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Interactive comment on "Spring and summer time ozone and solar ultraviolet radiation variations over Cape Point, South Africa" *by* D. Jean du Preez et al.

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We would like to thank the referee for taking the time to review the manuscript and provide valuable feedback. Clarity and additional information are provided in the responses below.

We thank the reviewer for their comment and appreciate their concern that combining the descriptive part of the study together with analyses used in the 'second part' of the study, however, since very few published studies have appeared since the 1990s that describe the climatology of UV-B and ozone in South Africa, we see value in retaining the first part of our paper here to test contextualise the second half.

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Discussion paper

We have completed the re-calculations, we believe that the results are improved. The differences in findings between this study and those from the 1990's is likely due to the different spectral range of instruments used, temporal resolution and specific location.

By choosing Cape Point, we assumed that the effect of anthropogenic aerosols on UV radiation was less, say for example in comparison to the City of Cape Town site, but the effect of maritime aerosols is definitely still present. We agree with the referee that in the original version of the paper, we had omitted to be explicit about it, but we made an effort to clearly point this fact in the revised version. For example, in the description of the study area, Section 2.1, page: 3 line: 5, we added that ". . .although considered free of air pollution (Slemr, et al., 2008), it may still be affected by maritime aerosols." and later in the same paragraph ". . . Cape Point offers a setting in which a modification of the UV-B radiation by anthropogenic aerosols can be overlooked." as well as on page: 10, line: 18 "that improvements can be made if the effect of aerosols on UV radiation are considered in future research."

We agree with the reviewer and we have made substantial revisions in this regard. We would like to add J-M. Cadet as co-author for the work done based on these revisions. On page: 4, line: 8 the following has been included" To convert from instrument-weighted UV radiation to erythemally-weighted UV radiation, a correction factor was applied as the instrument does not measure the full spectral range of the UV Index (Seckmeyer, et al., 2005; Cadet, et al., 2017)."

Figure 2,Revised Table 2 and 3, the results and discussion have been updated accordingly in the manuscript. Revised versions of Table 2 and 3 are provided in the supplement file.

We acknowledge that the reviewer has made an important comment about the need to express information regarding the calibration of the instruments and the data quality. The following information and additional table (in supplement file) have been included in the manuscript regarding the calibration of the Solar Light biometers used at Cape

Point on page: 3, line: 16 “Two different instruments were used at Cape Point between 2007 and 2016 (Table 1). The first from January 2007 until March 2016 and the second from April 2016 to December 2016. The SAWS calibrated the instruments at both Solar Light and the Deutscher Wetterdienst (DWD), Lindenberg, Germany. Calibration at Solar Light was according to the “Calibration of the UV radiometer - Procedure and error analysis”. At DWD, the instruments were calibrated using the spectrometer SPECTRO 320 D NO 15. During the period of operation for each instrument, the stability was checked by performing inter-comparisons with reference instruments (12010 and 2722) which had been calibrated shortly prior to the inter-comparison.

We were further prompted by this referee’s comment to look into our tests for determination of clear-sky days and found that Cape Point actually sees more clear-sky afternoons than clear-sky mornings, which could contribute to the shift in the UVI maximum. We added this information on page: 8, line: 14 “The maximum UVI values are not centred on the local noon, implying that more UV radiation reaches this site in the afternoon. Indeed, as previously mentioned, our clear-sky determination method identified more clear-sky afternoons than clear-sky mornings (Sec. 2.4.2), which under the assumption that cloud cover at Cape Point generally attenuates UV radiation reaching the surface, could explain the observed shift in the UVI maximum to about 14h00 SAST.” Also, earlier in Section 2.4.2, page: 6, line: 18 “It is interesting to note that at Cape Point, the second test of the clear-sky determination method identified more clear-sky afternoons than clear-sky mornings.”

