.e. change of cross-section, new a priori ozone profile and cloud climatologies, improved the data set. The improvements over Version 8 needs to be well documented and quantified/demonstrated.

Third, large part of the paper is spent on the monthly mean ozone (MZM). On p. 5921, l. 23, the so-called "MZM retrieval" is mentioned that retrieves MZM ozone from monthly zonal mean radiances (or N-values) rather than averaging individual profiles. Although the connection between radiances and ozone is quite non-linear as the author states, the MZM retrieval has been optimised by providing (or constructing) a reasonable error matrices for the MZM retrieval. There is a very large description and discussion how to set up MZM error matrices. The most quantitative part of the paper deals with the MZM ozone, its retrieval setup and evaluation (comparison to MLS). This needs to be better reflected in the paper title and abstract.

Fourth, apart from the fairly detailed description the MZM retrieval, MZM ozone data sets and related "constructed" errors, the evaluation of physical errors, e.g. influence of aerosols, cloud, ozone, and temperature climatologies as well as cross-section choice is apart from naming the errors absent (see section 4). Since the SBUV algorithm

is very fast, it would be very easy to make sensitivity tests on the error contribution. The argument that "such complexity cannot be handled simply by providing accuracy and precision" is not convincing. A detailed error and data characterisation is essential when describing new data versions, be it the retrieval of individual profiles or the MZM retrieval.

To my judgement this paper needs some major revisions. It may be wise to split this into two paper, first one dealing with the description of the new data version including detailed data and error characterisation (like the paper title suggests), the second one specifically on the MZM retrieval, error characterization, and datasets (which takes up large portion of this paper).

2 Item-by-item

p. 5914, l. 22: There have been peer-review papers on BUV ozone that should be cited here.

l. 23: The authors state "additional instruments of progressively improved design". Please provide a few sentences what the design improvements were.

p. 5915, l 1.: "but only a few have been published". Only the paper by Barthia et al. (1996) is mentioned, so it would be better to say "only one has been published" or alternatively list the other papers as well.

l. 3: please mention the data version released in 2004 (I guess it was V8)

l. 11: spell out numbers: "ten", "seven", and "three"

l. 25: To me the field of view seems to be very large, or is this the field of view related to the footprint after scanning thru the wavelengths in 18s and 24s, respectively.

p. 5917, l. 12: use the "citet" latex command for citing Twomey (1963).

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l. 18: What about V7 (see major comments)?

p. 5918, l. 3: What effect has the change in cross-section? The effect on the ozone shall be shown. Similarly what are the effective changes due to the new O3 and cloud height climatologies! (see also major comments).

p. 5919, l. 11: change "R & f_c" to "R and f_c".

p. 5921, l. 17: How MZM retrievals distinguish from averaging individual profiles. Some figures showing such a comparison should be provided and errors associated with MZM retrieval discussed (somewhere in the paper).

l. 27: When "constructing the S matrix" for the MZM retrieval, the systematic errors can not be completely neglected (even if related systematic biases are not relevant for long-term trends). A discussion and evaluation of possible systematic errors (for individual and MZM retrievals) should be provided.

p. 5923, l. 18: spell out MR: mixing ratio

p. 5924, l, 11: "SBUV documents" are mentioned. Please provide citations for the SBUV documents.

l. 18: You probably show MZM W (missing overbar).

p. 5928, l. 20ff: aerosols may be important for MZM since Pinatubo falls in the period where stratospheric halogen was close to the peak. As argued earlier a more thorough and quantitative assessment of this error is needed here.

p. 5929, l. 19: mesospheric daytime variations have been discussed in Dikty et al., ACP, 2010 as well, however, the authors are correct that little is known on upper stratospheric daytime variation.

Table 1: all details from the table are not discussed in the main text. How is the ozone-sensitivity weighted effective temperature calculated (which temperature and ozone profiles are assumed). Please indicate which ozone cross-sections are used (guess

Malicet). Units for T_{eff} is missing.

Figure 6 caption: change "theToms" to "the TOMS"