RBCC-E Triad

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OUTLINE:

- State of RBCCE Triad

    * Travelling Brewer #185

- Studying the instrumental stability with Fioletov method. (preliminary results)

The ozone retrieved for the brewer can be summarized:

$$X = \frac{F - ETC}{\alpha\mu}$$

The calibration process can be divided in three steps: Instrumental, wavelength and ETC transfer:

· The Instrumental calibration includes all the parameters that affect the measured counts (F): in particular <u>Dead Time, Temperature coefficients and Filter attenuation</u>.

· The wavelength calibration determines the ozone absorption coefficient, or differential absorption coefficient, this procedure called <u>dispersion test</u> obtain the particular wavelength for the instrument and the slit or instrumental function of the instrument.

· Finally the <u>ETC is calculated using Langley method</u> and transfer to other Brewer by comparison with the reference.
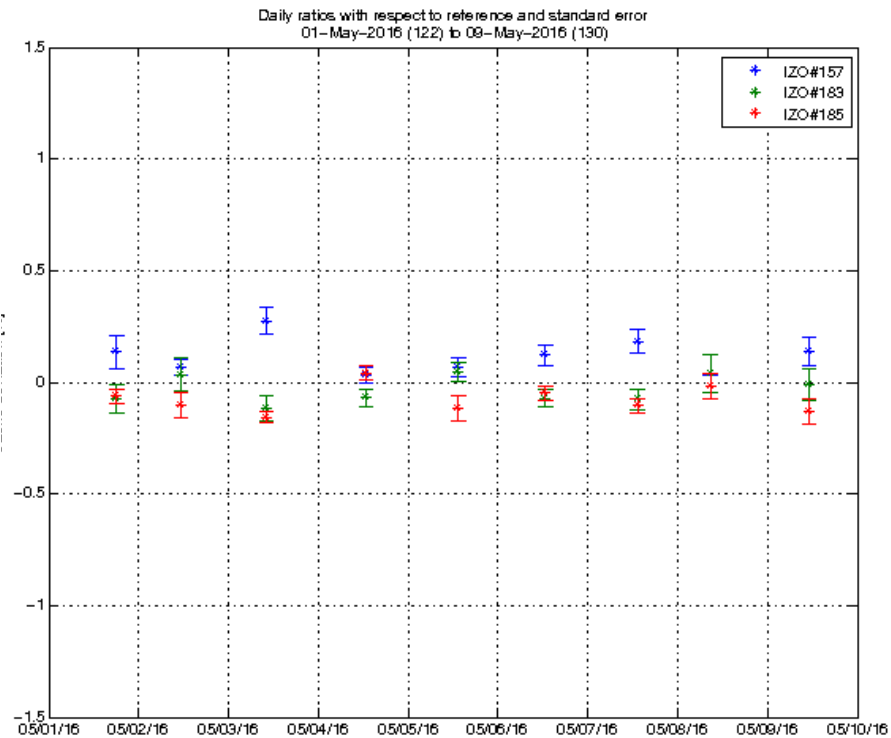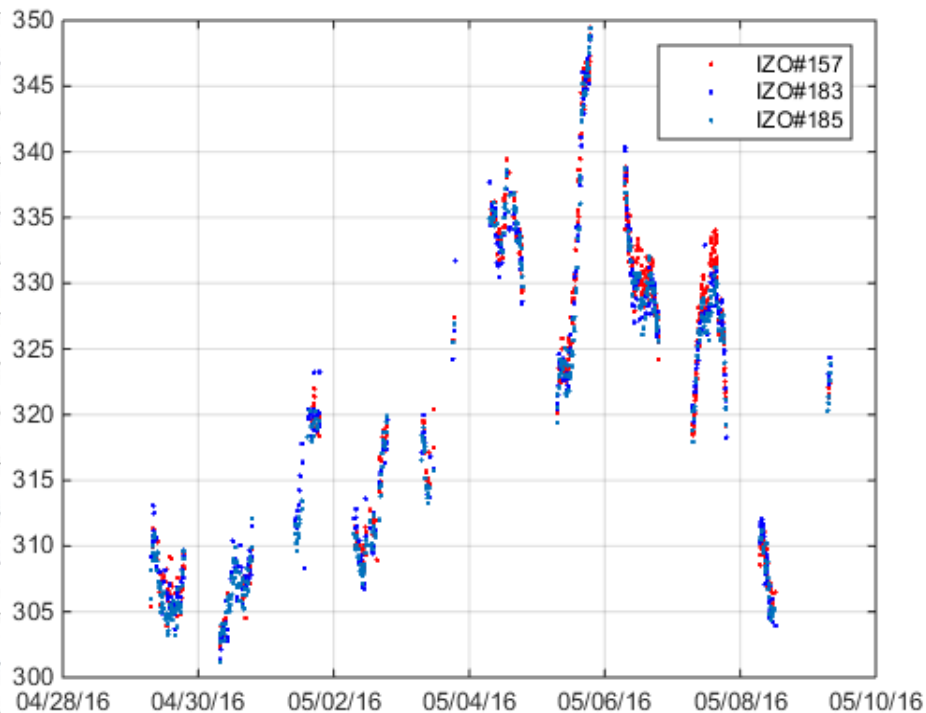
Dead Time Test, DTOAVG.185

