Aerosol Optical Depth in EUBREWNET

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Outline

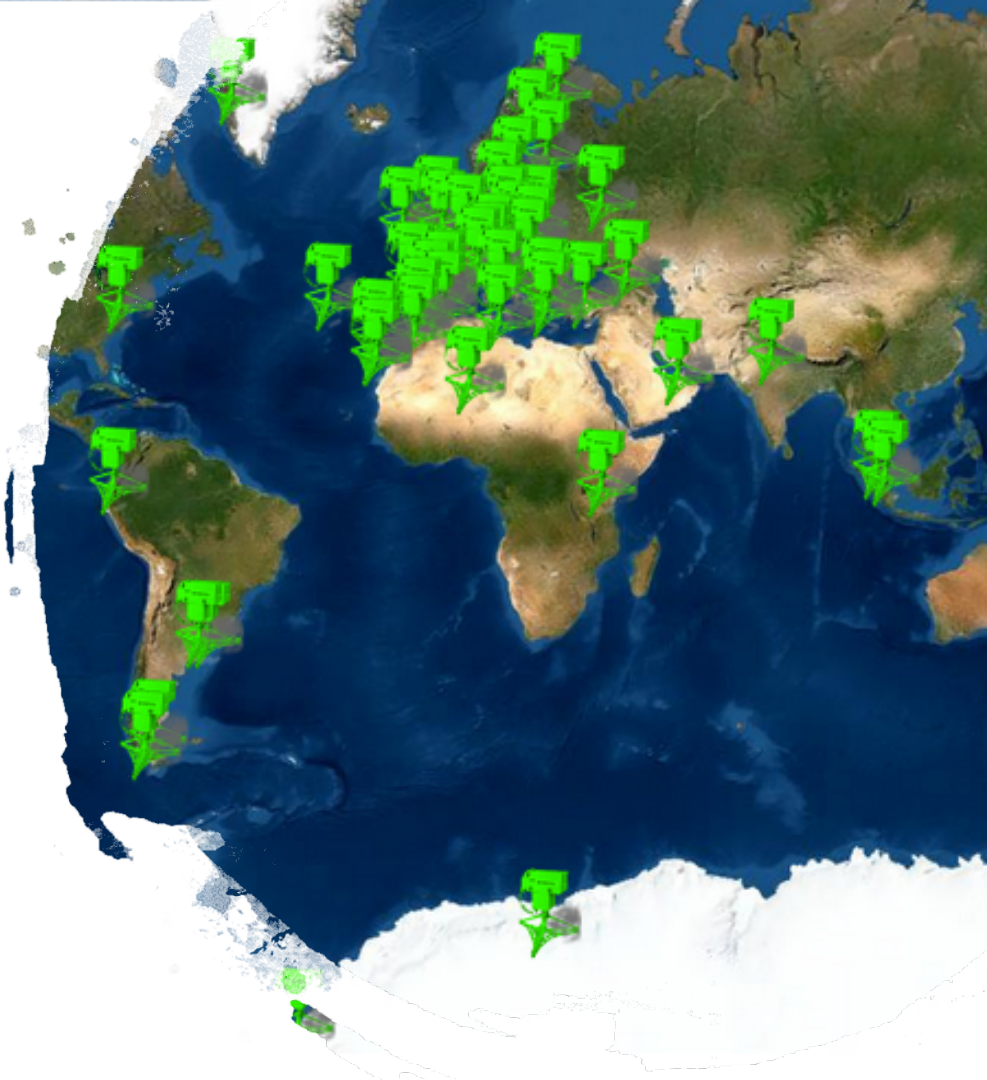
- EUBREWNET
- AOD in EUBREWNET
- AOD Measurements
- RBCC-C calibrations

High A
Spain)

EUBREWNET

- A spatially consistent network of Brewer Ozone Spectrophotometers providing O3,SO2, UV and AOD.
- European network developed on the COST action (2013-2017) with now with 70 spectrometers and 61 stations around the world and growing.

- QA/QC observations are central processed and distributed in AEMET
- Fiducial Reference Network for satellite validation (ESA) , Air Quality Copernicus CAMS and Copernicus Climate Studies



The brewer spectrometer: Canadian instrument developed in the 80's as Dobson replacement for ozone measurment.

-O3, SO2, Spectral UV, AOD and ozone profiles (Umkher).

Weather Services and Universities and Research Institutes 50 instruments around Europe independently managed.

Own processed data submitted to WOUDC and NDACC.

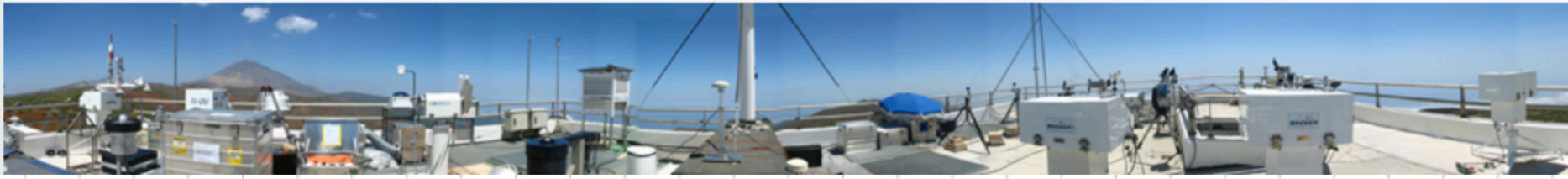
Two private calibration companies.

Past II

The Eubrewnet are based on the iberonesia application developed since 1999 to support the Spanish / Portuguese brewers.

In 2008 were updated to IBERONESIA 2.0 with the objective to give support to the Regional Brewer Calibration Center-Europe (RBCC-E) campaigns (ESA-CALVAL funded)

The support of the RBCC-E were transferred to EUBREWNET application since 2015 EUBREWNET/ RBCC-E campaign in Huelva.



Version 1 & 2

Level 0

EuBrewNet Central processing and QA/QC

Level 1.0 Operator only

Level 1.5 NRT. Level 1.6 interim. Available to user

Level 2.0 Final. Highest quality

Level 0

Calibration and characterisation

WOUDC Archive. Contributors only

O3, UV, AOD. Available to user WOUDC, NDACC and EVDC

Documentation: http://rbcce.aemet.es/dokuwiki/doku.php?id=start

Open Project: Source code on free access :
https://bitbucket.org/rbcc_e/iberonesia3-git/src/master/

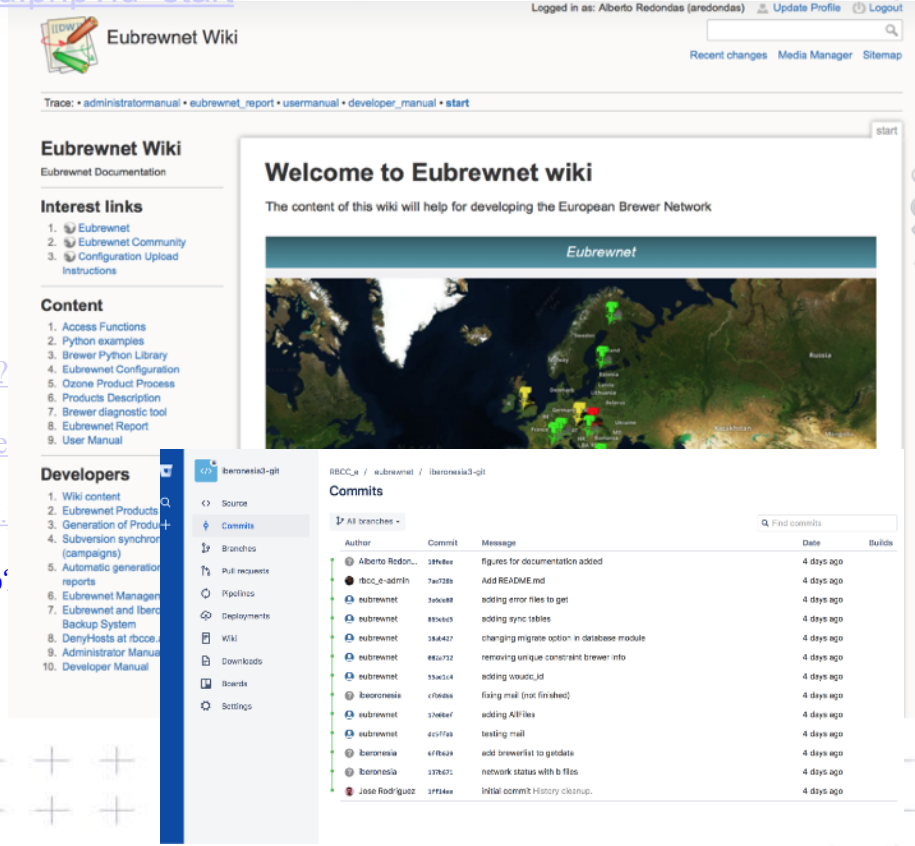
Eubrewnet manuals

System Description http://rbcce.aemet.es/dokuwiki/doku.php?

User Manual :http://rbcce.aemet.es/dokuwiki/doku.php?id=code

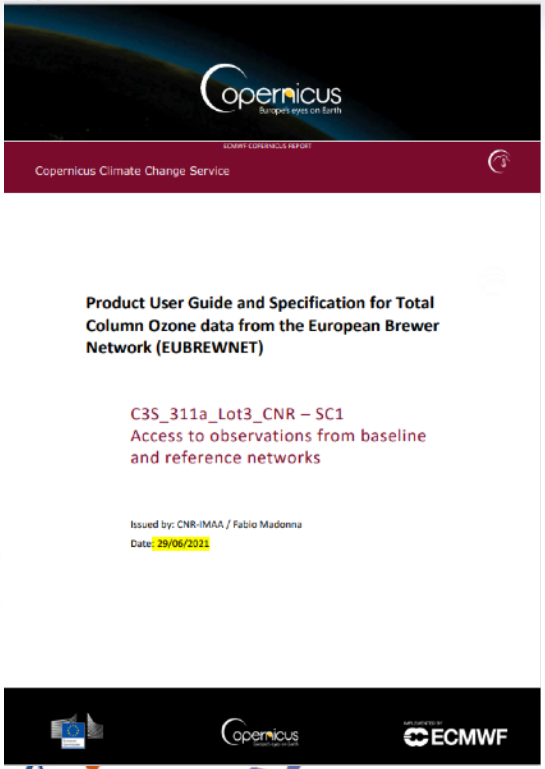
Administrador Manual http://rbcce.aemet.es/dokuwiki/doku.

