Revision to:

A Database of 10 min Average Measurements of Solar Radiation and Meteorological Variables in Ostrava, Czech Republic

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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).

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. 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. Why there were established 2 stations in the Botanical garden so close each to other? Explain it in the paper. 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. 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. I suggest introduction of this station S4 characteristics in the explanatory tables 1 and 2 and in the map in Fig.1.
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).

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.

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. 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. If the widened uncertainty of measurements have 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).
   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?

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.

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.

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.

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.

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?
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.
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.
4. It would be valuable to have photos of instrument installation at particular stations.
5. State the altitude of sensors above surface.
6. Please present the station (including coordinates) where the long-term climate characteristics came from (**part 2.1**).
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.
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.
9. I recommend presentation of typical wind condition at every station. Wind plays important role in aerosol and pollutant spreading.
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.

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.
12. **P. 5:..**sensors measuring radiation in the intervals [510, 700] nm and [600, 700] nm contain cut-off 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.
13. **P. 5:** Each sensor was equipped with cosine correction – explanation necessary.
14. **P. 6:** Daily profile of global radiation... – Did you mean daily course?
15. **P. 1: abstract**: air temperature at the surface - Clarify the thermometer position - at altitude 2 m or more closely to the surface?
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?
    Please, explain how and why did you perform cross-calibration correction. Did you perform some calibrations of the sensors during the presented period? Please, describe the calibration methods.
17. **P. 5:** The term 'weather conditions' should be replaced by term 'cloudiness condition'.

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.
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.
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.

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.

   I tis 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.