Authors' Response to Reviews of

UV-Indien Network: Ground-based measurements dedicated to the monitoring of UV radiation over the Western Indian Ocean.

K. Lamy, T. Portafaix, C. Brogniez
Earth System Science Data, essd-2021-55

EC: ***Editor's Comment***, **RC:** ***Reviewers' Comment***, AR: Authors' Response

EC: Topical Editor's Comments to the Author:

> **Dear Dr. Lamy,**
> **Thank you for submitting your revised manuscript. Referee 1 has some additional comments (see below) which need to be addressed point by point and submitted along with the revised manuscript.**
> **Please let me know if you have any questions.**
> **Best regards,**
> **Nellie Elguindi**

AR: Author's Response

Dear Editor, Thank you for these new corrections. Please find below our point-by-point responses to Referee 1's comments. Best regards,

K. Lamy, T. Portafaix, C. Brogniez

RC: Referee 1 General Comments:

> **This revised version addresses the concerns about the suitability of the paper for the journal expressed in the first set of reviews. This has improved its presentation as a data description article for the Earth System Science Data journal. In particular, the shift in focus is evident in the change of title (mention of satellites has been dropped) and the detailed information provided on the sites, instrumentation and calibration procedures. Generally, I find the submission more in line with the objectives of a ESSD data description paper. However, I continue to have some concerns about two of the main elements that were mentioned in the review of the first version, namely (1) the extent to which the data set, per se, is the focus of the presentation and (2) having a transparent account of which calibrations were applied over the full period of the publically available data set.**

AR: Author's Response

First of all, we would like to thank the referee for the time he spent on our manuscript and the relevant comments that helped to significantly improve the quality of the manuscript. Regarding the last two points of concern of the referee, we have modified the manuscript accordingly. Section 4 has been modified in accordance with the referee's suggestions to restructure the order of the sections, to condense the intercomparison section, and to shift the focus of the intercomparison from the Bentham to the radiometer. Regarding

the second point, calibration, the presentation figure of the instrument and calibration timelines has been improved and information has been added in the manuscript about the Bentham calibration, possible offsets and the future of the dataset. Please find below our detailed answers to these two points.

RC: Referee 1: First Point

> **On the first point, I appreciate the author's view that describing some characteristics of the data, particularly the presence of cloud enhancement, will assist users in proper use of the data. In recognition of this important consideration of the data, the sections on diurnal variation and cloud fraction should be the first parts of section 4. Like the first version, this revised version still leads off section 4 with a lengthy section about the derivation of the satellite/model and inter-comparison with the data. Within the three sections, numbers 3-5, the exposition of the satellite data set and its comparison to the Bentham and radiometers occupies 40% of the text (counting the 15 lines of the conclusion which basically just restate the results in section 4.1). This seems out of proportion to its importance in guiding use of the data.**
> **In a paper about a data set the primary focus should be its characteristics, per se, thus I recommend putting sections 4.2 and 4.3 before 4.1. Indeed, having the characteristics of cloudiness described first assists in explaining some of the discrepancies with the satellite/model results. The satellite/model comparison section should be condensed. The comparison should focus on the radiometer results, since that is what is in the published data set. I don't see what is shown in Figures 3 and 4 that is not also shown in the appendix figure A1 and A2. The latter are more relevant, since the Bentham data shown in Figures 3 and 4 are not included in the published data set.**

AR:

As suggested by the reviewer, sections 4.2 and 4.3 dealing respectively with the diurnal variation of the cloud fraction and UVI and the seasonal variability of UVI extremes have been moved upstream from the comparison with other UVI measurements. Sections 4.2 and 4.3 are now section 4.1 and 4.2 respectively.

The former section 4.1 (Comparison with other satellite measurements or models) is now section 4.3. Following the reviewer's suggestion, this section has also been condensed while keeping the essential references and information of the different satellite products and models (spatial and temporal resolution, parameters used). We have chosen to keep this information as it allows us to understand the discrepancies in the UV-Indian dataset and the other datasets. This information also makes it possible to appreciate the fact that the ground-based UV-Indien data, by virtue of their measurement method, take into account all the physical parameters influencing the UVI on the ground, unlike certain models or instruments on board satellites. These differences allow us to give indications of how the dataset can be used both for UVI studies and for satellite or model improvements.

The detailed comparison in this section is now between the St-Denis radiometer and the satellites and models (and no longer between the Bentham and the satellites and models). The corresponding figures and tables have therefore been inverted to reflect this change in the text. (Table 4 <-> Table A1, Figure 3/4 <-> Figure A2/A3)

RC: Referee 1: Second point

> **On calibration, I appreciate the detailed explanation of each of the three types of calibration. But only two of these calibrations are mentioned in Table 3 showing the caibrations by instru-**

ment: manufacturer's and Bentham. The author's response to reviewers states that in addition to the present Bentham calibration, the manufacturer's and Davos calibration were also used for the Saint-Denis radiometer.
A more complete accounting of calibrations covering the whole published record is needed. This could be conveyed in the paper by using different color codes in Figure 2 for periods covered by different procedures. More importantly, there are some inconsistencies between calibration procedures in terms of how corrections are applied as a function of SZA and ozone (no ozone adjustment for Bentham calibrations [?]). Have the authors examined what are the possible effects of these different calibration procedures on the record? Are there offsets that have been introduced in the record when calibration/correction procedures are changed? Lines 240-245 describe differences in the corrected UVI values between the Bentham calibration and manufacturer's/Davos calibrations. What (if anything) was done to the record to adjust for these differences in the UVI record?
Finally, it appears as though some of the data being reported is from instruments that, for various reasons, were overdue for recalibration at the time the observations were made but are scheduled for new calibrations (according to Table3). Should data users expect a possible round of corrections to these data sets when the "end cals" for a deployment period are known?

