This is the first review of the manuscript by J. Christodoulakis et al. submitted to AMTD  and titled "An assessment 1 of the stray light in 25 years Dobson total ozone data at Athens, Greece".

The  main subject of the paper is to determine  the quality of the Dobson derived total column ozone data at low sun conditions. Under this condition the measurement is the subject to the large optical path and therefore a weaker Solar radiation signal propagates to the surface  in the UV solar spectrum. In this case the instrumental artifacts becomes comparable to the measured signal strength, signal to noise is reduced,  and the accuracy of the derived total ozone column is diminished . The method for detecting the stray light (instrumental artifact) in Dobson measurement is described, followed by the description of the experiment to determine stray light  contribution to the measurement.. The fitting of the correction model into a data by using statistical approach, assessment of the results, comparisons with previous work and analysis for changes in the Dobson stray light levels with time are also included in the paper. In order to detect changes in the instrument optical throughput, it is a good practice to analyze stray light contribution to Dobson regularly, especially in case of  instrument replacement at the observing station. The stray light in the stations instrument could change over time and thus can impact the stability of the total ozone  record. This is further complicated by the fact that ~~the~~ an extended range of mu values might be used for measurements due to limitation of the solar elevation range that varies seasonally at the station.

**Questions for clarification of the statements:**

p. 1989, line 8-10.  I do not agree with this statement. The stability of new instruments and satellites is validated against Dobson, but they are not calibrated.  This is the reason there are differences in total ozone values measured by satellites and various ground-based systems.

p. 1990, lines 22-27, p. 1991, lines 1-3.Please clarify the difference between listed limitations  1 and 3. The third limitation may be better defined as contribution of the spectral component of the Solar light originating outside of the band-pass of the instrument. Since the out-of-band light is not completely removed by the slits, and thus it is measured by the instrument. The dependence of this contribution on the optical path of the light (solar zenith angle and amount of ozone) creates the non-linear error in the retrieved total ozone that appears as diurnal variability in the total column ozone measurements.

p. 1991, lines 19-21, Are you discussing the zenith sky measurements or direct sun measurements. Not sure if I understand the definition of the external scattered light. Are you suggesting that beside the direct sun light, the instrument also measures the light that is scattered in the field of view of the instrument (Dobson has relatively wide field of view)? See that this would be considered as homochromatic stray light. But then I do not understand the mechanism of the heterochromatic stray light contribution to the external stray light error. Can you provide an example?

p. 1994 – top of the page,  end of the paragraph from the previous page – It would be nice to have some statement about the effectiveness of the described alternative measurement method. Was it successful or it had some limitations? I would suggest to add some words here that would explain why the method

described in this paper could be a more effective (or reliable) approach for the assessment of the stray light error estimate of the TO column measurements as compared to the other method.

p. 1994, line25-26." In the next step ΔX values from step 2 are added to the total ozone values from step 1. " - this is what I understood from the text. Is it correct?

However, I have difficulty in understanding results in Table 3Following step 3 I need to add TOR (which is Xtrend column from Table 3) and the respective column (i.e. 1.2) from Table 2, then I should get smaller TO value, since values in Table 2 are negative. However, I cannot reproduce Xtrue columns in Table 3.

It appears that in order to obtain value in Table 3, I need to take one single TO value (representative TOC for a day?) and then subtract values from a column in Table 2.

p. 1994 line 15 Results of Figure 3 are not sufficiently discussed. – It has a lot of information. Please expand discussion on how the stray light model is fitted to the data. Results seem to differ between 5 days of measurements. What might be the reason?

P 1995, lines 22-23

If I try to calculate correlation between the second column and other columns in Table 3, I am getting difficulty in reproducing results in Table 4. The values in second column become smaller when airmass increases. Values in other columns are increasing with airmass. The only way to get correlations is to subtract corresponding True ozone value from columns 3 through 7 and obtain residuals. To obtain results in Table 4 I have to correlate negative value of residuals with Xtrend from column 2.

