Authors' responses to reviewer's interactive comment on "A Database of 10 min Average Measurements of Solar Radiation and Meteorological Variables in Ostrava, Czech Republic" by Marie Opálková et al.

Dear Anonymous Referee,

we thank you for your evaluation of our manuscript and valuable comments. We have taken each of your comments and suggestions into account. We brought answers and changes to text to satisfy your concerns. Below, we respond to each concern and comment. Your text is reported in this document in bold, our answer is in italics.

Yours faithfully,

Marie Opálková et al.

General comments

The paper aim was to provide complex information on solar radiation, air pollution and meteorological data measured in Ostrava and presented as free dataset in the PANGEA database for any user. The main advantage of the paper is establishment of solar radiation measurements in different spectral bands. The data can be used to study relationships between them in industrial polluted area. The data set provides good platform for further measurements and modelling. High attention was payed to Quality control methods used for good data selection.

Detailed and relevant information on the measurements performance, data processing and control for possible data users is very important. However, in my opinion, it was not fulfilled completely and correctly. I suggest several major (Specific comments 1) and minor corrections (Specific comments 2) of the paper and after that next revision.

Specific comments 1:

1. Database purpose

P. 1 abstract: This database offers a unique ensemble of variables having a high temporal resolution and it is a reliable source of information on radiation in relation with environment and vegetation in highly polluted areas of industrial cities in the middle of Europe.

P. 11: it can be used as input data for models of influence of this radiation regime on plants

Please, explain how this database can be used for research targeted to study of influence of polluted urban environment on plant when there have not been presented biological measurements or observations? In my opinion, the data from presented period can be used to study relationships between measured radiative parameters in polluted area of north middle latitudes under different condition (solar zenith angle, wind condition, relative humidity etc.). The data can be used for any environmental modelling, e.g. for atmospheric chemistry models, urbanistic studies - not only for biological research. In

the Introduction, there were presented many works studying relations between biological processes and selected ratios UVB/PAR, UVA/PAR or DIF/GLO. I recommend presentations of some relations between irradiances or photon fluxes in different spectral bands in this paper to attract the database users.

Please, specify the aim of this database creation and possibilities of the data utilisation in abstract and introduction. With respect to the database purpose, present relevant references in the Introduction (you referred only biological research).

Our measurements are nearly connected with studies about influence of the spectral composition of solar radiation on plant metabolism. The objective of the still on-going overarching project is to find differences in spectral composition of incident solar radiation during the periods with low and high air pollutants concentrations and to use these results in experiments on plants in growth chambers where it is possible to set up different spectral compositions of radiation. Field experiments with plants at the locations with measuring stations are also planned, but they were not realized yet. Hence, our measuring systems were designed for biology research. The information about specific aim of this database and other possible use of our data was added into the Introduction, see P3, lines 6–11.

2. Missing proof about pollution differences between presented stations

P. 12: One of the goals could be to find the influence of atmospheric pollution on the spectral composition of incident solar radiation with a focus on analyses of differences between measured values.

P. 3: BG OU is situated approximately 3 km from an industrial area which produces many air pollutants (Jančík et al., 2013) and is much more influenced by air pollution than the CHMI location, especially in the winter months.

There are mentioned 3 localities where data was measured – 2 stations in the Botanical garden of the OU and third about 3 km far on the CHMI plot. Stations are very close.

We use only two localities where measurements are carried out: Botanical Garden with 2 measuring stations (S1, S2) and CHMI area with 1 measuring station (S3). It was mentioned that there was an industrial area 3 km far from Botanical Garden which is the reason for higher concentration in air pollutants in this area. Distance between Botanical Garden and CHMI area is ca. 10 km (Fig. 1, P5).

There is declared that S3 station is in less polluted area than S1 and S2 stations. It is necessary to give some proof about this conclusion (some analysis of differences btw. stations) and present it in the paper. The CHMI air quality monitoring network data can be used for this purpose.

Information about higher concentration in air pollutants at S3 station than at S1 and S2 stations was based on the published information in the Atlas of Ostrava atmosphere (Jančík et al., 2013). Comparison of annual and winter air pollutants (PM_{10}, NO_x and SO_2) concentration for years 2015 and 2016 was prepared and it was added into the paper, see P5, Tab. 2. Our calculations confirmed the published information.

Why there were established 2 stations in the Botanical garden so close each to other? Explain it in the paper.