Developer Manual : http://rbcce.aemet.es/dokuwiki/doku.php'



by Ilias Fountoulakis, Bentorey Hernández , Javier Lopez, Alberto Berjon

Fiducial Reference Network for satellite validation (ESA) , Air Quality Copernicus CAMS and Copernicus Climate Studies



EUBREWNET Maturity index matrix

H2020 GAIA-CLIM (www.gaia-clim.eu)

Metadata	Documentation	Uncertainty characterization	Public access, feedback and update	Usage	Sustainability	Software (optional)
Standards	Formal Description of Measurement Methodology	Traceability	Access	Research	Siting environment	Coding standards
Collection level	Formal Validation Report	Comparability	User feedback mechanism	Public and commercial exploitation	Scientific and expert support	Software documentation
File level	Formal Measurement Series User Guidance	Uncertainty Quantification	Updates to record		Programmatic support	Portability and numerical reproducibility
		Routine Quality Management	Version control			Security
			Long term data preservation			

Legend						
1	2	3	4	5	6	Not applicable

Agencia Estatal de Meteorología

Network for the Detection of Atmospheric Composition Change

NDACC | STATIONS | INSTRUMENTS | DATA | ABOUT NDACC

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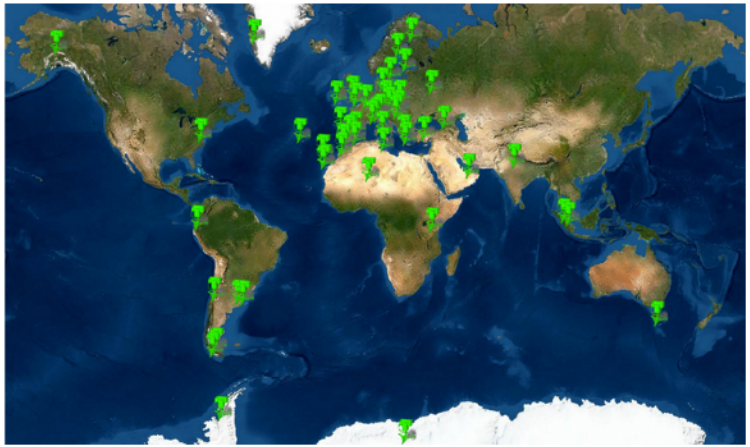
- About NDACC
- NDACC Perspectives
- NDACC History
- News and Events
- Publications
- Contact Us

European Brewer Network (EUBREWNET)

EuBrewNet Website



1349px

http://www.ndaccdemo.org/about/cooperating-networks/european-brewer-network

https://woudc.org/data/explore.php

Select Dataset, Station, Instrument, Time Period

Dataset

EUBREWNET

Country Optional

...

Station Optional

Izaña (Tenerife) (300)

Instrument Optional

...

Start

1924

End

2022

Set Your Map Extent

▸ How to Use: Interactive Map

DOI

- Permanent location and landing page will be provided by NILU, on behalf of EVDC, through the DataCite metadata service.

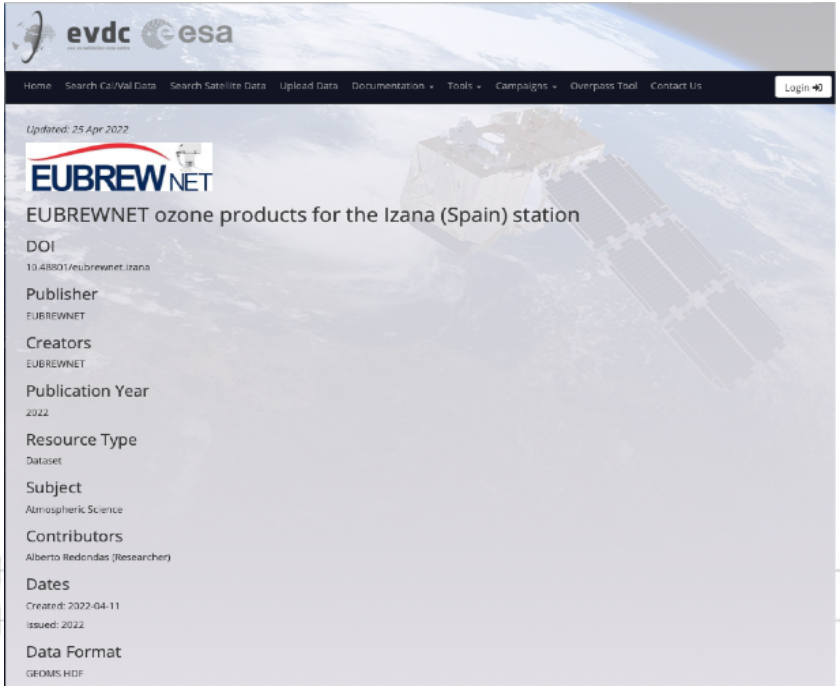
- EUBREWNET reports the metadata needed to generate the DOI and landing page:
  https://rbcce-test.aemet.es/eubrewnet/metadata/active_dois.json

- Granularity: One DOI for **each product** (O3, UV, AOD) from **each station**.

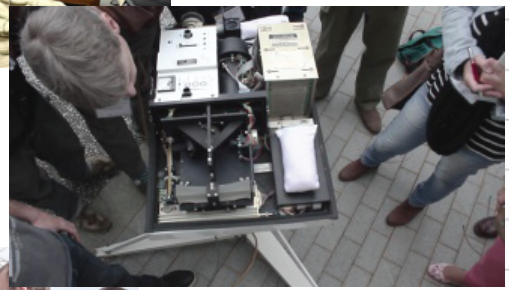
- The DOI is assigned to a ”collection” will not change when the data are processed and updated.
- The metadata will follow the ESA/AVDC guidelines (http://evdc.esa.int/documentation/doi-docs/), except the rights (copyright info) all the information is already on the database.

DOI, landing page (on develop)

https://evdc.esa.int/publications/eubrewnet-ozone-products-for-the-izana-spain-station/



- Operator training Courses.
  - Tenerife, March 2014
  - Huelva , June 2015
  - Edinburgh, Sept 2016
  - Sydney, Sept 2017
  - Huelva, June 2019
  - Online , June 2020/June 2021
  - Brasil, Jan 2024 ?
  - South America 2024?



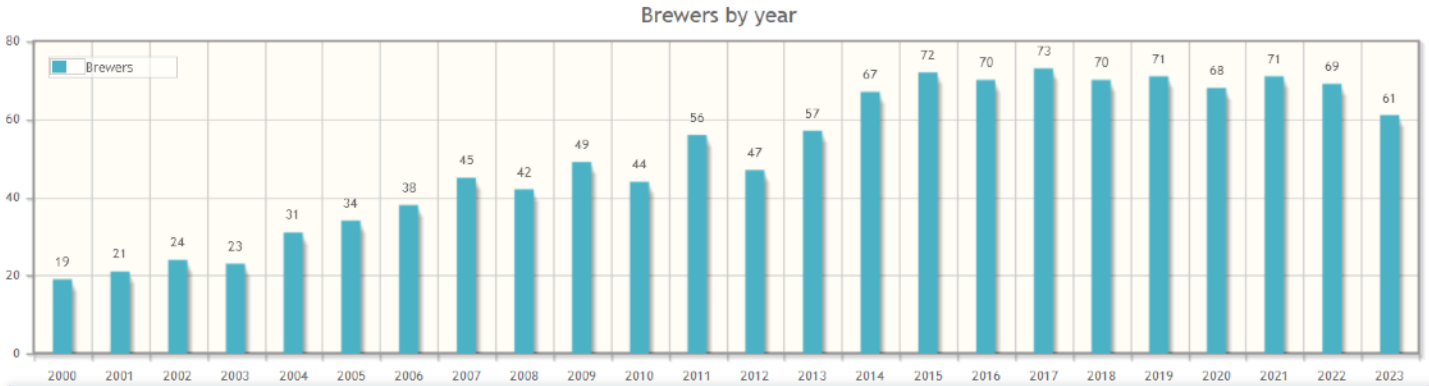
How EuBrewNet supports monitoring in A5 countries.

- The operator courses cover care and maintenance, scheduling, principles of operation and data management.
- The importance of regular calibration is emphasised.
- Calibration data can be stored in EuBrewNet database.
- Software can be installed to enable automatic transfer of raw data to the EuBrewNet database for QA/QC and processing into NRT products.
- Once set up **– *higher submission rates***.

Select One Stat

- B Files
- Direct Sun Measurements
- Zenith Sky Measurements
- Standard Lamp Measurements
- Focused Moon Measurements
- FZ Measurements
- DZ Measurements
- UV Measurements

Eubrewnet Stats

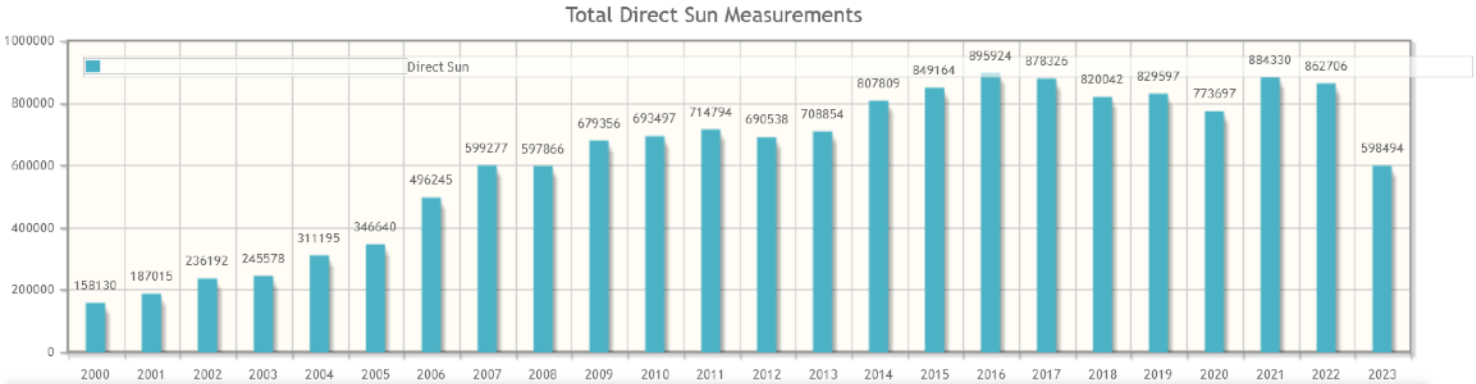


2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
38	45	42	49	44	56	47	57	67	72	70	73	70	71	68	71	69	61

