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Scientific report

Subject: Short Term Scientific Mission
Reference: COST Action ES1207
Host institution: AEMET- Meteorological State Agency, Spain
Period: 02/03/2016 to 10/03/2016
Reference code: COST-STSM-ECOST-STSM-ES1207-020316-069696

Purpose of the STSM

The main focus of the STSM was to develop algorithms for the UV processing in EUBREWNET. The current processing tools of FMI (Lakkala et al. 2008, Lakkala et al. 2015) were used as starting point. The use of existing algorithms and UV product processing tools were investigated. As final result, a suggestion for UV processing algorithms and calculated UV products for EUBREWNET were done.

The FMI's UV processing includes non-trivial methods for correction of errors due to spikes in raw data, non ideal angular response and temperature dependence. During the investigation, the use of the current cosine correction method was evaluated by implementing the method to the UV processing of the COST comparison campaign held in El Arenosillo, Spain, in May-June 2015.

Description of the work carried out during the STSM

The following work was carried out during the STSM:

1. Checking that the corrected counts calculated from UV measurements were the same in the EUBREWNET and in the FMI system.
Data of day number 153 of the Brewers #214 and #185 from the COST1207 campaign in Huelva, 2015, was used. The data was corrected for dark current, dead time and stray light.

2. Checking that the calculated Brewer UV irradiances were the same in the EUBREWNET and in the FMI system.

3. The UV configuration of the EUBREWNET was defined. The UV configuration was defined in a way that the information of which response file (UVR) need to be used was possible. Also other parameters of the UV configuration were defined enabling the operator to add Brewer specific information to the stray light, temperature and cosine corrections.

4. The cosine correction procedure of FMI was introduced to the AEMET personnel. Together, we searched for ways to implement it into the operating system of EUBREWNET.

5. A list of UV products, which can be generated by the EUBREWNET, was done.

6. I had a seminar talk about Arctic UV measurements for the staff of AEMET.

http://izana.aemet.es/index.php?option=com_content&view=article&id=408&Itemid=167&lang=en#

Description of the main results obtained

The checking of corrected counts and irradiances was successful, and we can trust that the data in the EUBREWNET is processed in a appropriate way.

The UV processing of the EUBREWNET was documented, and the UV configuration was defined (see Appendix_1.pdf). The criteria to different data levels were defined, and parameters for the corresponding corrections were included in the UV configuration. The list of UV products is shown in Appendix_1.pdf.

The cosine correction procedure of FMI was applied to the UV measurements made with the Brewer #214 during the COST1207 measurement campaign in El Arenosillo, 2015. The cosine correction factor ranged from 1.04 to 1.10 depending of the ratio of direct and diffuse radiation and SZA. This compensates most of the offset from the reference instrument of the UV campaign.

Future collaboration with host institution

We will continue the work to implement the cosine correction procedure into the EUBREWNET near real time data processing system. Also the work to evaluate the performance of the FMI cosine correction procedure will be continued by using the data of the Brewers of AEMET.

Foreseen publications/articles resulting or to result from the STSM

The results of the STSM will be published first as a poster (León-Luis et al., see appendix 2) in the Quadrennial Ozone Symposium in Edinburg, September 2016, and later as a scientific article.

Also a publication from Lakkala et al. regarding the performance of the cosine correction procedure of FMI is planed as a joint work with AEMET.

Confirmation by the host institution of the successful execution of the STSM

References

Lakkala, K., Arola, A., Heikkilä,A., Kaurola, J., Koskela, T., Kyrö, E., Lindfors, A., Meinander, O., Tanskanen, A., Gröbner, J. and Hülsen, G., 2008: Quality assurance of the Brewer spectral UV measurements in Finland. Atmos. Chem. Phys., 8, 3369-3383.

Lakkala et al. 2015. Quality Control of Near Real Time Brewer Measurements at FMI, oral presentation in COST1207 WG meeting, Sodankylä, 11.-12.11.2015.

Appendix 1 = Appendix_1.pdf

Appendix 2:

Preliminar results on the operative cosine correction in Eubrewnet

(poster)

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The amount of UV radiation reaching the Earth's surface is constantly changing due to the contribution of different factors of very different nature. On the one hand, the Sun-Earth distance is not constant but varies on annual cycle what is observed analyzing the average values of UV radiation measurements. On the other hand, the UV radiation varies daily due to the presence of external variables as ozone, aerosols, clouds, which can absorb or scatter the UV radiation [1].

In addition, all equipments used to measure the solar radiation must be corrected for their instrumental errors. In particular, the Brewers have a non ideal angular response. In this work, we show the initial results obtained when the UV measurement are corrected regarding the cosine error. The dataset used were collected by the Brewer#157, Brewer#183 and Brewer#185 which form the triad of the Regional Brewer Calibration Center for Europe (RBCC-E, Izaña Atmospheric Research Center, Agencia Estatal de Meteorología, Tenerife, Spain). In order to guarantee the validity of the UV measurements, the Brewers are calibrated each six months with 1000W lamps in the optical laboratory facilities and, monthly, using a portable calibration system with 200W lamps. Moreover, the Brewer#185 is calibrated annually in respect to the reference of World Radiation Centre. This study was carried out using the database of the European Brewer Network (EUBREWNET), http://rbcce.aemet.es/eubrewnet/.

References:

[1] Ilias Fountoulakis, Alkiviadis F. Bais, Konstantinos Fragkos, Charickleia Meleti, Kleareti Tourpali, and Melina Maria Zempila, "*Short- and long-term variability of spectral solar UV irradiance at Thessaloniki, Greece: effects of changes in aerosols, total ozone and clouds"*, Atmos. Chem. Phys., 16, 2493–2505, 2016. doi:10.5194/acp-16-2493-2016