Standard Lamp Tests by month, SLOAVG.185
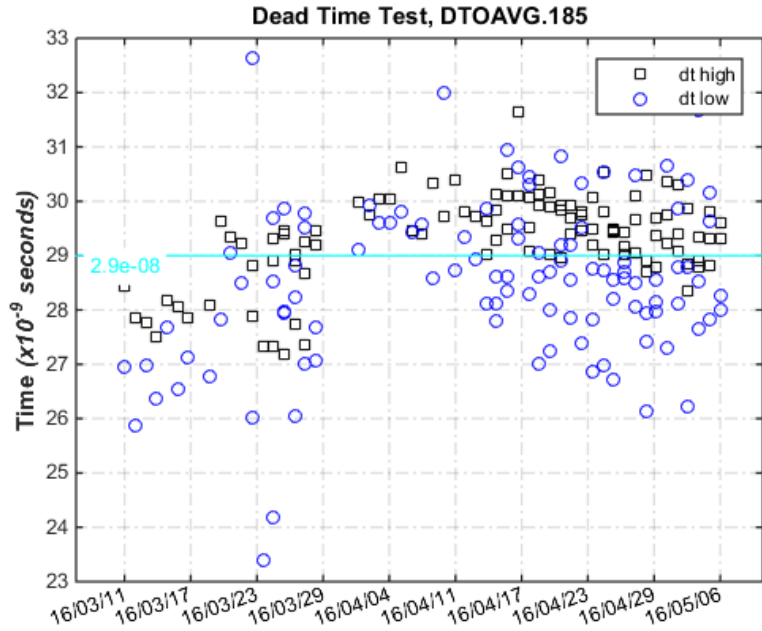
DT Test
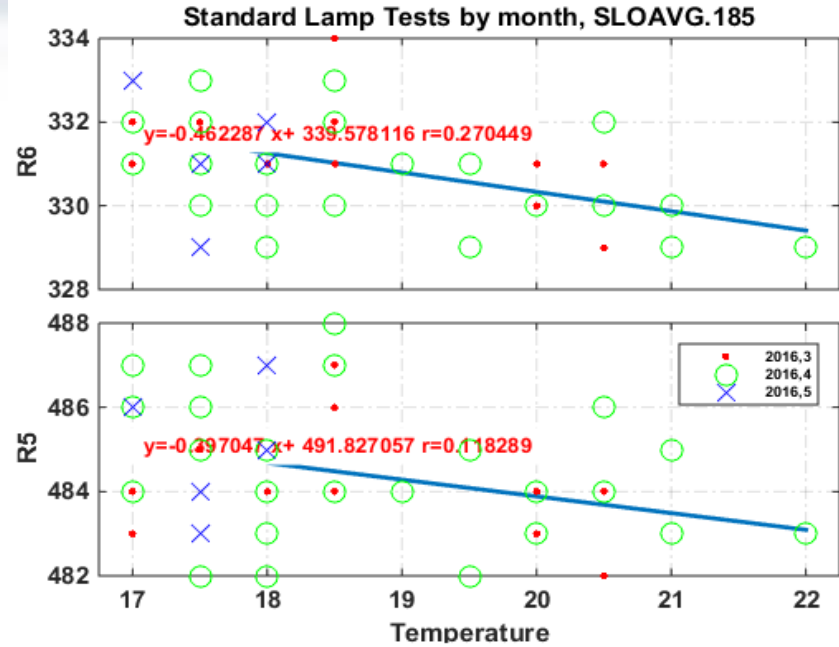
T Dependence
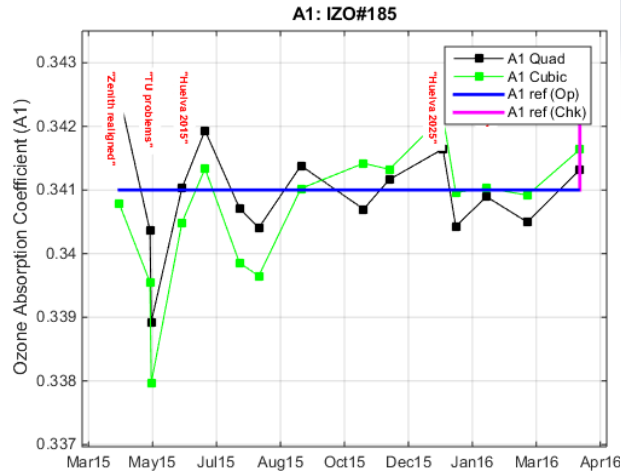
Dispersion Test

