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Interactive comment on “Evaluation of the use of five laboratory determined ozone absorption cross sections in brewer and dobson retrieval algorithms” by A. Redondas et al.

Anonymous Referee #1

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Dobson and Brewer spectrophotometers are the main instruments used for ozone monitoring and any discrepancies between their measurements should be detected and explained. The authors used five ozone cross section data sets and examined the impact of different cross sections and their temperature dependencies on retrieved ozone. The subject of this study is important and relevant for ACP. The paper is in general well written, although some parts of the manuscript should be simplified. I recommend it for publication in ACP after minor revisions. My comments are listed below.

Major comments:

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The Theory of measurements section is too general. What is “ n ” in eq. (2), (3), etc.? Why do not just use 4 instead of “ n ” if the standard Dobson and Brewer algorithms are discussed? The authors should define 4 wavelength used in this study for Dobson and Brewer instruments. While it is in the text, it is nearly impossible to find this information for somebody who is not familiar with Dobson and Brewer instruments. The Brewer wavelengths are given in Table 1 only and without any explanation what slits and weighting coefficients are used in the Brewer algorithm. How the slit number in Table 1 is related to “ j ” in eq. (2) and (3)?

The linear coefficient w_i in eq. (2), (3), etc. are not defined. Note that they are different for Dobson and Brewer ozone algorithms. The Brewer standard coefficients (1.0, -0.5, -2.2, and 1.7 for 310, 313.5, 316.8, and 320 nm respectively) were selected to minimize the SO₂ influence on the ozone retrievals, while the Dobson coefficients are just +/- 1. Thus in the presence of SO₂, it is not really appropriate to compare Dobson and Brewer ozone values, while in the absence of SO₂, there is no need to use the Brewer standard coefficients. One can reduce Brewer temperature dependence for any given set of cross sections by changing the coefficients w_i . While such analysis is probably outside the scope of the paper, the authors should mention this possibility.

The authors should check their equations. There are too many equations in the text and not all of them are necessary. For example, (4) is not used anywhere. The others are not well explained and often contain undefined terms.

Specific comments:

Title. It should be “. . . Brewer and Dobson. . .”

There are too many abbreviations in the text. Many of them are not necessary since they are not used in the text (GAW, IO3C, SAG..). Some of the abbreviations are defined in the text, but used only in Tables and Figures. Authors’ use of “XS” is particularly annoying: in some places they use XS, in others “cross section” or even “cross-section.”

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While the authors stated that they did not address stray light related issues (p.22982, l.12) but they mentioned single and double Brewer spectrophotometers (p. 22995, l. 2). Perhaps single and double Brewer spectrophotometers should be mentioned earlier in the introduction.

What is λ' in eq.(5) and (11)?

Define $T(z)$ and $X(z)$ in eq. (6).

Why the same sum is written in three different ways (Sum j to n , Sum 1 to n , Sum $j=1$ to n) in (12)? See also eq. (2) and (3)

Define all the terms used in eq. (16) and (17).

There is no need to use the bullet form for the conclusion section (p. 22996).

The wavelength units should be consistent though the text. But it is “nm” in some places and “A” in the others.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 22979, 2013.

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