Select One Stat

- B Files
- Direct Sun Measurements
- Zenith Sky Measurements
- Standard Lamp Measurements
- Focused Moon Measurements
- FZ Measurements
- DZ Measurements
- UV Measurements

Eubrewnet Stats



2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
693497	714794	690538	708854	807809	849164	895924	878326	820042	829597	773697	884330	862706	598494

Select One Stat

B Files

Direct Sun Measurements

Zenith Sky Measurements

Standard Lamp Measurements

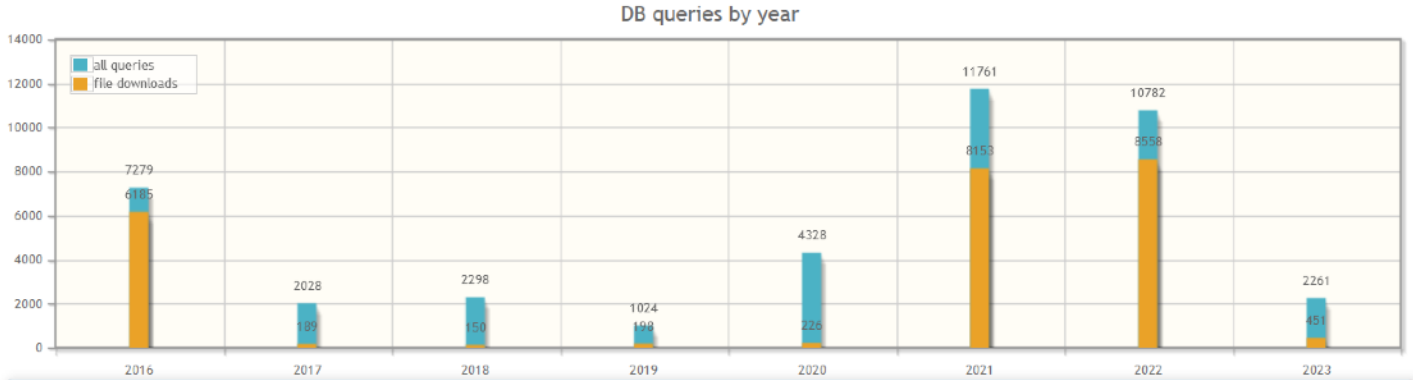
Focused Moon Measurements

FZ Measurements

DZ Measurements

UV Measurements

Eubrewnet Stats



DB queries by year: 65871

Year	2016	2017	2018	2019	2020	2021	2022	2023
all queries	7279	2028	2298	1024	4328	11761	10782	2261
file downloads	6185	189	150	198	226	8153	8558	451

New products and functions

- Ozone uncertainty determination
- UV level 1.6 using SHICrivm
- UV level 2.0 using BUVIC
- AOD-specific (JG) measurements
- Calibration tools (langley & filters)

AOD

GOBIERNO DE ESPAÑA
VICEPRESIDENCIA CUARTA DEL GOBIERNO
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO
AEMet Agencia Estatal de Meteorología

For all the details, see

Atmos. Chem. Phys., 18, 3885–3902, 2018
https://doi.org/10.5194/acp-18-3885-2018

Atmospheric Chemistry and Physics
Open Access
EGU

Aerosol optical depth in the European Brewer Network

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AOD

Aerosol Optical Depth

Extra-terrestrial constant

Corrected counts/s

Bass & Paur absorption coefficients

Station's pressure

Rayleigh airmass

$$\tau_a(\lambda) = \frac{1}{m_a}\{\log_e I_0(\lambda) - \log_e I(\lambda) - X_o k_o(\lambda) m_o - \frac{p}{1013}\tau_{R0}(\lambda) m_R\}$$

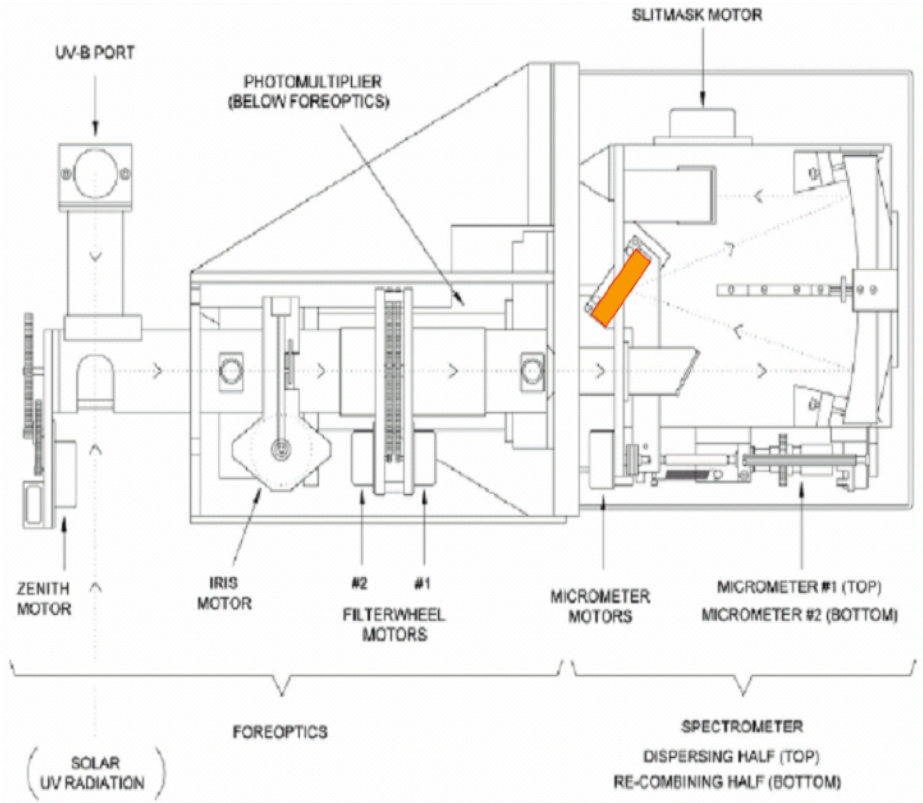
Aerosol airmass approximated by the Rayleigh airmass

Ozone with Nicolet's Rayleigh

Ozone airmass

Rayleigh optical depth

Modified Ebert Grating Spectrometer with photon counting detection and six exit slits



Basic design features:

- Spectral purity
- Wavelength step 0.0075 nm/step
- Passive temperature compensation
- High wavelength stability

From Julian

AOD mode

Brewer op mode	Ozone	UV	AOD
grating	Fixed at O3 position	Rotating	Rotating to fix positions
slit	6 quasi simultaneous	#1 and #5	6
FOV	~2	2pi	2
Attenuation	ND automatic	ND fixed	automatic
Temperature , correction	From Lamp ratios	Not implemented	
Measurement	Relative (Ratios)	Absolute	Absolute
Calibration	Travelling Langley	Lamp	Travelling / Langley
QA/QC	Travelling RBCC-E	Travelling (QASUME)	

Potential wavelengths for AOD-specific measurements

Micrometer pos., slit no.	Wavelength (nm)	Micrometer pos., slit no.	Wavelength (nm)
1, 0	311	3, 0	339
1, 2	314	3, 2	342
1, 3	318	3, 3	345
1, 4	321	3, 4	348
1, 5	324	3, 5	351
1, 6	327	3, 6	354
2, 0	326	4, 0	349
2, 2	328	4, 2	351
2, 3	332	4, 3	355
2, 4	335	4, 4	358
2, 5	338	4, 5	360
2, 6	341	4, 6	363

	Ozone calibration	AOD calibration
	- Instrumental	- Instrumental
	○ DT	○ DT
	○ TC (Relative)	○ TC (Absolute)
	○ Filter no linearity (Ratios)	○ Filter Matrix
	○	○ Polarization
	- Wavelegth Calibration	- Wavelength Calibration
	○ Ozone absortion coeffients	○ Ozone
	○ SO2	○ SO2
	○ Rayleigh	○
	- ETC transfer	-
	○ Langley (double ratio)	○ Langley (wv)
	○ Transfer From Reference	○ Transfer From Reference
	- Ratios-> No absolute calibration needed	- Relative calibration for AOD
		-

AOD

$I_0(\lambda)$: Langley-plot method at Izaña or calibration transfer during the RBCC-E Intercomparison campaigns

Aerosol Optical Depth

$I_0(\lambda)$ + filter correction

- stored as a single matrix
- "real" space, counts/second

For example:

8.24E+07 6.13E+07 (λ#1, f#2) (λ#1, f#3) ...
6.33E+07 4.72E+07 (λ#2, f#2) (λ#2, f#3) ...
(λ#3, f#0) (λ#3, f#1) (λ#3, f#2) (λ#3, f#3) ...
... ...