DSP Analysis: Brewer IZO#185

	CSN	wl_0	wl_2	wl_3	wl_4	wl_5	wl_6	A1 quad.	A1 cubic	A1 Cfg.
20-Apr-2015	1020.0000	−0.0402	−0.0956	−0.0878	−0.1526	−0.0162	−0.1519	0.3425	0.3408	0.3410
14-May-2015	1020.0000	−0.0334	−0.0252	−0.0436	−0.1061	−0.0607	−0.0716	0.3404	0.3396	0.3410
15-May-2015	1020.0000	−0.0130	−0.0603	−0.0350	−0.1150	−0.0801	−0.0760	0.3389	0.3380	0.3410
08-Jun-2015	1020.0000	−0.0513	−0.1025	−0.0386	−0.1794	0.0113	−0.0698	0.3410	0.3405	0.3410
26-Jun-2015	1020.0000	−0.0782	−0.0910	−0.0386	−0.1003	−0.0015	−0.0638	0.3419	0.3413	0.3410
23-Jul-2015	1020.0000	−0.0794	−0.1058	−0.0444	−0.0750	−0.0244	−0.0726	0.3407	0.3399	0.3410
07-Aug-2015	1020.0000	−0.0913	−0.0546	0.0129	−0.0950	−0.0224	−0.0894	0.3404	0.3396	0.3410
09-Sep-2015	1020.0000	0.2143	0.0121	−0.0265	−0.0699	−0.0052	−0.0395	0.3414	0.3410	0.3410
28-Oct-2015	1020.0000	0.0074	0.0257	0.0182	−0.0087	0.0210	0.0504	0.3407	0.3414	0.3410
17-Nov-2015	1020.0000	−0.0739	−0.0645	0.0003	−0.0358	−0.0160	0.0096	0.3412	0.3413	0.3410
29-Dec-2015	1020.0000	−0.0115	−0.0067	0.0459	0.0212	0.0196	0.0315	0.3416	0.3422	0.3410
08-Jan-2016	1020.0000	−0.0457	−0.0130	0.0726	0.0282	0.0605	0.0205	0.3404	0.3410	0.3410
01-Feb-2016	1020.0000	−0.0590	−0.0688	0.0080	−0.0222	0.0033	0.0019	0.3409	0.3410	0.3410
04-Mar-2016	1020.0000	−0.0847	−0.0641	0.0057	−0.0250	−0.0007	0.0297	0.3405	0.3409	0.3410
14-Apr-2016	1020.0000	−0.0717	−0.0478	0.0046	−0.0500	−0.0097	0.0154	0.3413	0.3416	0.3410

A1: IZO#185

Langley plot (Apr.01,2016 – Apr.29,2016): IZO#185, airmass range = [1.15, 3.75], Config = config185