Some sensors which are used for measurement were custom-made. When the study was planned, it was believed that it was desirable to have two similar systems at the same place at one place to better assess custom-made sensors and the quality of the measurements. Explanation was added to the paper, see P4, lines 5–7.

To study influence of air pollution on solar radiation spectral distribution, at least one station should be placed in rural unpolluted area with similar geographical characteristics as at stations in Ostrava.

We have only three measuring stations (i.e. sets of irradiance sensors), two of them are situated at one location for the reason mentioned in the paragraph above, and the third one is situated at the location with lower air pollutants concentration. It was not possible to use more measuring stations. When we were choosing the suitable location for our stations, we had to consider only fenced areas with good approach in the area of the city of Ostrava, because we wanted to measure irradiance of incident solar radiation in the conditions of industrial city. In future, we certainly acknowledge that it would be useful to compare our measurements of spectral irradiance at two industrial locations with those at rural unpolluted one location. But in the Ostrava region, it would be difficult to find suitable locations with available data on pollution at the similar altitudes.

Some air pollution indicator, especially aerosol content, should be measured at every station. Air pollution characteristics were measured at fourth station (within very small area studied, these data do not represent neither botanical garden stations S1 and S2 nor the CHMI station S3) and it should be clearly explained.

Devices for measurement of air pollution are very expensive and it is necessary to have trained staff. It was not possible to have own sensors for measurement of concentrations in air pollutants, so we decided to use measurements from other sources. We realize that data measured 2 km far away from our measuring stations are not ideal, but we expect that concentration in air pollutants should be directly proportional, i.e. if the concentration of PM_{10} at the station of Public Health Institute of Ostrava (PHI) is in the "very-high" category, it is in the same category 2 km far away, even if the accurate value would be a little bit different. The situation is better for the station S3 (CHMI area), we have air pollution data for the same place where our station was located, but we had to pay for these data (data from PHI were free) and for that reason we were not allowed to publish these data in our database.

I suggest introduction of this station S4 characteristics in the explanatory tables 1 and 2 and in the map in Fig.1.

We do not prefer to add station "S4" (PHI) into the Tab. 1, because only stations measuring solar radiation and owned by the University of Ostrava are mentioned here. But we agree *with introduction of this station in the chapter 2.1, so it was added here, see P4, lines 19–22. This station was added also into the Fig. 1 (P5).*

If S1-S3 stations represent similar pollution condition (with characteristics measured at the S4) then reflect it in abstract and text (see also point 1).

Station S1–S3 do not represent similar pollution conditions, because stations S1 and S2 are located in the Botanical Garden which is situated in more polluted part of the city of Ostrava and station S3 is located in the CHMI area which is situated in less polluted part of the city of Ostrava. This information is highlighted in the text of paper, see P4, lines 10–12 + Tab. 2 (P5).

3. Unification of data description in the paper text, tab. 2 and in the database

In table 2 there is 'broadband irradiance' but in database 'shortwave downward global irradiance' Red, blue, green band terms used in text, only red in table 2, UVA, UVB in text - UV-b, UV-a in the database etc. I recommend usage of the same terms for measured irradiances and photon fluxes in database, text and tables.

The table of parameters for each table with data was prepared by the people from the PANGAEA system and they use the PANGAEA Standard which try to use the internationally available standard names. There are a lot of parameters and each scientist uses a different naming which PANGAEA as a relational database cannot mirror. The names "UV-a" and "UV-b" were changed on "UVA" and "UVB" on the base of our request. The name "shortwave downward global irradiance" was not changed because it is the standard of PANGAEA. We do not prefer use these words for this quantity in our paper, we think that there is clear connection between names of this quantity even in the case that no exactly words are used, because there is the note about wavelength range of this quantity in the table of parameters. Names of quantities are consistent between own tables with data and the paper.

Table 2 was modified because the use of the "red" in the text is not connected with radiation of wavelength 610–680 nm, but with radiation of wavelength 600–700 nm.

4. The threshold as QC control criterion

P. 7: The relative uncertainty for daily irradiation of good quality is set to 5% in the WMO guide if the irradiation is greater than 8 MJ m^{-2}, which corresponds to an hourly mean of irradiance of 220 W m-2 for an average day length.

Explain, please, term 'average day length' and how it was calculated/derived and for which geographical coordinates.

Average day length means the average number of hours when solar radiation incident on our sensors is not influenced by objects on horizon (trees, etc.). It is ca 5 hours in winter and 15 hours in summer, so average is equal to 10 hours. It was calculated for geographical position of locations of our measuring stations.

