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Interactive comment on "New continuous total ozone, UV, VIS and PAR measurements at Marambio 64° S, Antarctica" *by* Kaisa Lakkala et al.

Anonymous Referee #2

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General comments: The manuscript presents and discusses a dataset for the Antarctic station Marambio, that is based on GUV multiband filter instruments installed in 2017, providing a continuation of the 2000-2010 NILU-UV network series at Marambio. The time series are accessible at https://zenodo.org/record/3553634#.XhsiBchKhaQ, and contain several data products that are essential for satellite ground truthing and assessing the impact of global climate change in the Antarctic region. The paper also present infrastructure and data resources available for scientific use at Marambio, facilitating scientific co-ordination in Antarctica. The monitoring program conducts strict quality site control and quality assurance, including repeatably intercomparisons with spectroradiometers, and by using one of the GUV instruments as travelling reference for the other.

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Discussion paper

Unfortunately, after analyzing the data sets and presentations in the manuscript, I found several flaws regarding use of measurement units, as well as suspecting anomalous results in final data. The manuscript is within the scope of the journal, but the data sets should be re-evaluated, and manuscript revised before publication.

Specific comments. Page 1 in Abstract: lines 9-11: A long list of final data products is stated being available – however in the internet link provided I found only a subset available at the given repository (e.g. 10 biologially effective dose rates and corresponding doses are missing). Please, be more specific. A screendump of files available (attached figure).

Page 1 line 14-15 in Abstract: "Average daily maximum UVB dose rates 7.6 – 10.2 kW/mˆ2". Compare these numbers for the UVB with the Sun's total integrated solar irradiance at the top of the atmosphere – 1.366 kW/mˆ2 (https://wattsupwiththat.com/2018/09/19/how-constant-is-the-solar-constant/). One might suspect a misprint, that the prefix k (kilo) should be omitted, but even in that case, 7.6-10.2 W/mˆ2 is almost a factor 10 above realistic natural surface irradiance levels, compared with quality controlled measurement data for an equivalent latitude and network station (e.g. mountain station Finse in the UV-monitoring network in Norway, spanning latitudes 58-78 N https://github.com/uvnrpa). The same applies to Table 4, UVB DMDR [kW/mˆ2] and UVA DMDR [kW/mˆ2], as well as Figure 5C and 5D, where units and numbers also look anomalous.

Page 3-4, section 2.1 Marambio station and section 2.2: The text relates much to the same content provided in section 2.1.1 and section 2.2.1 in another publication under discussions by the two first authors, where the same datasets are applied https://www.atmos-chem-phys-discuss.net/acp-2019-896/acp-2019-896.pdf Figure 4A and Figure 4B on page 10 in Lakkala et al. is almost identical with Figure 5 and Figure 6 in the second paper submitted by Aun et al. 2019. Although the two papers deal with different topics: one presenting the data sets, QA/QC and resources, and the second paper an analysis of UVI and erythemal doses in relation to the long-term series, there

are redundancies between the two papers.

Page 5, Figure 1c and Figure 1 d: Units are given as uW/mˆ2. The units should probably be given as uW/cmˆ2 (difference 10ˆ4).

Pages 7-8. The section describes calibrations and comparisons of UVI against spectroradiometers SUV, Brewers and QASUME. I miss a comparison which includes other data products as well in order get an estimate of overall uncertainties.

Table 5 and Table 6. Please, consider if this information is too detailed in this context.

Page 14, Figure 5E: Units is given as mW/cmˆ2/nm at 555 nm. Realistic units is uW/cmˆ2/nm (difference 10ˆ3). Page 14, Figure 5F: PAR, units given as E/mˆ2/s. Realistic units is E/cmˆ2/s (difference 10ˆ4).

Page 16, Section 5 Data availability. The units of most datasets look correct. However, the six data files max305nm.dat etc are expressed in units W/cmˆ2/nm. The units should probably be uW/cmˆ2/nm (difference 10ˆ6). I have plotted the spectral irradiance data from these files, and changed observations to appropriate units, and made a model comparison, see attached figure. The model takes as input the total ozone given in file GUV_UVB_UVA_PAR_O3_noon.dat, the noon SZA for Marambio, assuming snowfree ground (albedo given as 0.2 to 0.3 for November/December in Aun et al. 2019) and assuming clear sky conditions.