Ozone

ETC and "ETC filter correction"

- stored by separate
- Brewer log space

For example:

1616 and [0, 0, 0, 5, 8, 0]
f#0 f#1 f#2 f#3 f#4 f#5

AOD: JG

Direct-Sun measurements at different micrometer steps

Source code:

```
10000 REM ***************** jg routine 16/04/19 *********************
55555 ' 4 feb 2014 Julian, based on original js . jump scan for aod retrieval, to be used after ds
55555 ' 4 oct 2014 Alberto, based on original js . Add slit 7 for DT calculation
55555 ' 12 Jan 2016 Added Summary in line 13005
55555 ' 16 Apr 2019 Added check for extended range. Volodya
55555 ' *** Setup ***
55555 '
11010 DATA jg
11020 TR$="d"+"s":UC%=0
11028 IF TYP$="mkii" or (TYP$="mkiv" AND ZERO+VAL(MC$)>3000) OR (TYP$="mkiv" AND Q9%=0) THEN XR%=0 ELSE XR%=1
11030 IF VAL(SQ$)<128 AND M2<2 THEN SQ$="128"
11050 GOSUB 6610:IF MDD$="o3" THEN GOSUB 6630 ELSE GOSUB 6636   'Filter#1 to 1 or 4
11060 M5$=SQ$:GOSUB 6650                    'Filter#2 to SQ$
11070 GOSUB 6690:GOSUB 7750                 'Iris closed, ZE to zenith
11080 LOCATE ,SP:PRINT "4 - Point Brewer at zenith"
11090 GOSUB 9650          'Wait until ready, test intensity
12000 '
12001 ' *** Take Set of Observations ***
12002 '
12010 GOSUB 2450:CZ$="10":GOSUB 9700
12020 GOSUB 8000:MS(0)=11:DS%=0
12025 GOSUB 21000    ' move to 1st pos
12030 GOSUB 7500:SQ$=M5$:CZ$="5":GOSUB 9700
```

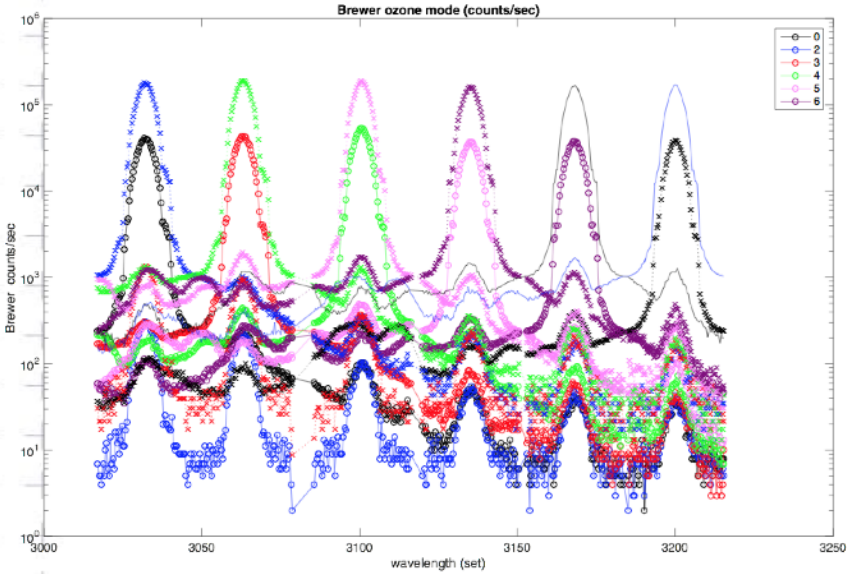
B-file:

```
08:58:37
jg: Running jg from o319722a line -67.03

hk
08:58:44
 27
 30
 27
 14
 4.24
-99
-38

jg
a
192
 539.34
0
6
5
 84888
 31
 122857
 176112
 228198
 300241
 388081
rat
 27.1411
 29.99208
 26.66594
 2090

jg
```

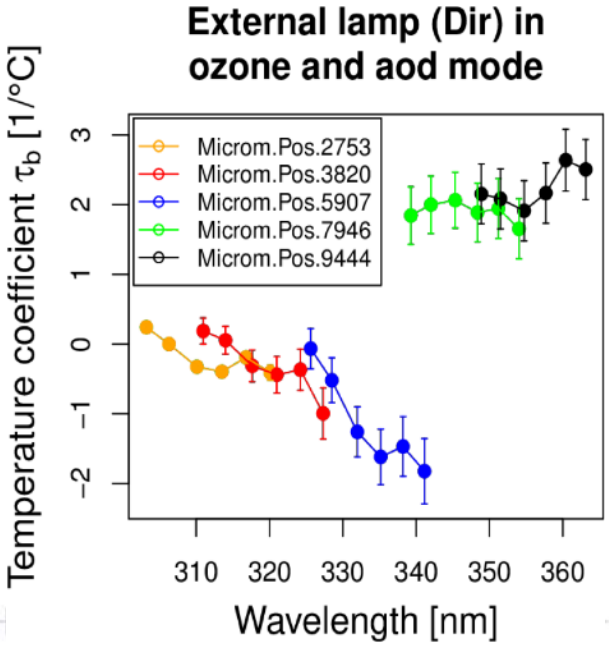
Counts

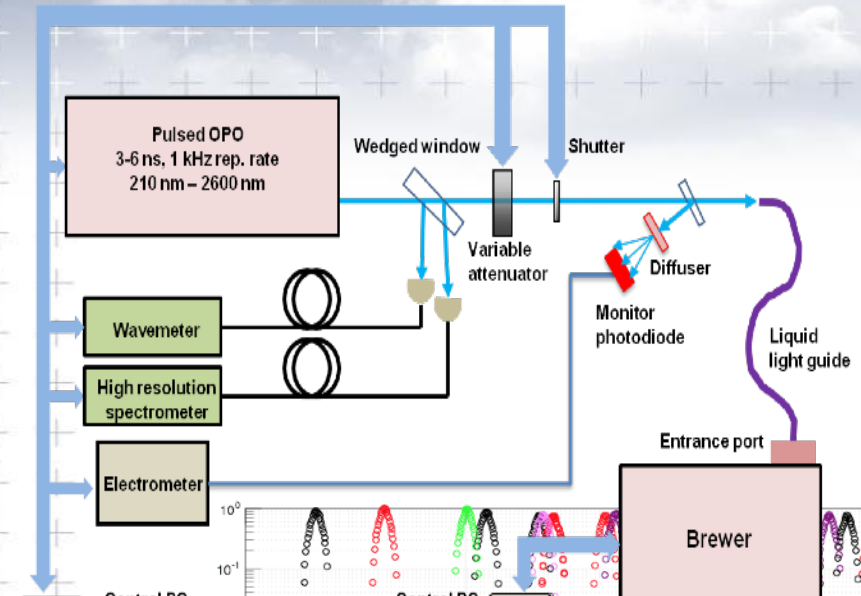
Mic step

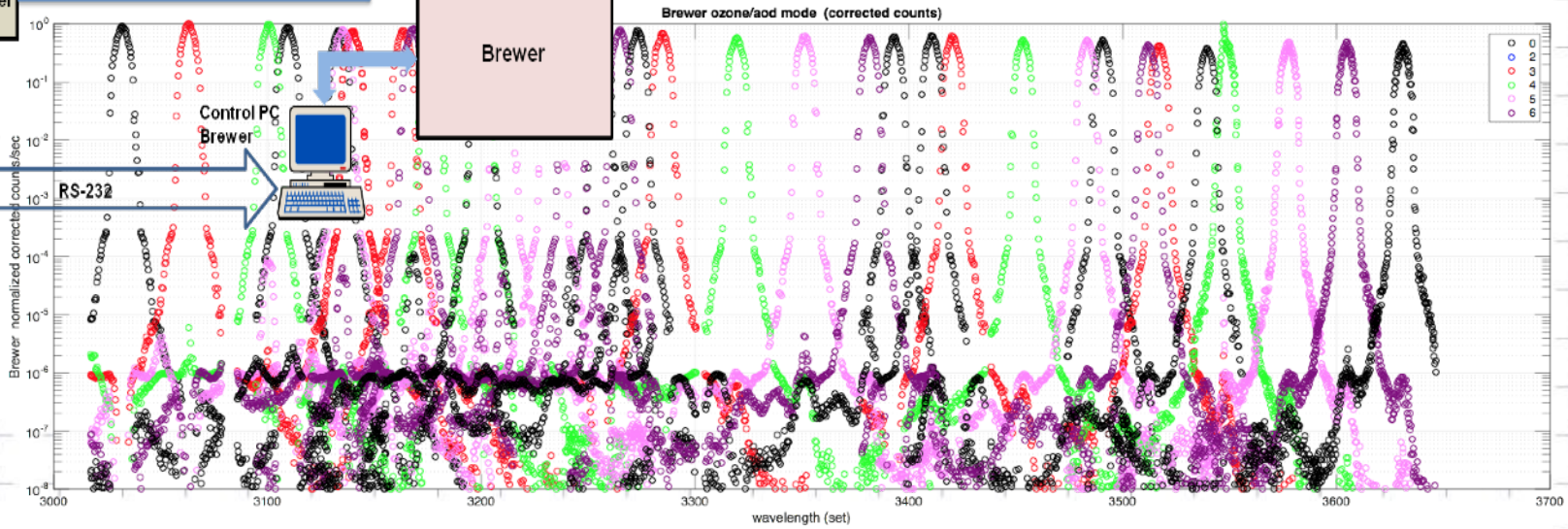
Wavelength Calibration (Redondas *et al.*, 2018)



Temperature analysis (Berjón *et al.*, 2016, https://presentations.copernicus.org/QOS2016/QOS2016-110_presentation.pdf)

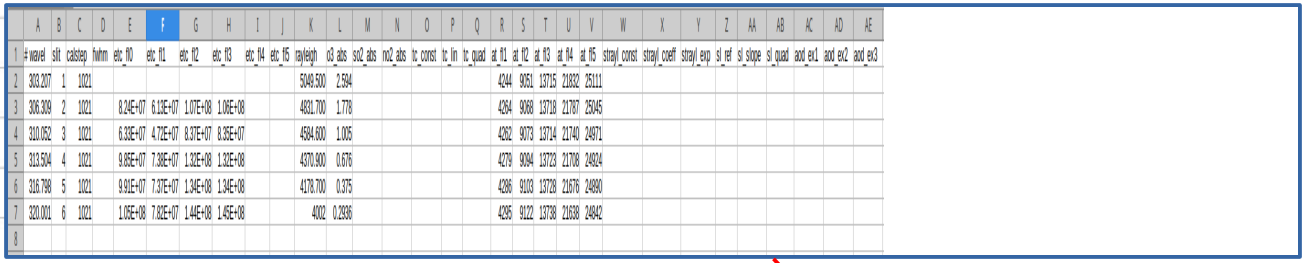



Pulsed OPO
3-6 ns, 1 kHz rep. rate
210 nm – 2600 nm
Wedged window
Shutter
Variable attenuator
Diffuser
Monitor photodiode
Liquid light guide
Wavemeter
High resolution spectrometer
Electrometer
Entrance port
Brewer
Control PC laser setup
Control PC Brewer
RS-232


Brewer ozone/aod mode (corrected counts)
Brewer normalized corrected counts/sec
wavelength (set)
0
2
3
4
5
6

Calibrations and data

Calibration file: just a CSV with one row for each wavelength (only ozone DS ones for now) and a lot of columns (many of them not used yet!)