Since there are multiple steps in the process, please take time to describe intermediate steps.

p. 1996, line 26-27. In order to get score "1" in Table 7 do all three tests have to have "good" results? And the same question for score "0", or rejected condition, is it required to have "rejection" in all three tests or it is sufficient to have one test failed to get final score "0"?

p. 1997, lines 7-8 I would expect that Final scores in some lines would be 5 (5 days). Since there is no clearly defined parameters for the stray light model – what should be the conclusion? How well can such model explain stray light in the instrument?

p.1997 lines 17-18. The cause for the offset between satellite and ground-based measurements can depend on various differences in the spectroscopic and other parameters used in satellite and Dobson retrievals, including aerosol interference, interference from other atmospheric absorbers, use of different spectral windows, etc. It is not just stray light that can be responsible for the mean offset. The stray light error has seasonal dependence (due to seasonal variation of TOC and thus attenuation of short wavelengths spectrum). It would benefit the paper if you add analysis of seasonal pattern in differences between Dobson #118 and individual satellites.

p.1997, lines 20-22. I am not sure what you mean by "does not suffer". Do you mean that for airmass between 1 and 2.5 instrument has small (define how much) error on the Dobson retrieved ozone due to

stray light. The stray light still is evident in the measurements when airmass is extended to larger than 2.5. However, during Dobson regular operations I assume that measurements are not taken at airmasses larger than 2.5, correct?

**Technical corrections:**

p. 1988 line 21-24. Here is suggestion on re-writing the sentence "Since the first instrument was constructed, a number of instruments were placed around the world ~~in~~ at selected stations ~~and~~ that began ~~to be used to~~ measurements of total ozone content (TOC) on a daily basis.

p.1989, line 1 "instruments were since created, i.e. Brewers spectrophotometer, "

p. 1989, line 6, "Dobson spectrophotometer it makes"

p. 1989, line 11. "all sources of errors in Dobson instrument operations"

p. 1990, line 10. Suggested change " Currently there are about 50 Dobson instruments that represent the global Dobson network. It is 100 less instruments that used to monitor total column ozone "

p. 1990, line 17-18. Suggested change "Beside these campaigns each station performs regular tests that are designed to determine whether the instrument is operating within the required limits for the accuracy and stability."

p. 1990, line 20. "Instrumental malfunction" … " limitations in the optical design of the instrument"

p.1992,lines 6-10.  Correction of the Athen's Dobson record for the previously and newly determined stray light errors can help to adjust the long-term time series and to allow for re-calculations of trends. Is it what you were trying to say there?

p.1992, lines 9-10 comparisons to the "zonally averaged data" – is it from the model? Not clear, please add details.

p. 1993, line 21 suggested change to the text "Yet another method can be used to assess stray light contribution to Dobson measurements as described in paper by Evans et al. (2009)."

p. 1993, line 23, please explain what you mean by "current". May be it should say " current output from photomultiplier tube"? It is also customary to use quotes when inserting text from another publication.

p.1994, line 5 replace "obtained" with "collected"?   For example "In order to determine stray light error for Dobson # 118 we collected a series of the AD wavelength pair measurements. The data were collected over a large range of solar zenith angles during 5 clear-sky days in September-October of 2012. For further details see Table 1."

P, 1994, line 8-10 "Results of the experiment are summarized in Figure 2. The theoretically estimated errors (eq. 2) are plotted as function of airmass. Results  vary based on the selected values of  R0 and alfa.

p. 1994 ,lines 10-12 DO you mean  that when R0 becomes small, the errors tend to become small, close to zero?

P, 1994 line 12 – able -> capable

P, 1994, line 15 Suggested change "Total column ozone data reduced from AD-pair measurements are plotted as function of airmass, separately for 5 days (Fig 3).  Observations are compared with the theoretical stray light model results.  Model parameters are provided in each panel legend."

p. 1994, line 22-24. …Basher's model (see Eq. 2)…

Suggested text: " Table 2 shows ΔX values as function of airmass (μ) and α. Results are based on the Eq. 2. The best fit to the observations taken on September 5,  2012 is tested by selecting one fixed $R_0=10^{-3.5}$ and by varying α values"

p. 1995, line 4-5. Suggested change to the text:" The average of the $X_{true}$ is calculated for each column in Table 2. These averages are termed as "true Ozone Value" and are shown at the bottom of the Table 3."

p. 1995, line 23-25 –suggested change to the text: "Table 4 shows correlation coefficients for all stray-light models that were tested to fit observations on September 5, 2012."

p. 1996, line 7 replace "from"  by "than"

p. 1996, line 8  suggested change: "Table 5 provides all RMSD values calculated for difference between the model and observed data.