Explain clearly what is the difference between data above and under the threshold you defined. You based your criteria for threshold on recommended but not real characteristics of your measurements. I disagree with the thresholds definition.

Establishment of threshold value should ensure data quality from the WMO point of view. Lower values than threshold values cannot be distinguished from zero and hence should not be used for further calculations and analyses. We do not have means to establish thresholds from the actual data and this is why we have established thresholds from the WMO recommendations.

If the widened uncertainty of measurements has been the concept for it, then uncertainties of every instrument provided by manufacturer or calibration authority should have been used (not the WMO data quality categorization).

Uncertainties of instruments were taken into account by the fact that for further calculations and analyses it is recommended to use only data measured in the moments when solar elevation angle was higher than 8° (this information was added to the paper, see P11, lines 12–15). During lower elevation angles, the cosine correction of each sensor does not work properly and there is a higher variability of measured data. When solar elevation angle is high, the deviations in measured data connected with technical parameters of sensors are negligible.

Other quantity which can be used as a criterion of data quality, is the mask shadow. When the sensors are influenced by shadow of surrounding objects, measured values are lower than expected values and they usually do not pass the quality check process mentioned in our paper (except values measured during sunny days in summer, these data are high enough for passing quality check).

I suggest different threshold definition and its calculations performing separately for every measured radiative parameter (In that case 80% or realistic UVB data would not be under threshold limit.) and with reasonable explanation of the meaning of the criteria for data separation to above and under defined threshold values. If it would be impossible, I suggest exclusion of threshold concept from QC control. Why didn't you base the threshold calculations on the noise values of particular instrument?

As already written, we do not have means to ascertain the actual uncertainty for each sensor. Manufacturers provide noise, or signal-to-noise ratio, for their own instruments. These values are NOT the uncertainty of the data when installed at a given site. Several other effects should be taken into account, which magnitudes are a priori unknown. Besides modelling these effects using some approximation, the uncertainty can only be assessed by an appropriate analysis of data acquired in particular and reproductible conditions.

5. Relative spectral response of sensors missing

Please, present the relative spectral responses of particular radiation sensors (don't let reader searching general information by internet). I recommend presentation in separate table (e.g. in Appendix) together with information about source of this information (whether it was measured by manufacturer or calibration authority or presented by manufacturer as approximate characteristic of the instrument type). Other important characteristics of the sensors can be also added – time response, cosine errors etc.

The graph with relative spectral responses of used sensors (Fig. 10 in the Appendix) and the table with parameters of used sensors (Tab. 1 in the Appendix) were added to the Appendix and links to these documents were added to the text of the paper, see P6, line 1.

6. Data complexity indicator missing

The radiative data were sampled every 1 min. This sampling interval is far from the WMO recommendation (1 s) and a lot of information about radiation variability was lost. 10 min averages are presented in the database. There is no indicator of data complexity. I suggest presentation of number of 1 min data involved for 10 min average calculation.

The radiative data were sampled every 1 min, but these data were not stored, only 10 min averages were stored. For that reason, 1 min averages of measured data are not available, so it is not possible to present them. The main aim of our measurement was to find out long-term variability of solar radiation for the further use of results for experiments on plants in growing chambers, so we have not been interested in short-term variability in the minute scale.

7. Offset presentation missing

I suggest presentation of night values from all sensors in the database which will help to quantify noise - influence of infrared radiation and data acquisition system on measured data.

Night values are presented in all of our tables with data, as it is mentioned in text of the paper, see P10, lines 5–6; or P12, line 10.

8. Cloudiness condition in night hours

How did you characterise cloudiness condition in the night hours when there was no solar irradiance approaching sensors? Add some explanation in the text.

Prevailing weather conditions (called as weather category in the database) were determined on the base of daily course of the broadband irradiance and it was established for the whole day (both day and night). Because solar radiation quantity was used for this determination, it is not possible to establish weather category for night measurements separately. The main goal of the establishing of weather category was to know what prevailing weather type (cloudy, partly cloudy, sunny) was on the specific day regardless to day or night *measurements and found information was extrapolated for whole 144 records per each day. This information was added to the paper, see P7, lines 17–18.*

Specific and technical comments 2:

1. P. 1 abstract: '10 min of downward surface irradiance ', revise this term with respect to points 3 and 4. Where sensors placed on the surface?

