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Stability of the RBCC-E Triad during the period 2005 - 2015

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The RBCC-E Triad

In November 2003, the WMO/GAW Regional Brewer Calibration Center (RBCC-E) was established at the observatory of Izaña (IZO). RBCC-E owns a full calibration and reference-maintenance equipment composed of three spectroradiometers: a primary and secondary reference, Brewer #157 and # 183, and a travelling reference, Brewer # 185, which is used during the campaigns.

The IZO Triad is linked to the Meteorological Service of Canada (MSC) Triad by yearly calibrations towards the Canadian Traveling reference Brewer #017. Moreover, the IZO Triad is routinely calibrated by the Langley method. However, the MSC Triad is respected as the official bearer of the GAW Brewer International scale.

Nevertheless, the establishment of the IZO Triad allows the implementation of a self-sufficient European Brewer Network which is needed both for present and future quality control and assurance of ground total ozone observation and for validation of satellite instruments. The function of RBCC-E also allows development and testing of new techniques applied to UV or AOD measurements.

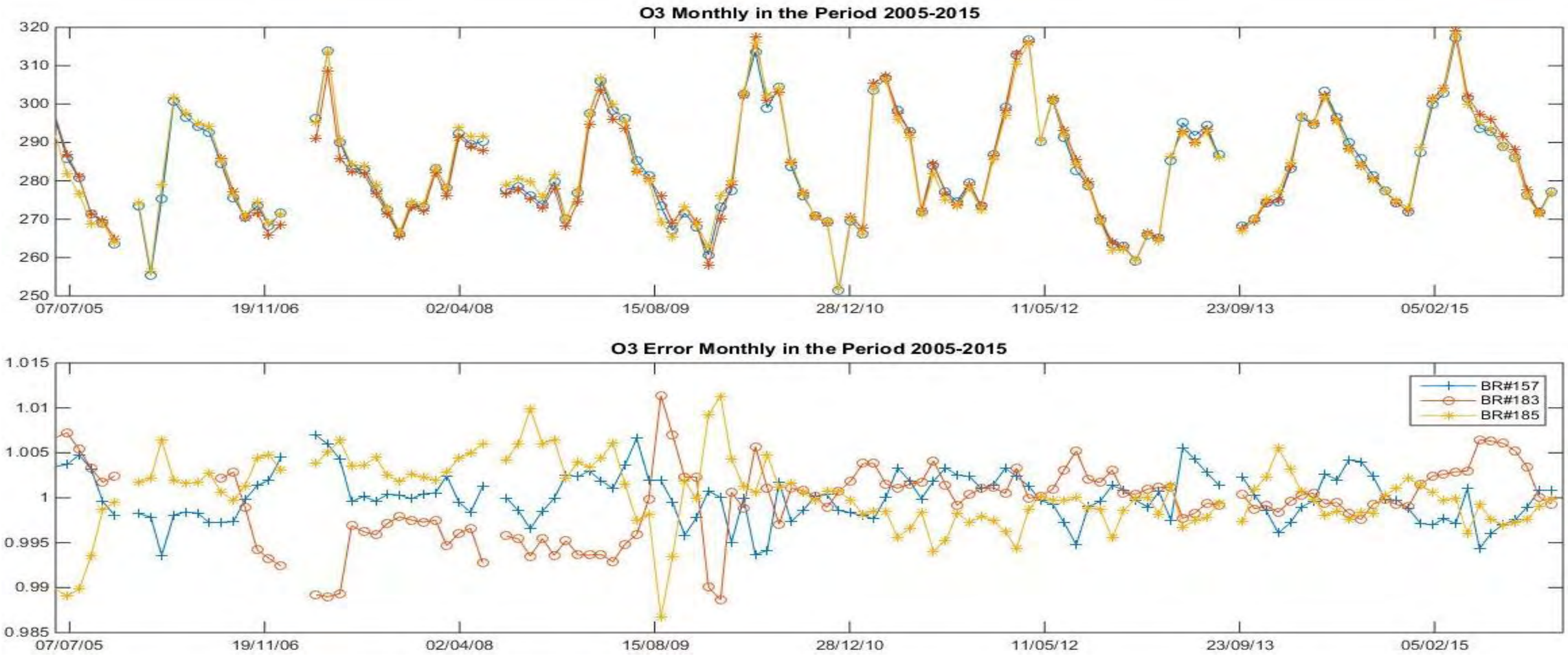
Ozone data evaluation using the method by Fioletov *et al.*