# wavel	slit	calstep	fwhm	etc_f0	etc_f1	etc_f2	etc_f3	etc_f4	etc_f5	rayleigh	o3_abs	so2_abs	no2_abs	tc_const	tc_lin	tc_quad	at_fl1	at_fl2	at_fl3	at_fl4	at_fl5	strayl_const	strayl_coeff	strayl_exp	sl_ref	sl_slope	sl_quad	aod_ex1	aod_ex2	aod_ex3
303.207	1	1021								5049.500	2.594						4244	9051	13715	21832	25111									
306.309	2	1021		8.24E+07	6.13E+07	1.07E+08	1.06E+08			4831.700	1.778						4264	9068	13718	21787	25045									
310.052	3	1021		6.33E+07	4.72E+07	8.37E+07	8.35E+07			4584.600	1.065						4262	9073	13714	21740	24971									
313.504	4	1021		9.85E+07	7.39E+07	1.32E+08	1.32E+08			4370.900	0.676						4279	9094	13723	21708	24924									
316.798	5	1021		9.91E+07	7.37E+07	1.34E+08	1.34E+08			4178.700	0.375						4286	9103	13728	21676	24890									
320.001	6	1021		1.05E+08	7.82E+07	1.44E+08	1.45E+08			4002	0.2896						4295	9122	13738	21638	24842									

O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
tc_const	tc_lin	tc_quad	at_fl1	at_fl2	at_fl3	at_fl4	at_fl5	strayl_const	strayl_coeff	strayl_exp	sl_ref	sl_slope	sl_quad	aod_ex1	aod_ex2	aod_ex3
			4244	9051	13715	21832	25111									
			4264	9068	13718	21787	25045									
			4262	9073	13714	21740	24971									
			4279	9094	13723	21708	24924									
			4286	9103	13728	21676	24890									
			4295	9122	13738	21638	24842									

AOD: configuration

Right now, we're doing a lot of approximations to many of these configuration parameters, but to determine the ETCs at each wavelength and filter position, we have a new Langley code which is quite complete

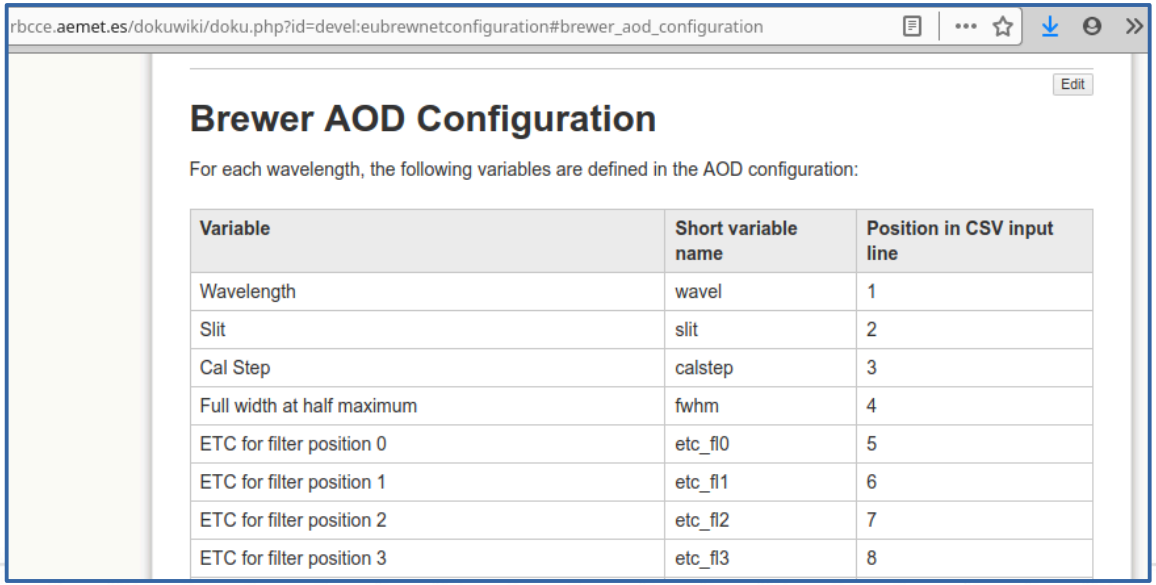
```
def doLangleyFunc(myData,langleyFunc,filters_minobs,showplots,verbose):
    """Do the requested Langley

    Langley methods:

    * Paper: contr_counts_i + contr_rayleigh_i = -τ_i'*airmass_ozone + logeI0_i

            So, for each wavelength i:
                x = airmass_ozone+airmass_aero ~= airmass_ozone
                y = contr_counts + contr_rayleigh
                slope ~= -τ_ozone
                intercept = logI0

    * Separate ozone: contr_counts_i + contr_rayleigh_i + contr_ozone_i = -τa_i*airmass + logeI0_i

            So, for each wavelength i:
                x = airmass_aero
                y = contr_counts + contr_rayleigh + contr_ozone
                slope = -τ_aero
                intercept = log I0

    Fit methods:

    * fit without dummies, using numpy's polyfit

    * fit with dummies to take into account the filters, using
       sklearn's LinearRegression

    202207 JLS
    """
```

In the future, you will be able to run this code directly on EUBREWNET's data server, as you can do right now with the ozone Langley, see https://eubrewnet.aemet.es/dokuwiki/doku.php?id=codes:calibration

Calibrations and data

More information on the format of the file is available at EUBREWNET's wiki:

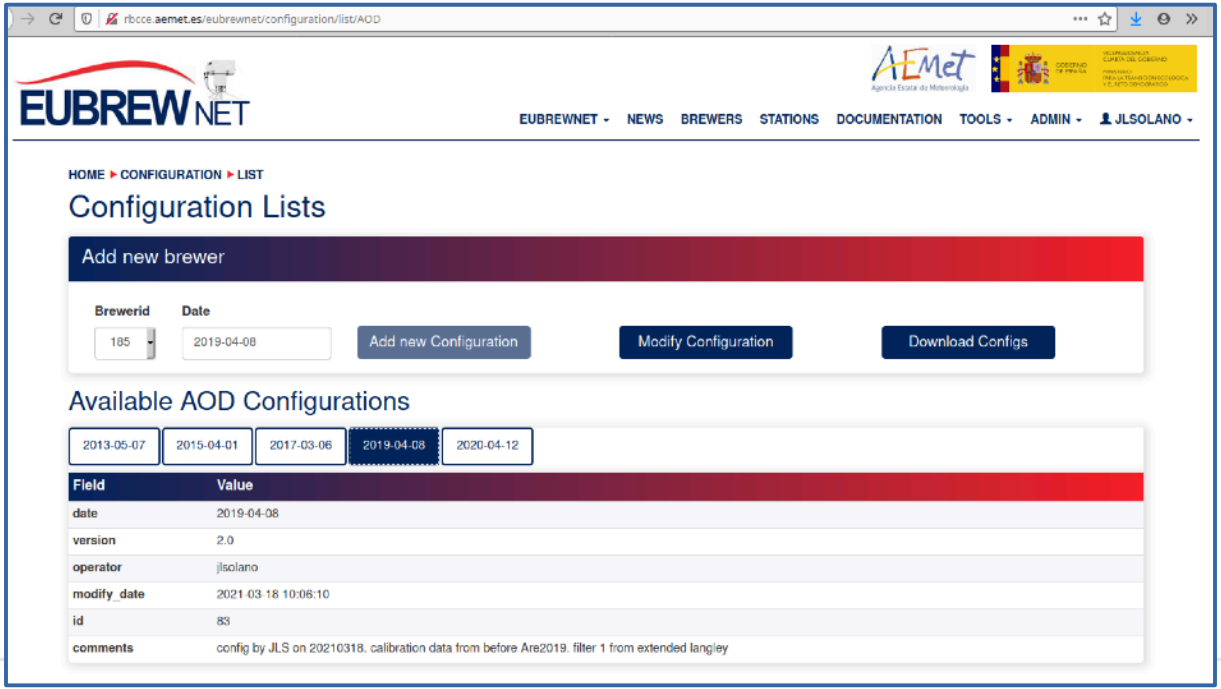
http://rbcce.aemet.es/dokuwiki/doku.php?id=devel:eubrewnetconfiguration#brewer_aod_configuration



Calibrations and data

Add, modify, or just check which configurations are available:

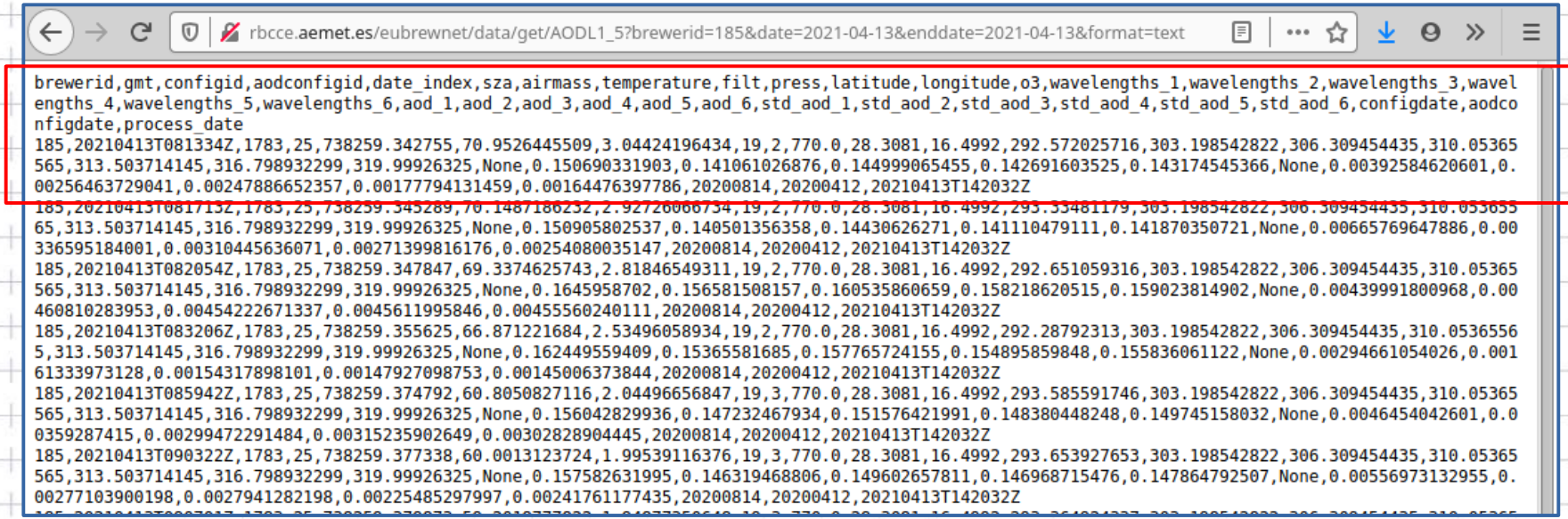
http://rbcce.aemet.es/eubrewnet/configuration/list/AOD



Calibrations and data

To get the data stored in the server, use e.g.

