General comments: the paper makes a good review of the existing knowledge state about a particular characteristic of the Brewer spectrophotometer photon counting system, the dead time (DT), and provides some new ways to estimate it and analysis of its effects on the final products like total ozone column (TOC), spectral UV and the aerosol optical depth (AOD). Some parts of the text need more accuracy and precision, while others seem to be not fully relevant and can be removed.

In one numerical experiment described in the paper that I was able to replicate the authors did not recognized that the algorithm for the DT calculations has to be changed (the number of iterations has to be increased for the calculation process to converge) when the data collection method changes. This led to a misleading plot in the paper as well as references through out the text assuming there is a limitation to when DT can be successfully calculated. Those parts of the paper will need to be changed.

Here are more detailed, line-by-line comments.

page 12590
    line 2: add "scattered" to the list of measured UV irradiances to cover the zenith sky observations;
    line 7: start a new paragraph at "The dead time is..."
    line 8: "characteristic" is not a good choice here. Try "specific" or similar. Use "improper" instead of "non-proper"
    line 9: change "It may change" to "The dead time value may change" or similar.
    line 12: add "to" between "due" and "a"
    line 13: This comment is relevant not only here but everywhere in the text: the use of the word "nominal" is not very appropriate here. I suggest "the value in use" for the value that is in the configuration file and "the value calculated by the DT test" for values that are reported by DT. Please review the entire text for this.
    line 24: "provides" instead of "provide"

page 12591
    line 6: "in" Canada;   In the Netherlands the equivalent to "Inc." is "BV" and should be used instead
    line 7: remove "they"; it is proper to use the Netherlands, not Holland (this is just a region of the Netherlands)
    line 10: there are more than two types of Brewer electronics, but rather than counting them it is best to refer to "multiple-board and single-board" electronics. It is common to use MB and SB for these.
    line 27: from here the discussion of various issues affecting Brewer products is not very relevant and takes the reader away from the main focus of the paper without providing useful context. Consider reducing or removing this part.
page 12592
    line 13: Here discussion about the DT starts without any word about what it is. Add text to introduce the main topic of the paper.
    line 14: make RBCC-E non breakable text
    line 15: please rephrase or expand "the actual DT derived" to make easy to follow
    line 17: the correct spelling of the name is "Grajnar" - please also correct in the bibliography
page 12593
      In the description of the detection system there is no mentioning of the way the system decides what is signal and what is noise. If this is not working properly the system may have different DT values for different signal levels !!!
    line 10: add "tube" after "photomultiplier"

line 16: please review the description of the DT. You seem to suggest that the dead time is the finite temporal width of photon pulses, which is not correct.

line 18: again the use of the word "characteristic"; I suggest splitting the DT range based on the type of the PMT, otherwise the text makes an impression that the DT can actually vary from 15 to 45.

line 22: "correction .. is complicated" doesn't sound very scientific. Please either provide more details or remove.

line 23: add "and comparing" between "measuring" and "different"

page 12594

line 6: "common" - please add a qualifier why this is common (oversight, mistakes, one value better than the other or unknown reason(s)?)

line 8: usually, "Brewer" is used with the definite article "the" as it comes from "the Brewer spectrophotometer"; Also, the process of the high voltage selection takes into account the slope of intensity vs voltage to minimize the effects of the HV variability. Please review to make this description more precise.

line 11: signal to noise ratio is only one consideration for HV adjustment and not the most definitive.

line 17: Please justify why at high signal it is not easy to correct for non-linearity.

line 20: not all measurements are interrupted when the signal is high, spectral UV is not, scans of the lamps are not either.

line 24: suggest "set for making ozone observations" or similar. This is never referred to as "zero" position. I suggest using "operational"

line 25: Please add a comment about the dark count position in the slit mask and either explain that how you use wavelength numbers (0 to 5) vs slit mask positions (0, 2-6) or better still pick one system (wavelengths or slit mask) throughout the paper. Otherwise it is very confusing for readers.

page 12595

line 5: please revise this paragraph. You mention "low" and "high" intensities before describing what they mean later in the paragraph. Also, there is no explanation why low/high are used and the paper never mentions this again. The DT test is design specifically to do lo+hi. Address this.

line 12: "holes" are not selected, positions on the filterwheels are. Please revise. Not all Brewers use no attenuation ("empty" is not a good word here) for high intensity. Please reword.

page 12597

line 3: don't forget to fix the typo in equation 7

line 6: this is a bit of a confused description of the dead time application and calculation. Please make sure you are clear what you are describing and why.

line 13: in the standard Brewer algorithm there are 10 iterations of equation 10 together with equation 9 (only for slits 2 and 4). Please review this description to make it clear, accurate and precise.