The term "downward surface irradiance" was changed for "solar irradiance" (see P1, line 1). Sensors are placed on the arm of measuring station and it is 2 m above ground. Photos of stations were added to the Appendix and the link on them was added to the paper, see P4, lines 5, 8–9.

2. P.1 abstract: These two stations offer additional data: PM10, SO2, NOx, NO, NO2 concentrations. – revise the sentence with respect to point 2 in previous part of revision – air pollution data were measured at 4th station.

This suggestion was accepted, see P1, lines 13–15.

3. P. 4: The PPFDs in three PAR bands were calculated from the sensor data: blue [400, 510] nm, green [510, 600] nm, and red [600, 700] nm by subtraction. Which radiation characteristics were obtained by subtraction of values measured in some spectral bands? It seems that all parameters in Tab.2 were measured. Please, explain the meaning of the sentence.

We measured irradiance in these PAR bands: [400, 700] nm, [510, 700] nm and [600, 700] nm. Because this research is connected with plant studies and plant are sensitive on blue [400, 510] nm, green [510, 600] nm and red [600, 700] nm spectral bands, these spectral bands had to be calculated from measured irradiances:

irradiance in blue [400, 510] nm = irradiance in [400, 700] nm – irradiance in [510, 700] nm

irradiance in green [510, 600] nm = irradiance in [510, 700] nm – irradiance in [600, 700] nm

Irradiance in red [600, 700] nm is equal to measured irradiance by the sensors for wavelengths [600, 700] nm.

Irradiances of these colour spectral bands are not present in the database, because they can be easily calculated in the case of interest. The mention about these colour spectral bands was deleted in the chapter 2.2 and it was left in the chapter 5 where calculations are showed (see P13, lines 4–5).

4. It would be valuable to have photos of instrument installation at particular stations.

Photos of stations were added to the Appendix and the link on them was added to the paper, see Figs. 1–6 in the Appendix, P4, lines 5, 8–9.

5. State the altitude of sensors above surface.

Sensors are placed 2 m above surface, their exact altitude is 237 m above sea level for the Botanical Garden and 242 m above sea level for the CHMI area. Because exact altitudes of locations of measuring stations are given (see P4, lines 5, 8) and it is said that sensors are placed 2 m above surface (see P5, lines 9–10), these values of altitudes of sensors are not mentioned in the paper.

6. Please present the station (including coordinates) where the long-term climate characteristics came from (part 2.1).

Long-term climate characteristics mentioned in the chapter 2.1 came from the publication of Weissmannová et al. (2004) and there was no direct information about source of these data in this publication because it is not scientific publication and it is not focused on the meteorology of the Ostrava region. This information was mentioned only peripherally. We changed values of some of these characteristics for values which we found during our measurements (mean annual air temperature and mean annual sum of precipitation); see P4, lines 1–2.

7. There is mentioned that some obstacles reduced direct component of solar radiation (p. 10). I recommend showing the horizon elevation as function of azimuth for stations with solar radiation measurement in this paper. I also recommend calculation of sun elevation and azimuth for every data, comparison with horizon altitude by particular azimuthal angles and evaluation of the shading indicator.

The relationship between surrounding horizon, solar azimuth angle and solar elevation angle is represented as Figures presented in the tables with data for each station. These graphs were added also to the Appendix (Figs. 7–9 in the Appendix) and the link on them was added to the paper, see P4, lines 17–18. Solar elevation angle and solar azimuth angle were calculated for all data and these values are presented in the tables with data, as it is mentioned in Tab. 6 (see P12) in the paper.

8. An altitude should be added to geographical characteristics. Solar radiation undergoes changes with altitude and it could be reason for differences in radiation measured at particular stations.

Exact altitude of location of measuring stations is 235 m above sea level for the Botanical Garden and 240 m above sea level for the CHMI area. This information was added to the paper, see P4, lines 5, 8.

9. I recommend presentation of typical wind condition at every station. Wind plays important role in aerosol and pollutant spreading.

We do not have data about wind conditions at locations where measuring stations are situated, this suggestion cannot be satisfied.

10. In part 4.1, there is declared precipitation data storage in the database (and the data are there). In previous parts and tab. 2, there is no information how and where it was measured. Information on snow presence on the surface (or albedo data) would be valuable as auxiliary meteorological parameter because reflected irradiance contributes to diffuse component of measured global radiation significantly. If this information was available (at least at the CHMI S3 station), add it in the database.

Information about measurement of precipitation was added to the paper, see P6, lines 1–2. We do not have data about snow presence on the surface at locations where measuring stations are situated and we are not allowed to publish any data from CHMI in our database, so this suggestion cannot be satisfied.