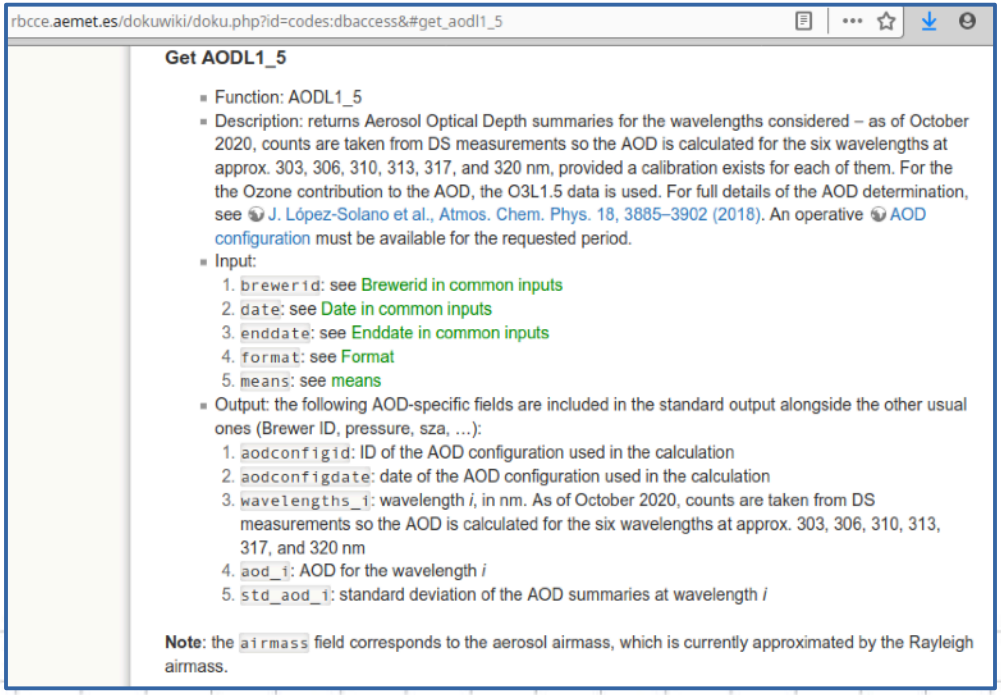
http://rbcce.aemet.es/eubrewnet/data/get/AODL1_5?brewerid=185&date=2021-04-13&enddate=2021-04-13&format=text



Calibrations and data

For more information, see EUBREWNET's wiki entry:

http://rbcce.aemet.es/dokuwiki/doku.php?id=codes:dbaccess#get_aodl1_5



rbcce.aemet.es/dokuwiki/doku.php?id=codes:dbaccess&#get_aodl1_5

Get AODL1_5

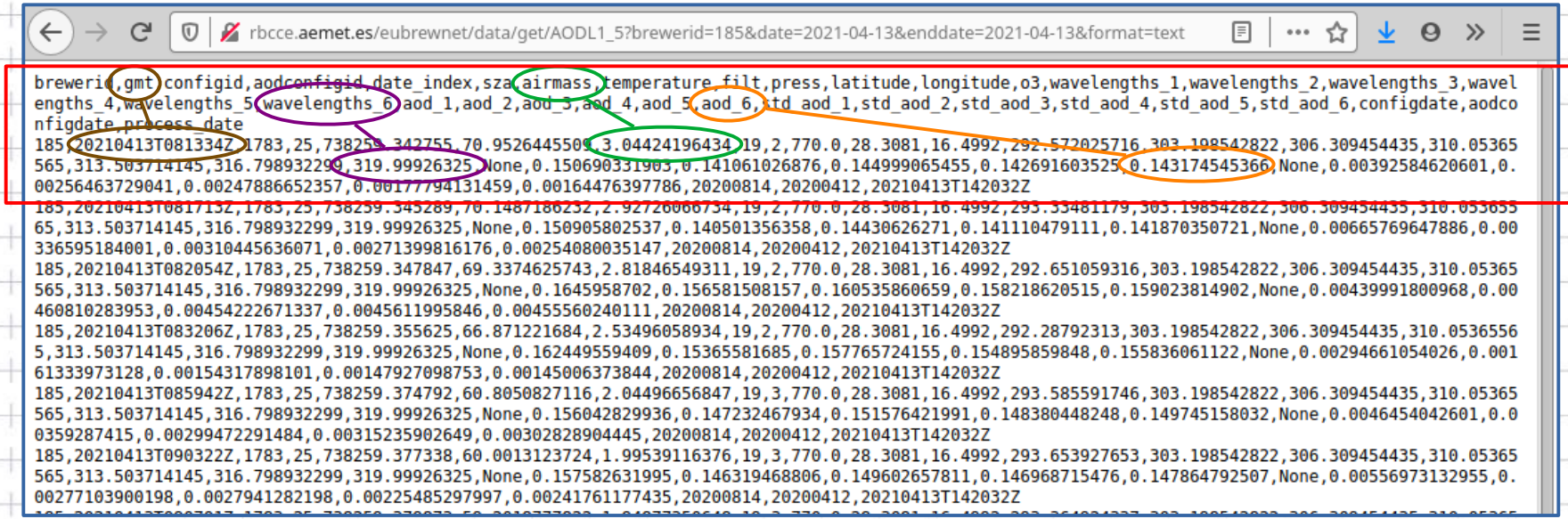
- Function: AODL1_5
- Description: returns Aerosol Optical Depth summaries for the wavelengths considered – as of October 2020, counts are taken from DS measurements so the AOD is calculated for the six wavelengths at approx. 303, 306, 310, 313, 317, and 320 nm, provided a calibration exists for each of them. For the the Ozone contribution to the AOD, the O3L1.5 data is used. For full details of the AOD determination, see J. López-Solano et al., Atmos. Chem. Phys. 18, 3885–3902 (2018). An operative AOD configuration must be available for the requested period.
- Input:
  1. `brewerid`: see Brewerid in common inputs
  2. `date`: see Date in common inputs
  3. `enddate`: see Enddate in common inputs
  4. `format`: see Format
  5. `means`: see means
- Output: the following AOD-specific fields are included in the standard output alongside the other usual ones (Brewer ID, pressure, sza, ...):
  1. `aodconfigid`: ID of the AOD configuration used in the calculation
  2. `aodconfigdate`: date of the AOD configuration used in the calculation
  3. `wavelengths_i`: wavelength *i*, in nm. As of October 2020, counts are taken from DS measurements so the AOD is calculated for the six wavelengths at approx. 303, 306, 310, 313, 317, and 320 nm
  4. `aod_i`: AOD for the wavelength *i*
  5. `std_aod_i`: standard deviation of the AOD summaries at wavelength *i*

Note: the `airmass` field corresponds to the aerosol airmass, which is currently approximated by the Rayleigh airmass.

Calibrations and data

To get the data stored in the server, use e.g.

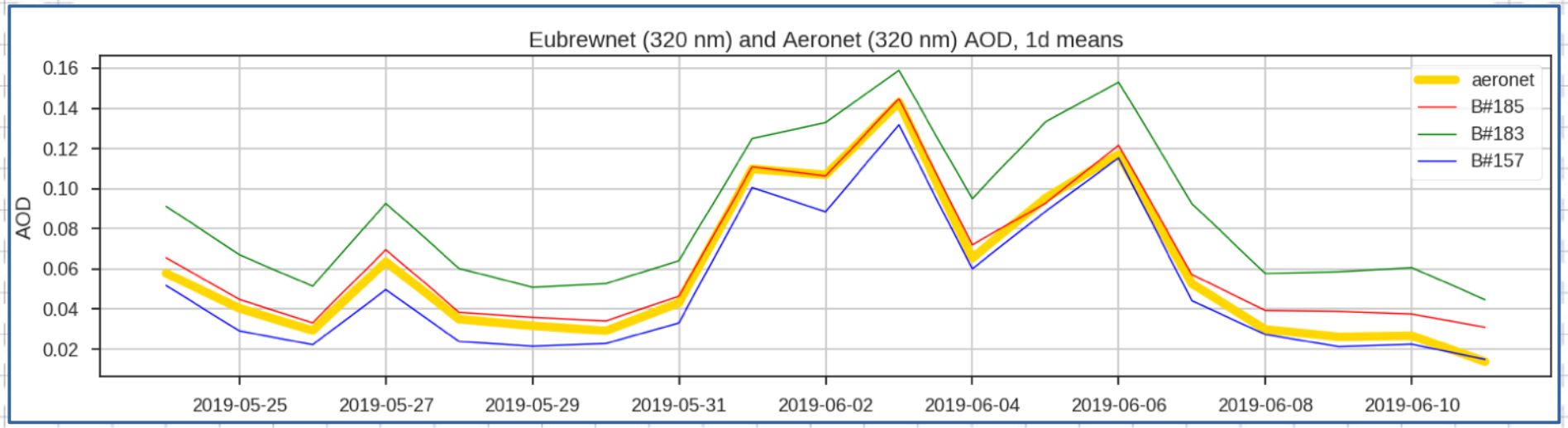
http://rbcce.aemet.es/eubrewnet/data/get/AODL1_5?brewerid=185&date=2021-04-13&enddate=2021-04-13&format=text



El Arenosillo

We transfer the calibration of B#185 – the travelling reference of the RBCC-E Triad – at the Intercomparison Campaigns.

The RBCC-E Triad is calibrated by the Langley-plot method at Izaña, using 1-2 months of data.



El Arenosillo

We have uploaded to EUBREWNET preliminary calibrations for the El Arenosillo 2013 and 2015,2019,2021 campaigns.