This work is focused on the study of the stability of the RBCC-E Triad using the method proposed by Fioletov *et al*. [1] These authors proposed to fit the daily Ozone values by a 2nd grade polynomial. Later, Stübi *et at.* [2] proposed to use a 3rd grade polynomial:

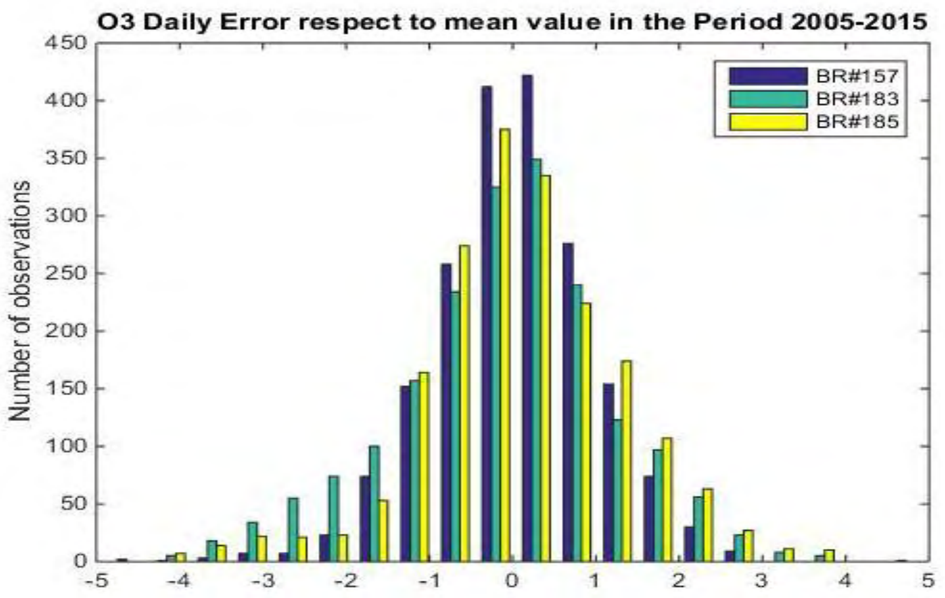
$$\Omega = A + B\cdot(t-t_0) + C\cdot(t-t_0)^2$$

$$\Omega = A + B\cdot(t-t_0) + C\cdot(t-t_0)^2 + D\cdot(t-t_0)^3$$

where Ω is an Ozone measured by each Brewer of the Triad, t is the corresponding time of the measurement and t_0 is the time of local solar noon. The coefficients A, B, C and D were estimated by the least-squares method. The coefficient A for a particular day can be interpreted as an average of all measurements on that day from Brewers #157, #183 or #185.



In the upper figure, the A coefficient obtained from the fit of the daily ozone measurements to 2nd grade polynomial, as suggest Fioletov *at al.*[1] was monthly averaged for each Brewer. The ratio between the mean value of the three coefficient $A_M=(A_{157}+A_{183}+A_{185})/3$ and the particular coefficient of each Brewer can be used as a benchmark to estimate the performance of the instrument. As can be observed, the error is lower than 1% for the period 2005-2015.



The figure on the right shows the error distribution between the daily A coefficient obtained for each Brewer with respect to the mean value $A_D=(A_{157}+A_{183}+A_{185})/3$, calculated only for the days where the three Brewers are operational. As it can be observed, the error distribution presents a good Gaussian profile. This confirms the good stability of the IZO Brewer Triad.

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Ozone data filters:

- Only days with at least 15 measurements distributed between before and after the solar noon, and with standard deviation lower than 0.5 are selected for this study.
- We remove data from Brewer #185 measured during campaigns.
- We remove days with operational errors (tracker problems, etc.)

Summary

► In the period 2005 – 2015, the IZO Brewer Triad presents a good stability, especially in the last 5 years. As can be observed the error is lower than 1%.
► No relevant difference are observed between the 2 and 3 order fits.
► This study has been carried out using ozone measurements available in EUBREWNET's data server.

Acknowledgments

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