The reviewer has highlighted an important point and we have taken time to consider this and have re-done the RAF calculations. To clarify the results in revised Table 2, at SZA 40° the RAF value is 0.42. The following has been included on page: 10, line: 8 “At Cape Point, the RAF value for clear-sky days range between 0.15 and 1.60 with an average RAF value of 0.59. This can be interpreted as for every 1% decrease in TOC, UV-B radiation at the surface will increase by 0.59%. RAF values specific to ozone and solar UV studies found in the literature range between 0.79 and 1.7 (Massen, 2013).

RAF values have been used to describe the effect of other meteorological factors such as clouds and aerosols on surface UV radiation (Serrano, et al., 2008; Massen, 2013). The differences to the RAF values found here and those found in the literature can be attributed to changes in time and location (Massen, 2013). “

We made an effort to check our calculations and addressed all the issues raised by the referee. There are a number of instances where we recognised the need to be more specific about our data, as suggested by the reviewer. We hope that the responses given here, and revisions we made to the manuscript will be satisfactory, and that the referee will find the manuscript suitable for publication.

Please also note the supplement to this comment:
https://www.ann-geophys-discuss.net/angeo-2018-56/angeo-2018-56-AC2-supplement.pdf

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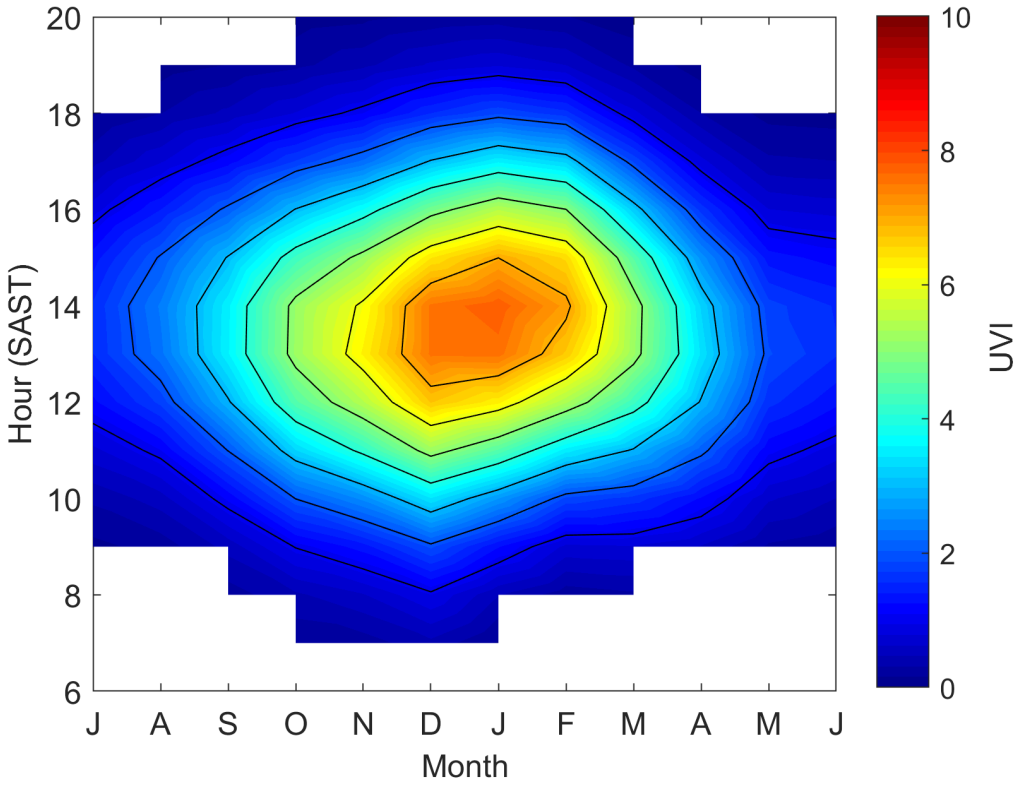

Fig. 1. Figure 2: The UVI climatology for all sky conditions at Cape Point. The x-axis starts with the month of July and ends with June.