Some results of these campaigns are discussed in López-Solano *et al.* (2018)

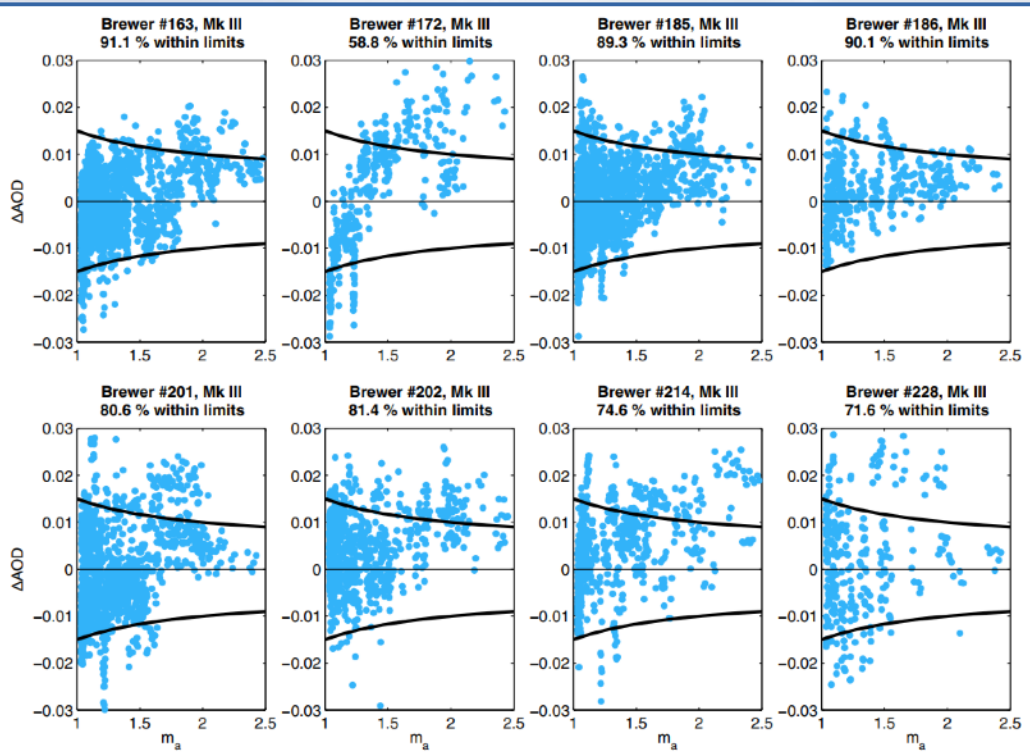
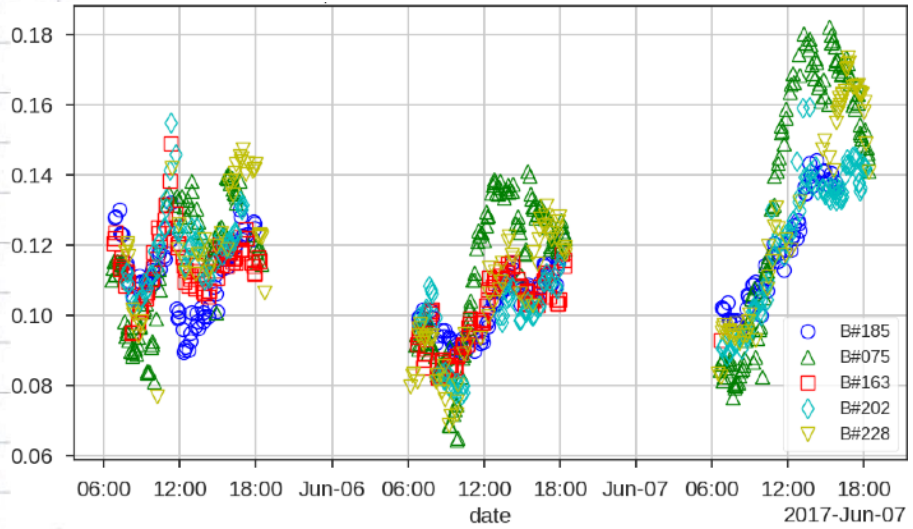


Figure 4. AOD differences, for observations within 1 min at 313.5 nm, between the Brewer instruments and the UVPFR during the tenth intercomparison campaign of the RBCC-E, plotted as a function of the aerosol optical air mass. The UVPFR data have been interpolated from those at wavelengths 311.3 and 317.5 nm using the Ångström relationship. The WMO traceability limits for finite field-of-view instruments (Eq. 11) are shown as thick black lines.

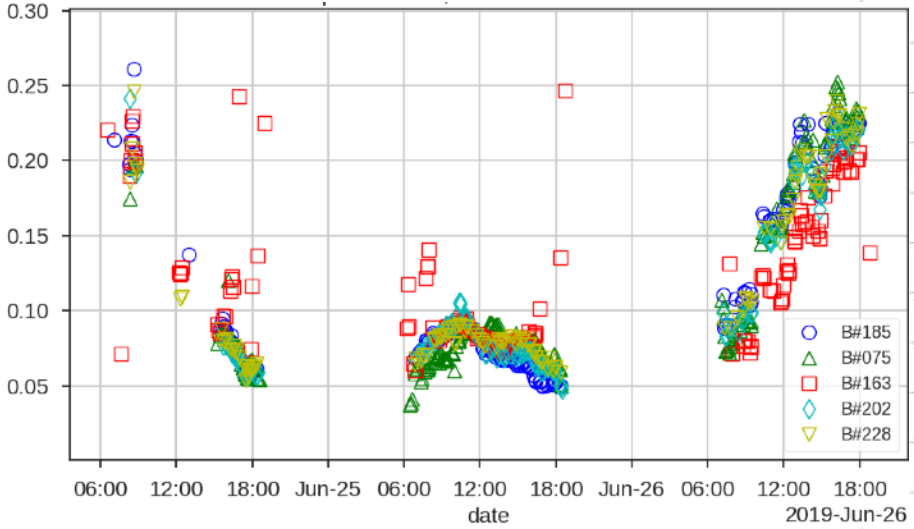
El Arenosillo

Calibrations of the 2017 and 2019 campaigns.

AOD 320 nm



El Arenosillo 2017, last three days

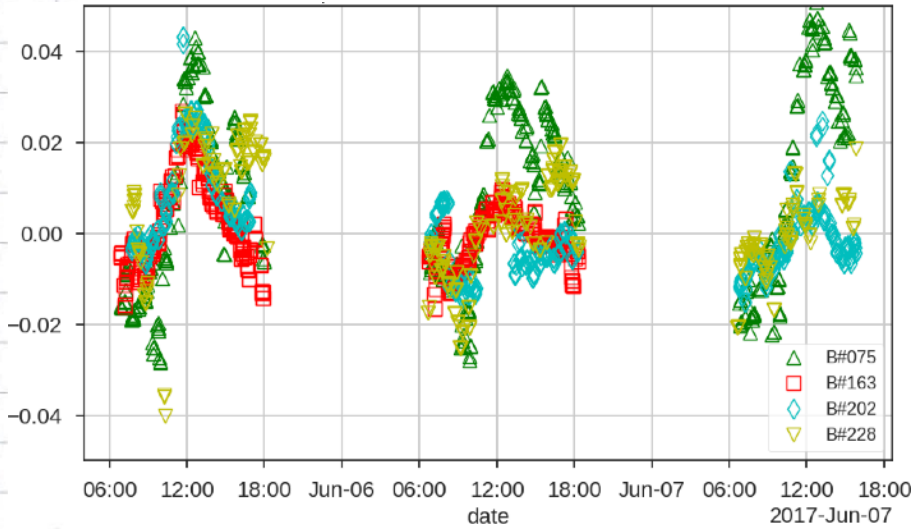


El Arenosillo 2019, last three days

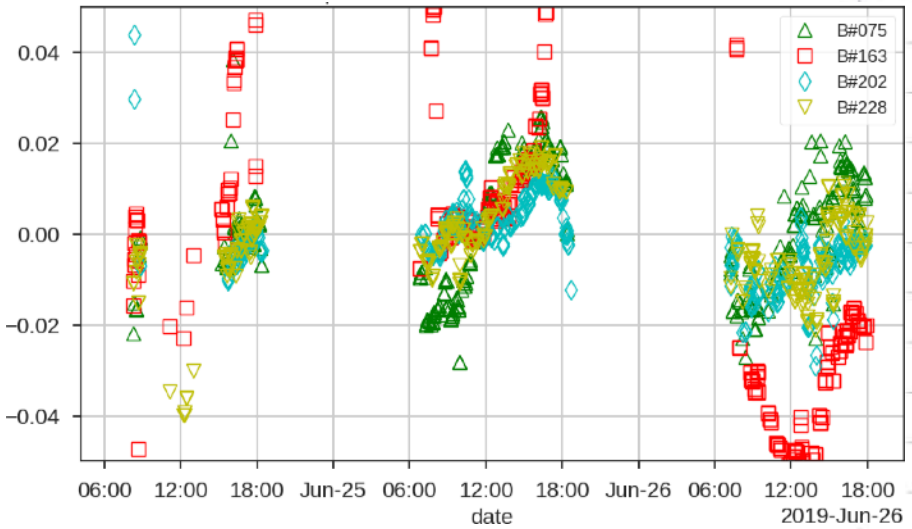
El Arenosillo

We are working on the calibrations of the 2017 and 2019 campaigns.

AOD 320 nm differences with respect to B#185



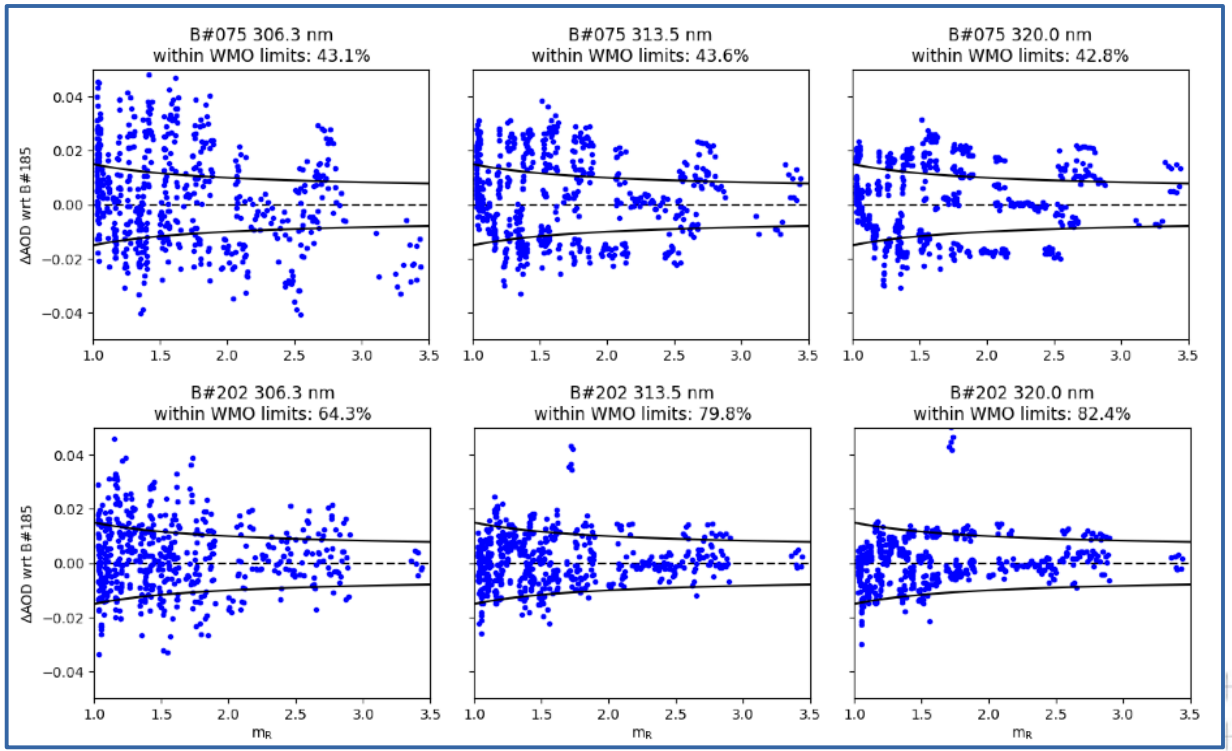
El Arenosillo 2017, last three days



El Arenosillo 2019, last three days

El Arenosillo

Some instruments behave better than others: stray light? Polarization? Temperature? Something else?