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DSP Analysis: Brewer IZO#185
            |      CSN |    wl_0 |    wl_2 |    wl_3 |
20-Apr-2015 | 1020.0000 | -0.0402 | -0.0956 | -0.0878 |
14-May-2015 | 1020.0000 | -0.0334 | -0.0252 | -0.0436 |
15-May-2015 | 1020.0000 | -0.0130 | -0.0603 | -0.0350 |
08-Jun-2015 | 1020.0000 | -0.0513 | -0.1025 | -0.0386 |
26-Jun-2015 | 1020.0000 | -0.0782 | -0.0910 | -0.0386 |
23-Jul-2015 | 1020.0000 | -0.0794 | -0.1058 | -0.0444 |
07-Aug-2015 | 1020.0000 | -0.0913 | -0.0546 |  0.0129 |
09-Sep-2015 | 1020.0000 |  0.2143 |  0.0121 | -0.0265 |
28-Oct-2015 | 1020.0000 |  0.0074 |  0.0257 |  0.0182 |
17-Nov-2015 | 1020.0000 | -0.0739 | -0.0645 |  0.0003 |
29-Dec-2015 | 1020.0000 | -0.0115 | -0.0067 |  0.0459 |   0.0212 |   0.0196 |   0.0315 |   0.3416 |   0.3422 |   0.3410
08-Jan-2016 | 1020.0000 | -0.0457 | -0.0130 |  0.0726 |   0.0282 |   0.0605 |   0.0205 |   0.3404 |   0.3410 |   0.3410
01-Feb-2016 | 1020.0000 | -0.0590 | -0.0688 |  0.0080 |  -0.0222 |   0.0033 |   0.0019 |   0.3409 |   0.3410 |   0.3410
04-Mar-2016 | 1020.0000 | -0.0847 | -0.0641 |  0.0057 |  -0.0250 |  -0.0007 |   0.0297 |   0.3405 |   0.3409 |   0.3410