AR: Author's Response

In order to better detail the instrument calibrations and data calibration periods, Figure 2 has been updated with a colour code.The corresponding figure can be found below this answer.

Indeed, the Bentham calibration does not directly include the total ozone column. The Bentham calibration coefficients are functions of the SZA and were calculated from the manufacturer's recalibrated radiometer measurements. These manufacturer's recalibrated radiometer measurements have a calibration coefficient that is a function of the SZA and the total ozone column. Unfortunately, for the Bentham calibration to take the total ozone column directly into account, the radiometers would have to be installed for at least one year at the Moufia site in order to capture all possible ozone and SZA values over the course of a year. The intermediate use of a radiative transfer model could also be used to extrapolate to larger total ozone column values. The impact of taking into account the total ozone column on the Bentham calibration has not yet been studied for these instruments. No offset has been particularly observed between two calibration periods, however we have not yet done any detailed analysis on this subject. We thank the reviewer for raising these points of interest regarding the calibration and thus the quality of the data set. We plan to focus our next study on these aspects. The discussion detailed here is now present in the manuscript in order to inform the user about possible offsets due to calibration changes.

Another round of correction is indeed expected, especially for radiometers whose calibration date has passed. When calibrations are made possible again by the opening of the borders, instruments that have been in place for more than 2 years will be replaced by instruments recalibrated from the Bentham. The replaced instruments will then be recalibrated at the Moufia site before possible redeployment. During this re-calibration, and if it is noted that there is too much drift compared to the previous calibration, it is possible that part of the data set will have to be corrected over a short period and made available to users with an alert. This new correction will also allow a more detailed understanding of possible calibration offsets or the impact of the total ozone column for the Bentham calibration. The available dataset will therefore get a new version and the documentation will also detail the new modifications.

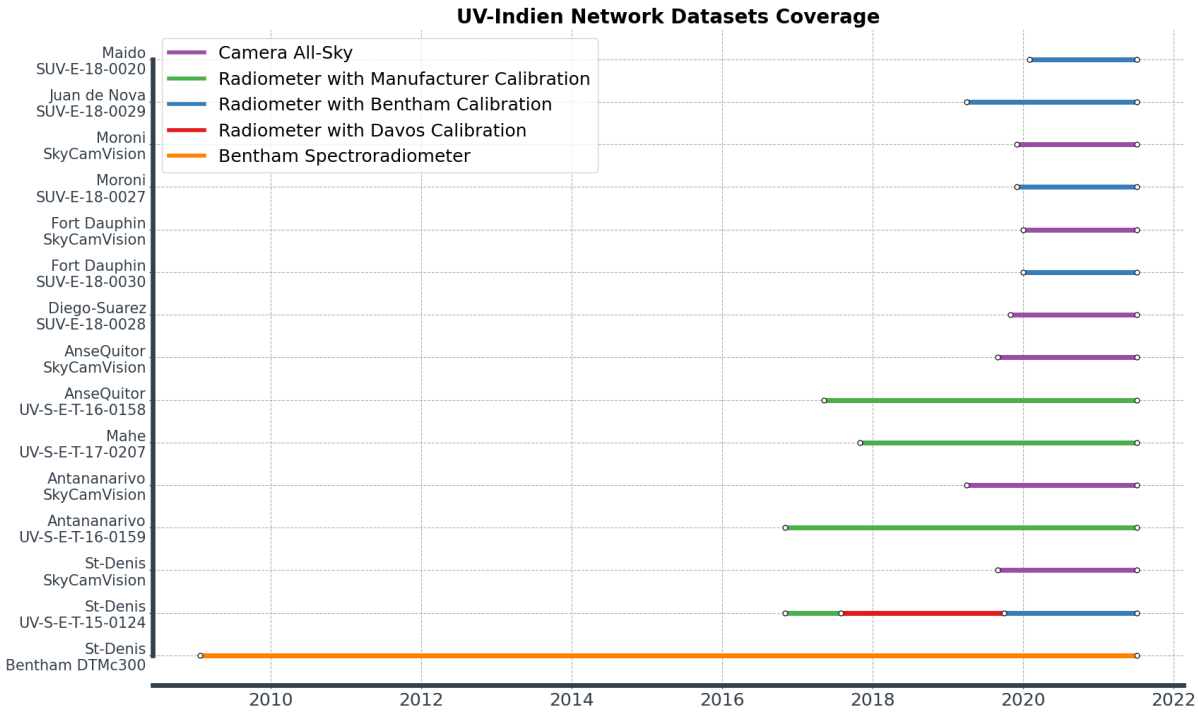

Figure 1: Timeline of the instruments of the UV-Indien network.
The measurement periods of the cameras are shown in purple. The measurement period of the BENTHAM spectroradiometer is shown in orange. The measurement periods of the radiometers that are either manufacturer-calibrated, Davos-calibrated or BENTHAM-calibrated are shown in green, red and blue respectively.