page 12598

line 1: It isn't clear if this section adds anything to the paper. You are not providing any new information and only seem to repeat what (Kiedron, 2007) said. Since you cannot improve on what (Kiedron, 2007) published I suggest reducing or removing this section.

line 3: this text is a repetition of lines 22-25 in this page. Please review.

page 12599

line 1: I don't quite understand the value comparison between the full equation (11) and its simplification (13). From the mathematics point of view it is obviously better to use the full version if possible. Please justify this numerical experiment.

line 17: "less than"

line 22: This section 2.3.2 describes a numerical experiment that explores light level distribution among the exit slits that is very different from that assumed by the design of the DT test. While doing so is interesting and useful the authors need to be careful not to use algorithms for data analysis outside

of the algorithm scope/limitation. The authors used 9 iterations in the DT calculation algorithm (while the Brewer software has 10, by the way) for light levels that are never present during the DT test. 10 iterations are enough for the signal level distribution from the standard lamp at the ozone operational position (intensity on slit 2 and slit 4 are comparable), but not enough for signal level distribution that is artificially modified (either using the sun instead of the lamp or simply modeling numerically). If authors repeat this numerical experiment with 500 iterations(to be on the safe side) they will find that the correct DT value is derived no mater what ratio of N3/N7 is. This also has an implication to another section of the paper where DT data on the sun is processed: authors need to reprocess those results using significantly larger number of iterations. Please recalculate relevant data, re-plot graphs and review the text where this is used.

page 12601

line 10: was the usual 20W lamp replaced with 50W or is it a typo?

line 17: when using an external lamp through the quartz window at short distances it is unclear what effect has the fact that this is not a point source (light rays are not parallel). Please comment.

line 26: Can you provide any reference that states that the ND transmittance is independent of intensity? How can you claim that all the various manufacturers used as suppliers conform to this? For the non-linearity to be only (mostly) due to the DT the separation between the signal and noise has to work properly. Please be more precise in your assumption description.

page 12602

line 7: please clarify if "lower and higher" refers to results from the internal lamp or??

page 12603

line 18: why did you use different number of cycles? Did you explore low/high signal levels for the DT on the sun (like the normal DT test does on the lamp)?

page 12604

line 20: add "of" between "inclusion" and "data"

page 12605

line 19: how "very clear days" were selected?

line 28: I don't want to repeat what is relevant here about n3/n7

page 12606

line 23: please review the usage of the words "uncertainty" and "error"

page 12607

line 7: This seems to be a more complicated description than it needs to be. The DT correction for a single intensity measurement is essentially a simple exponent and so errors can be easily expressed analytically and estimated then numerically.

line 19: Only the signal level ("intensity"?) is important for the DT effect calculation, not the Brewer sensitivity (which is also not the same as responsivity). Please be more accurate here.

page 12608

line 3: Does anybody use UV data with no DT correction? If not, why mention it here?

line 25: actually, the filter is a combination filter consisting of NiSO4 crystal together with a UG11 filter.

line 27: the type of electronics has no effect on the shape the spectral response, please either explain how this is possible or remove this comment.

page 12609

line 11: "ratio" is not defined/explained here. Please provide context for readers.

page 12610

line 1: This paragraph will be better position in the next section 3.2.2

line 15: The same effect happens when ND filters change from higher to lower attenuation.

line 20: not only that, but the distribution of light among slits is different at different slant ozone

page 12612

line 12: try "in either reference instrument or the instrument being calibrated"
page 12613
line 12: "we estimated" is too vague here. natural log of the error in intensity is the error in AOD.
page 12614
line 1: analyzing TOC when NDF changes will tell you whether DT is correct - the best way also.
page 12615
line 8: "photon counting system", not just the PMT - remember to review the text for signal vs noise decision of the counting system
page 12616
line 8: I'm not convinced that reducing the number of iterations will improve timing. Have you done tests for this? How much time is saved?
line 21: please remember revising anything relating to your conclusions about N3/N7 ratio and DT calculations
page 12617
line 13: The rates of 5 x 10^6 are not uncommon in the UV observations.
line 20: What do you refer to when saying "tolerance of 2ns"? How is tolerance estimated/used?
page 12618
line 4: Same comment as before, can you quantify the time saving?
line 11: Due to the shape of spectral sensitivity in most MKIIIs lower overall signal level will lead to very dim light at slits 0-2. How do you propose to deal with this?
page 12620
line 20: "Grajnar"
Figure 2

Remove this plot as it is very misleading. See my comments in the text.
Figure 3(a)

it is not clear how from this result 29ns is any better than 33ns or even 56 ns
Figure 4

Please recalculate the sun data using larger number of iterations and replot