14-Apr-2016 | 1020.0000 | -0.0717 | -0.0478 |  0.0046 |  -0.0500 |  -0.0097 |   0.0154 |   0.3413 |   0.3416 |   0.3410
```

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Relative error Brewer's Triad

Relative error Brewer's Triad
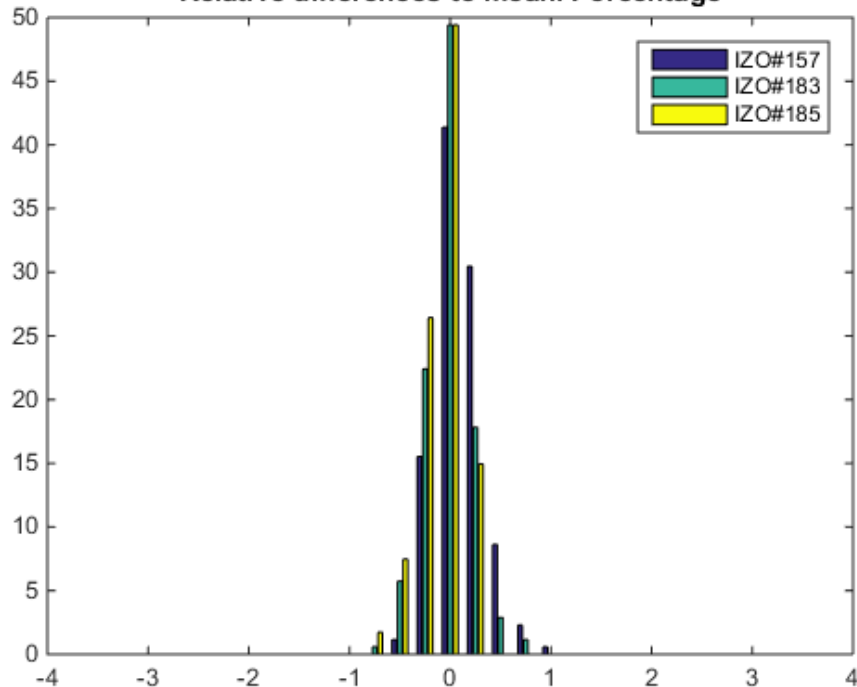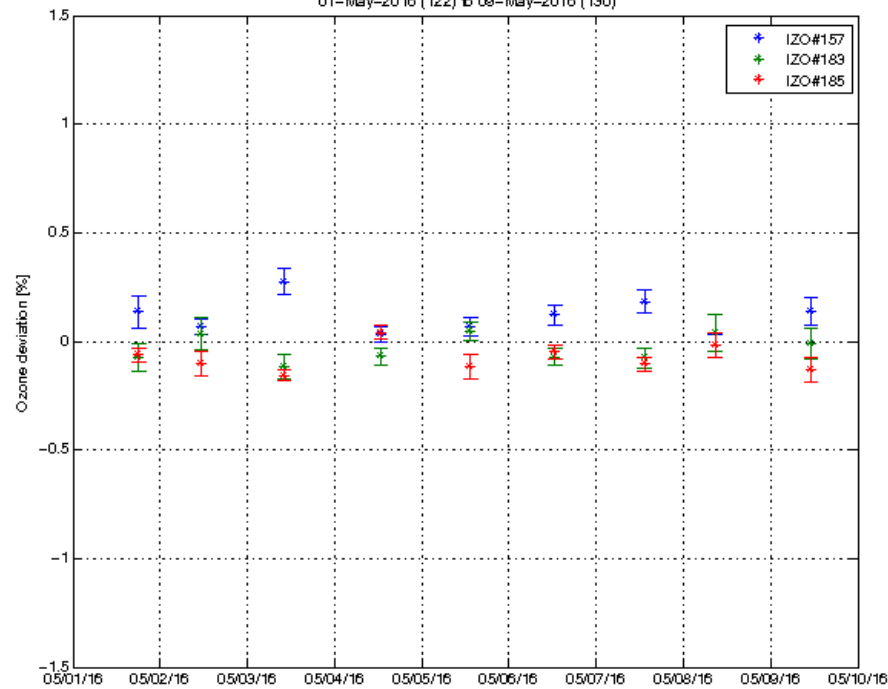
Conclusions:

IZO Triad

- The brewers present good stability

- Brewer # 185 has an excellent behavior and it is ready for Arosa/Davos Campaign.

Conclusions:

IZO Triad

- The brewers present good stability

- Brewer # 185 has a stable behavior at one month from Arosa/Davos Campaign.

More information about IZO Triad, please visit our webpage:

http://rbcce.aemet.es/svn/iberonesia/RBCC_E/2016/html/month05/comp_monthly.html

http://rbcce.aemet.es/svn/iberonesia/RBCC_E/2016/html/week19/comp_weekly.html

http://rbcce.aemet.es/svn/iberonesia/RBCC_E/2016/html/week19/weekly_157.html

http://rbcce.aemet.es/svn/iberonesia/RBCC_E/2016/html/week19/weekly_183.html

http://rbcce.aemet.es/svn/iberonesia/RBCC_E/2016/html/week19/weekly_185.html

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Fioletov Method

