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Stability of the RBCCE triad during the period 2005-2015

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Brewer spectrophotometers are widely used to measure the total ozone column (TOC), SO_2, ultraviolet irradiance and, more recently, the aerosol optical depth in the ultraviolet range.

The calibration of Brewer instruments is traceable to a Triad of Brewers at the Environment Canada facility in Toronto, Canada. The reference instruments in Toronto are recalibrated every few years at Mauna Loa Observatory in Hawaii but most of the the Brewer spectrophotometers are calibrated with respect to a travelling standard reference instrument, Brewer #017, managed by International Ozone Services (IOS). Since November 2003, and within the GAW/WMO program, the Regional Brewer Calibration Centre for RA-VI Region (Europe) (RBCC-E) was established by Izaña Atmospheric Research Centre (I-ARC) at Izaña Observatory (IZO, Canary Islands), managed by the "Agencia Estatal de Meteorología" (AEMET, Spain). At present, the RBCC-E maintains a triad of reference instruments. The Regional Primary Reference Spectrophotometer (B157) and the Regional Travelling Reference Spectrophotometer (B185) are part of the triad. Each spectrophotometer is calibrated independently with the standard Langley method at IZO and since 2011 transfer their own calibration and are regularly compared with he Toronto Triad.

This work is focused on the study of the stability of the RBCCE triad using the method proposed by Fioletov et al. [1]. The ozone values are fitted with a 2nd grade polynomial, as originally proposed in Ref. [1], and with an extended 3rd grade polynomial [2]. Moreover, two ozone datasets are used, including 1) all the daily ozone measurements of each instrument or 2) only the simultaneous data of all three instruments.

Our initial results suggest that the second dataset provides a better estimation of the behaviour of the RBCCE triad. The analysis of the TOC data indicates that the uncertainty in the daily values of the RBCCE triad is $\sim$0.5%. This study was carried out using the data available at the website of the European Brewer network (EUBREWNET), http://rbcce.aemet.es/eubrewnet/.

References:

[1] V.E. Fioletov, J. B. Kerr, C.T. McElroy, D.I. Wardle, V. Savastiouk and T.S. Granjkar, "The Brewer reference triad", Geophys. Res. Lett., 32, L208805.

[2] René Stübi, Herbertt, Schill, Werner Siegrist, "The Arosa Triad: Report on data quality", oral presentation, Eubrewnet Meeting 2014, Santa Cruz de Tenerife, Spain.