Irradiance values of observations look anomalous for the 313 and 320 nm (factor almost 2x), but reasonable for 305 nm, 340 nm and 380 nm. You can see this by observing the differences in spectral irradiances for increasing wavelengths of observations and modelled data: Subset of data covering 2017/2018, wavelengths 305-313-320-340-380 nm: Observations: 4-26-16-54-74 uW/cmˆ2/nm Model predications: 4-15-26-54-64 uW/cmˆ2/nm (continuous increase, matching observations at the three wavelengths 305, 340 and 380 nm). Page 16, line 26-27. “..crucial to obtain homogenized long-term series..”. Here I miss references to the international intercomparison of multi-

band filter radiometers, held in Oslo 2005: GAW report no. 179 / WMO/TD-No. 1454. Geneve: World Meteorological Organization. 2008.

Caption to figure DailyMax_Marambio.png Figure – a compilation of daily max spectral irradiance at 5 wavelengths provided by the authors for the Antarctic station Marambio (where I have rescaled data in realistic units (uW/cmˆ2/nm) – versus clear sky values derived from a radiative transfer model (libradtran), with input total ozone amounts based on the authors final results.

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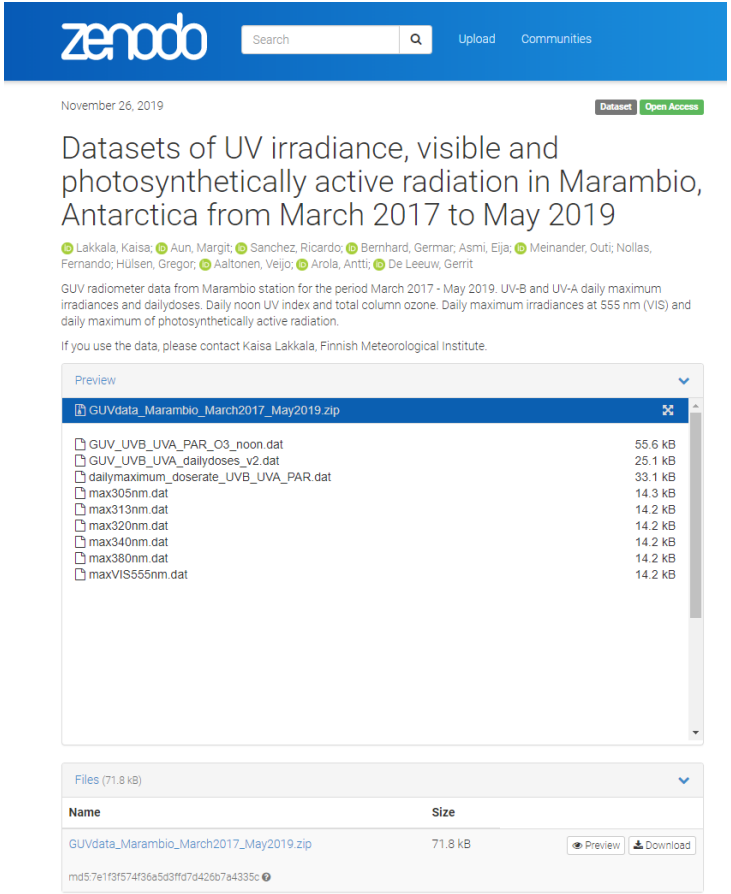

Fig. 1.

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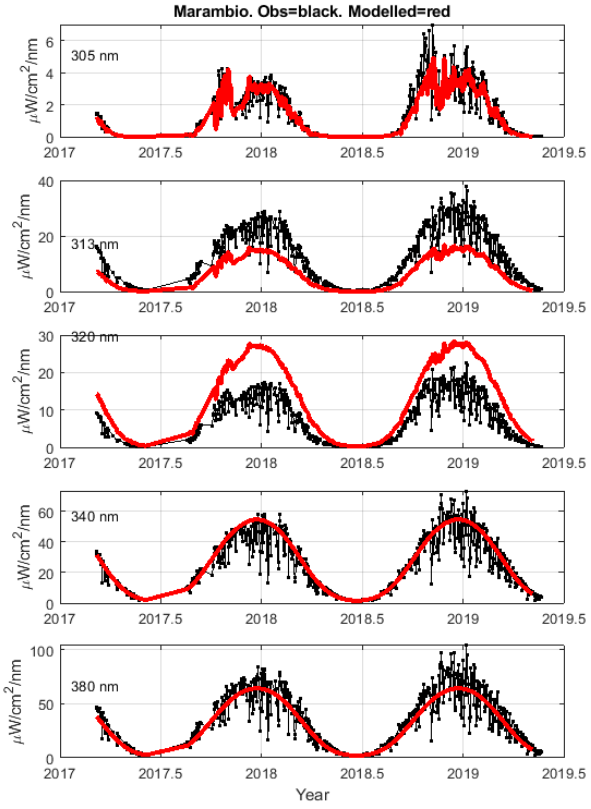

Fig. 2.

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