- The daily ozone is fitting a 2do grade polynomial

$$O_3 = A + B(t - t_0) + C(t - t_0)^2$$

t$_0$= local solar noon

t = time measurement

- The A coefficient are used to find discrepancies in the ETC and O$_3$ absorption values.
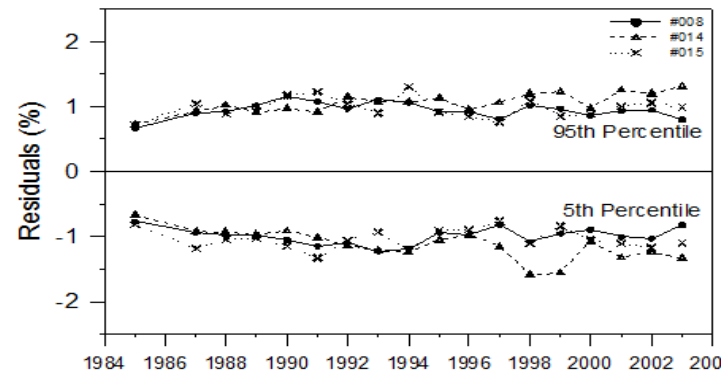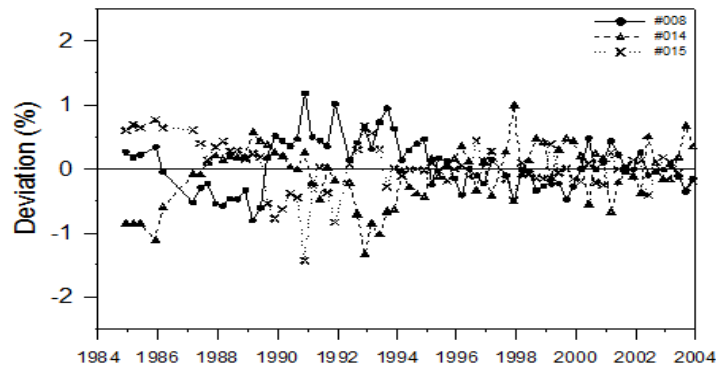
V.E. Fioletov et al., "The Brewer Reference Triad", Geophysical Research Letters 32, L20805 (2005)

Fioletov Method (IZO Triad)

The daily ozone is fitting a 2do and 3th grade polynomial

$$O_3 = A + B(t - t_0) + C(t - t_0)^2$$

$$O_3 = A + B(t - t_0) + C(t - t_0)^2 + D(t - t_0)^3$$
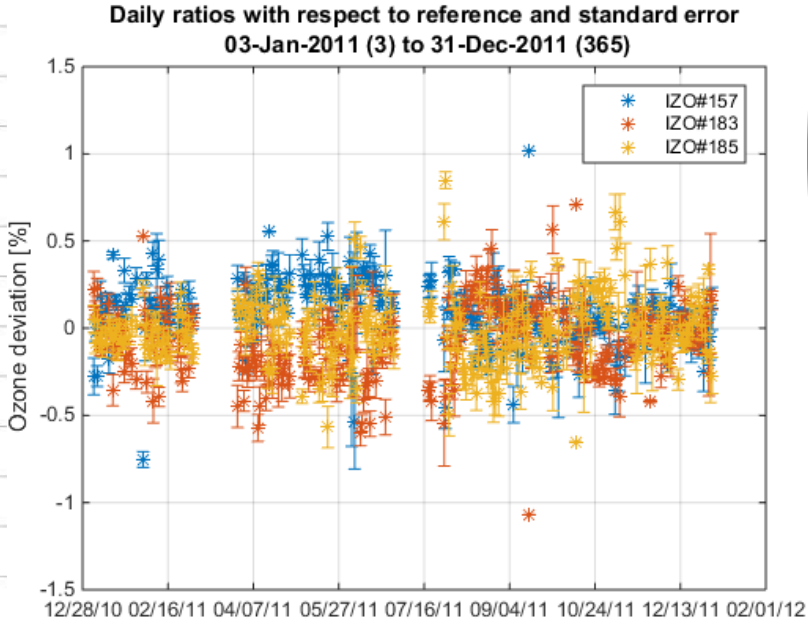
t$_0$= local solar noon

t = time measurement

Single measurements meet following requirements:
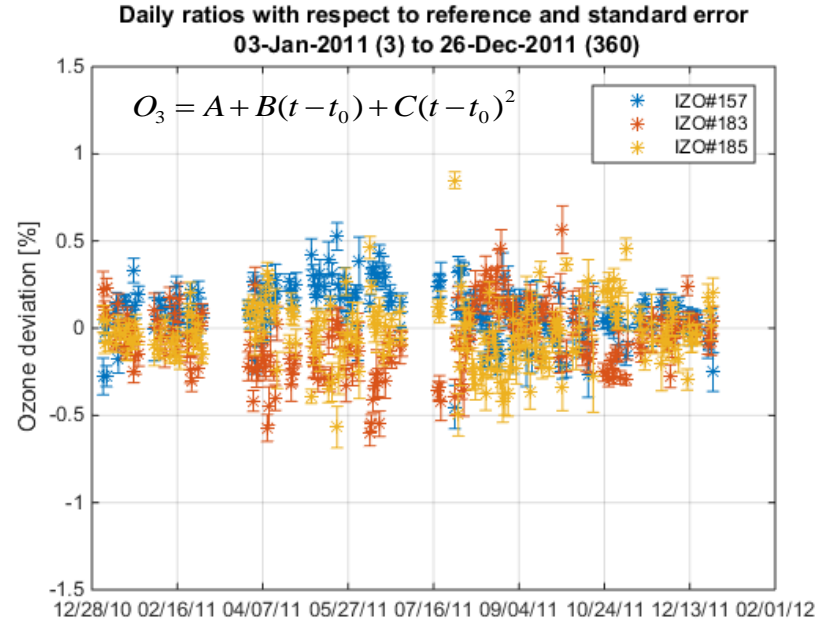
- Std ≤ 2.5 DU and μ ≤ 5.0
- Outliers are removed: automatic + visual checks
- Quasi simultaneous measurements for **Three Brewers**:
    ΔT ≤ 5 minutes, Δμ ≤ 0.05, (outliers removed)
- Only days with DS before and after of local solar noon

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Fioletov Method (IZO Triad)

applying our conditions

Daily ratios with respect to reference and standard error