11. P.7: Which ET spectrum was finally used - Kurutz (1992) or Mayer and Kylling (2005)? Which was the Sun –Earth distance when the spectra were measured? Is there difference in wavelength resolution in mentioned spectra? Was the integral ETC presented in table 3 obtained by integration of spectral data from Kurutz (1992) or Mayer and Kylling (2005) (if not, present the source of the value)? Explain calculation of integral ET irradiances and photon fluxes in selected spectral ranges in more details.

The ET spectrum published by Kurucz (1992) was used and was found in the library of datasets in LibRadTran folders. Other information about this dataset: These data were taken from LBLRTM 5.21 (http://www.meto.umd.edu/~bobe/LBLRTM/). The original Kurucz [1992] data were converted to mW / (m^2 nm) and averaged over 1 nm intervals centered around the given wavelength (BM, September 25, 2001). Reference: Kurucz, R.L., Synthetic infrared spectra, in Infrared Solar Physics, IAU Symp. 154, edited by D.M. Rabin and J.T. Jefferies, Kluwer, Acad., Norwell, MA, 1992.

The reference on Mayer and Kylling (2005) is connected only with the fact that we used the software LibRadTran and it is not possible to write about any software without reference.

Unfortunately, we do not have information about the Sun-Earth distance used for Kurucz calculations/measurements. Usually, spectra are given for one astronomical unit. Because of usage of Kurucz spectrum as a typical spectrum of the irradiance at top of atmosphere only for calculation of percentage representation of studied spectral regions according to global (solar constant) and relations between values of irradiances in studied spectral regions in W/m^2 and $\mu mol/m^2$ s, Sun-Earth distance is not crucial information in this case.

Integral ETC presented in the table 3 are obtained from spectral data from Kurucz (1992).

The Kurucz spectrum was useful in order to obtain actual values of irradiance at the top of atmosphere for studied spectral regions as explained below.

Published Kurucz data contains values of irradiance for each wavelength from 200 nm to 4000 nm for top of atmosphere. We converted units of Kurucz (mW/m^2 nm) to ***W/m^2 nm*** *(division by 1000). Then we calculated amount of* ***energy in W/m^2 for 1 µmol/m^2 s nm*** *(calculation according to the formula E0(λ) = h c/λ; 6.626 * 3 * 6.021 divided by value of energy in W/m^2 nm; used values: Planck constant, light speed and Avogadro constant). Then we calculated photon flux of radiation with given wavelength (****µmol/m^2 s nm****) which is associated with energy in W/m^2 nm (calculation: energy in W/m^2 nm for 1 µmol/m^2 s nm divided by energy in W/m^2 for radiation with given wavelength).*

When we had values in W/m^2 nm and µmol/m^2 s nm, we calculated energy of irradiance and photon flux for studied spectral intervals at the top of atmosphere, so we added up values in intervals 280–315 nm for UVB, 315–380 nm for UVA, 400–1100 nm for broadband radiation, 400–700 nm for PAR, 510–700 nm for irradiation in the interval [510, 700] nm, 600–700 nm for irradiation in the interval [600, 700] nm, 600–680 nm for the radiation with peak at 660 nm, 690–760 nm for the radiation with peak at 730 nm. All this sums were done both in W/m^2 and µmol/m^2 s.

In next step, we calculate percentage representation of all studied spectral regions according to global (solar constant, 1365.78 W/m^2). Then, we found conversion factor between irradiance in W/m^2 and µmol/m^2 s (value of irradiance of given spectral region in µmol/m^2 s divided by value of irradiance of given spectral region in W/m^2). Final conversion factor was established as a percentage representation of given spectral region according to solar constant, and in the case that studied spectral region was measured in µmol/m^2 s, this percentage representation was multiplied by conversion factor between irradiance in W/m^2 and µmol/m^2 s.

12. P. 5:..sensors measuring radiation in the intervals [510, 700] nm and [600, 700] nm contain cutoff filters which have the S-shaped permeability curve and it causes a little bit different measured values. Based on these tests, we can conclude that no long-term decrease of the sensitivity of solar sensors is noticeable... Please explain the S shaped permeability curve relations to the filter and the sensitivity tests in the paper. Permeability is magnetic characteristics of materials.

The term "S-shaped permeability curve" was used improperly, the right term for the optical filter property which we wanted to name is the "transmission curve", this term was corrected in the paper, see P6, line 17.