03-Jan-2011 (3) to 31-Dec-2011 (365)

All DS

Daily ratios with respect to reference and standard error
03-Jan-2011 (3) to 26-Dec-2011 (360)

$$O_3 = A + B(t - t_0) + C(t - t_0)^2$$

Only DS which satisfy our conditions

Fioletov Method (IZO Triad)

Preliminary results:
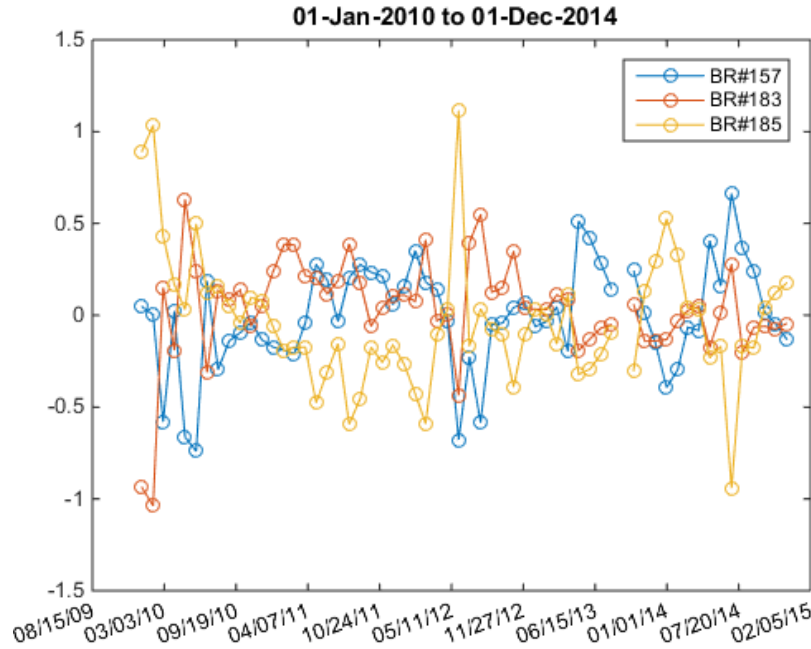
*www.**ozone**-symposium-2016.org/*

Conclusions:

IZO Triad

- The brewers present good stability

- Brewer # 185 has a stable behavior at one month from Arosa/Davos Campaign.

Fioletov Method and IZO Triad (preliminary results)

Median deviation of individual brewer toward triad for total column are ± 0. 5 %

Good inter-instrument coherence during 2010-2015.

The preliminary results have identified changes in the instrumental calibration which was detected by Langley method, previously. This changes are being studied.
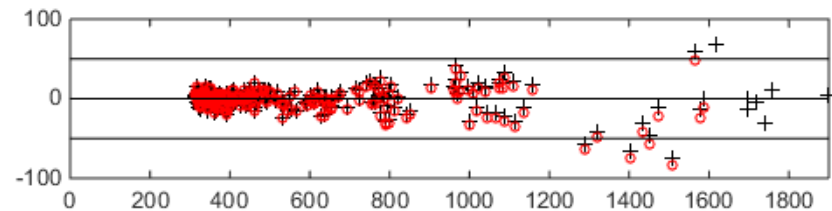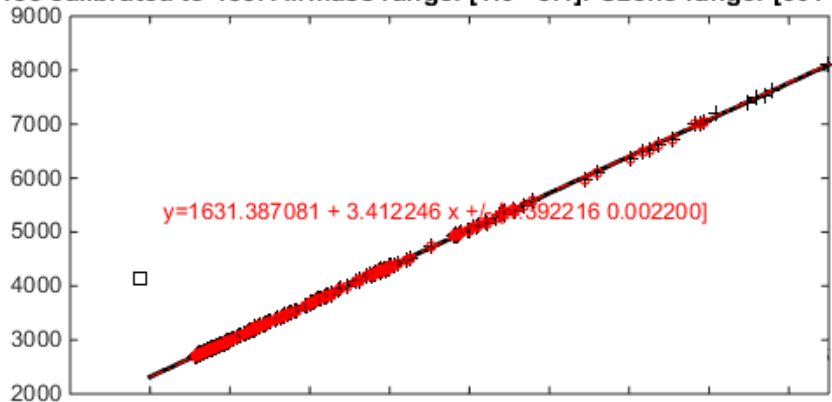
The RBCC-E Team

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Thanks for your attention

183 calibrated to 185. Airmass range: [1.0 - 5.1]. Ozone range: [301 - 346]

y=1631.387081 + 3.412246 x +/- [0.392216 0.002200]

(183 - 185) / 185