13. P. 5: Each sensor was equipped with cosine correction – explanation necessary.

Information about presence of cosine correctors was deleted from the chapter 2.2. and it was added with connection to improper measurements when solar elevation angle is less than 5° to the chapter 4.2 (Additional comments), see P11, lines 12–15.

14. P. 6: Daily profile of global radiation... – Did you mean daily course?

Yes, we meant daily course of global radiation, but we prefer to use the term "daily profile".

15. P. 1: abstract: air temperature at the surface - Clarify the thermometer position - at altitude 2 m or more closely to the surface?

Thermometer is situated 2 m above surface, similar like solar radiation sensors, see P5, lines 9-10. Their position is more clear from the photos of stations in the Appendix. The link to these photos was added to the paper, see P4, lines 5, 8–9.

16. P. 5: No significant systematic biases were observed and the least square linear regression provided a cross-calibration correction of less than 5%. Differences between them could be caused by unequal irradiance during partly cloudy days, or by technical properties of sensors. , unequal irradiance' - Did you mean variable irradiance?

As unequal irradiance was meant the fact that during partly cloudy days it can happen that one measuring station can be brightened by the Sun, but the second measuring station can be shaded by clouds. This information was added to the paper, see P6, lines 14–15.

Please, explain how and why did you perform cross-calibration correction.

As the cross-calibration correction was meant the process when measurements made by similar sensors belonging to two measuring stations at one location were compared to check the temporal consistency as these two stations were only 3 m apart (P6, lines 10–14). This process was performed for the revealing of potential shifts of measured values during measurements which could be caused by systematic errors, but no shifts in data were found and we concluded that our measurements were fine from the "temporal consistency" point of view.

Did you perform some calibrations of the sensors during the presented period? Please, describe the calibration methods.

No real and physical calibrations of the sensors were performed during the measuring period, it was not necessary because of recommended calibration periods for sensors were longer then measuring period in the most sensors (see P6, lines 6–8) and we did not want to interrupt measurements because we wanted to have complete dataset.

17. P. 5: The term 'weather conditions' should be replaced by term 'cloudiness condition'.

Thank you for the suggestion. See P7, line 13, 17.

Other notes:

1. P. 5: In addition, at BG OU, measurements made by similar sensors were compared to check the temporal consistency as the stations were only 3 m apart. Coefficients of determination were in the interval [0.94, 0.98], thus confirming the expected similarity in data between S1 and S2. No significant systematic biases were observed and the least square linear regression provided a cross-calibration correction of less than 5%. This comparison between measurements of the same instrument type installed at the same place would have been perfect to organize before the beginning of measurements at particular stations.

It is true that this process would be fine before the beginning of measurements. We did this comparison to assess if there are some shifts in data during measurements. Even if we did this process before the beginning of measurements, we would not have information about long-term correlations between measured values. From our point of view, it is a good way to assess if measurements are stable during the time.

2. The WMO recommends more frequent maintenance and control of instruments on site than once per month or 2 months. Are the instruments equipped with some ventilation to avoid persistence of water vapour condensation products (dew, freezing) on sensors? Cleaning of the instruments to avoid dust coverage on the sensors is recommended to perform more frequently in the future. Also levelling and dessicant checking should be provided more frequently.

There is no special equipment to avoid persistence of dew or glaze ice on sensors, only drainage for drain of water during rain (so sensors are not flooded). Cleaning of instruments because of dust and changing of desiccant will be arranged more frequently in future measurements.

3. Sensitivity of sensors operating in UV range of spectrum has been sometimes changing very rapidly and more frequent calibrations (at least once per year) are recommended.

We will try to arrange more frequent calibrations of UV sensors. However, based on cross-calibration analyses, no shifts in measured values of UV irradiation were observed during measuring period.

4. P. 5: To check the long-term stability of the sensors, measurements from each of them were compared with the measurements in the broadband range and linear regressions were computed in the whole measuring period and for each individual year. It is not good method for stability check because operational broadband radiation sensor sensitivity can be also changing. Regular comparison to reference instrument is the WMO recommended procedure for the solar radiation sensor stability control.

Behaviour of operational broadband radiation sensor sensitivity during measurement period was checked by owner of the company EMS Brno (Jiri Kucera) and no shifts of measured *values caused by errors potentially occurred during the time were found. For that reason, the comparison of values measured by the other sensors with values with values measured by the broadband radiation sensor is a sufficient method for checking of long-term stability of measurements.*

References:

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