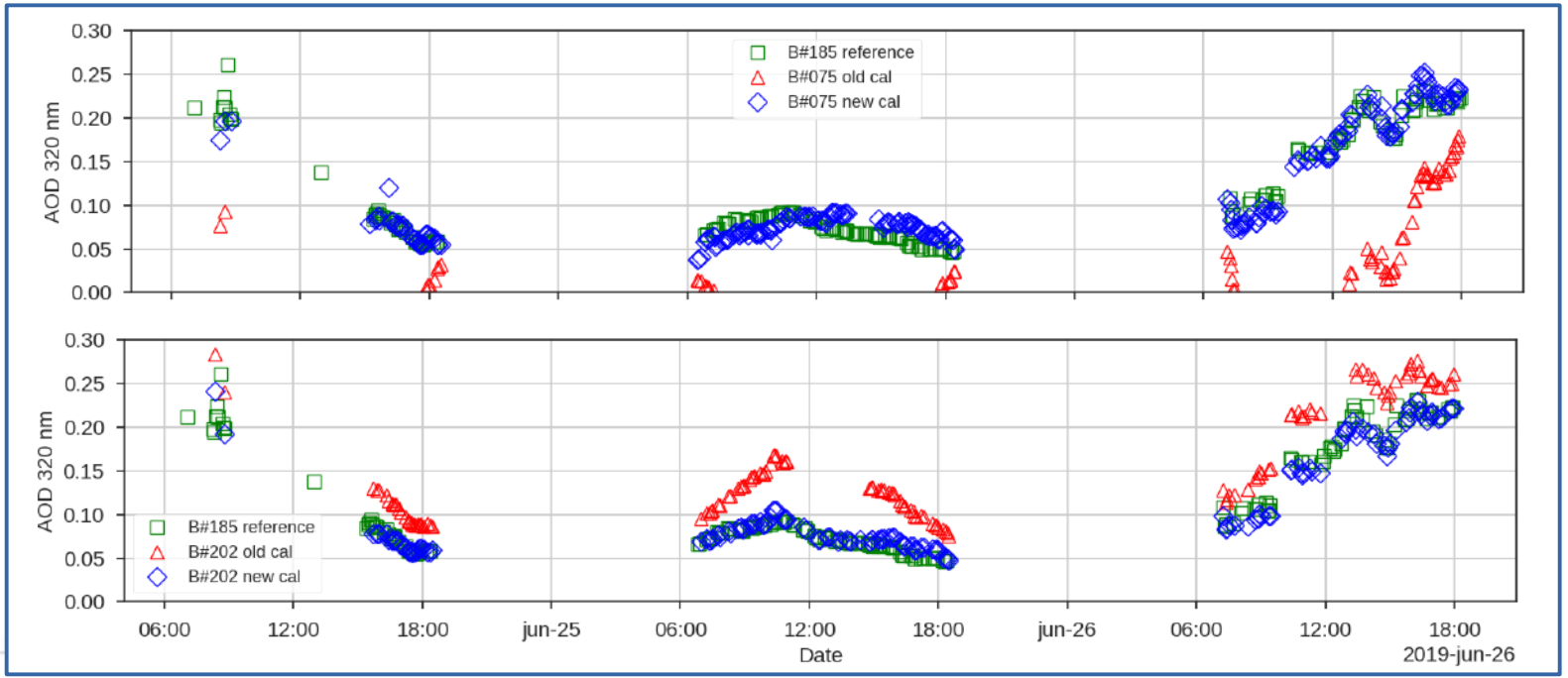
El Arenosillo 2019, last 3 days, final calibrations

WMO traceability criteria: 95% of the differences within the limits

El Arenosillo

We are also working on tracking the changes between campaigns.

El Arenosillo 2019, last 3 days. Old cal = Arenosillo 2017, new cal= Arenosillo 2019



AOD: JG

Parsing at Eubrewnet with *get/JG*

rbcce.aemet.es/eubrewnet/data/get/JG?brewerid=185&date=2022-07-15&format=text&fields=gmt,steps,raw_counts*

```
20220715T081101Z,4178,171776,177804,229877,268754,245924,276185
20220715T081114Z,4178,172182,178881,230274,269650,246511,276867
20220715T081128Z,4178,173425,179904,232185,270898,248103,278192
20220715T081143Z,4178,173718,180769,232614,271780,248622,279252
20220715T081158Z,4178,174373,181177,233474,272752,249536,279836
20220715T081237Z,6205,265912,323503,321180,334966,343698,411486
20220715T081250Z,6205,265345,323130,321106,335018,343176,410834
20220715T081304Z,6205,266271,323912,321135,335053,343230,410744
20220715T081318Z,6205,268395,327003,324351,338462,346928,415620
20220715T081333Z,6205,271044,330194,328213,341522,349523,419118
20220715T081410Z,7678,336157,357683,440070,394253,427587,465038
20220715T081424Z,7678,337937,359173,442582,397092,429595,466895
20220715T081438Z,7678,337946,359215,442377,396063,428292,466808
20220715T081452Z,7678,338205,358971,442329,396822,429688,466432
20220715T081507Z,7678,337551,358562,442686,396086,429142,466123
20220715T085920Z,2090,84888,122857,176112,228198,300241,388081
20220715T085933Z,2090,85021,122553,176022,228484,299372,387043
20220715T085947Z,2090,85977,123725,177623,230344,302582,390579
20220715T090002Z,2090,86718,124600,178453,231259,303776,392374
20220715T090016Z,2090,86706,125344,179612,232219,305271,393953
```

Each JG makes 5 measurements at 4 different steps. And for every step, we have data at each of the 6 slits. So we have 4×6=24 wavelengths

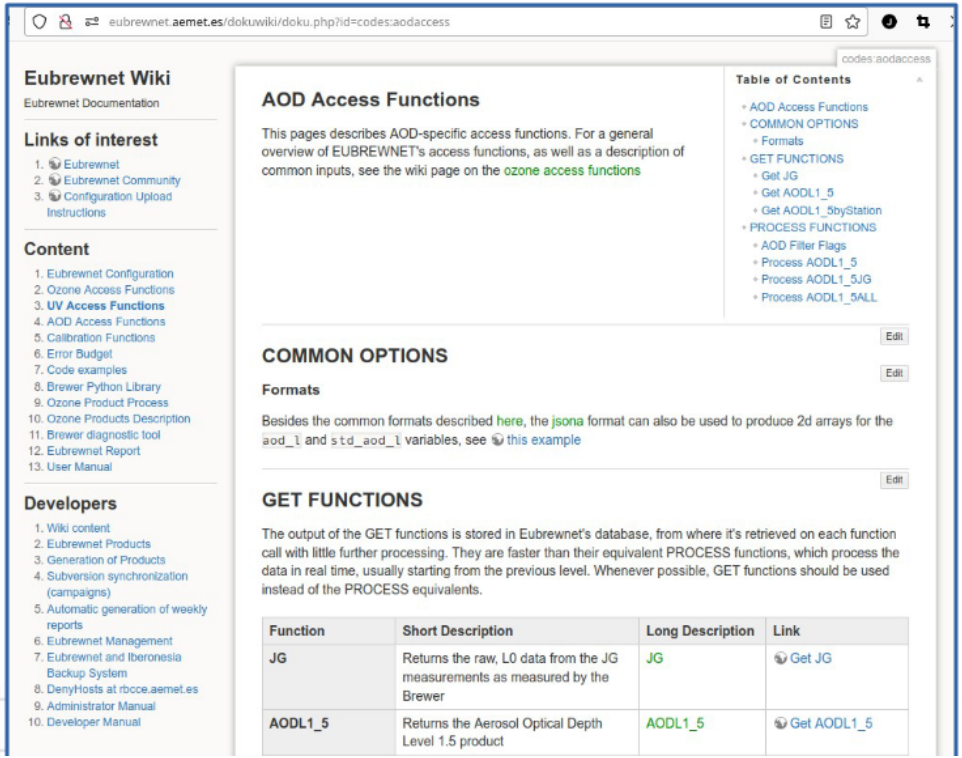
Processing at Eubrewnet with *process/AODL1_5JG*

https://rbcce-test.aemet.es/eubrewnet/data/process/AODL1_5JG?brewerid=185&date=2022-07-15&format=text&fields=gmt,wavel*

```
gmt,wavelengths_1,wavelengths_2,wavelengths_3,wavelengths_4,wavelengths_5,wavelengths_6
20220715T081128Z,3256.14,3285.1,3319.71,3351.49,3381.91,3410.46
20220715T081304Z,3392.08,3419.49,3452.16,3482.17,3510.93,3536.78
20220715T081438Z,3486.96,3513.16,3544.37,3573.06,3600.64,3624.27
20220715T085947Z,3109.65,3139.99,3176.58,3210.07,3242.2,3273.17
```

AOD: JG

For more information on these functions, see the wiki page at https://eubrewnet.aemet.es/dokuwiki/doku.php?id=codes:aodaccess

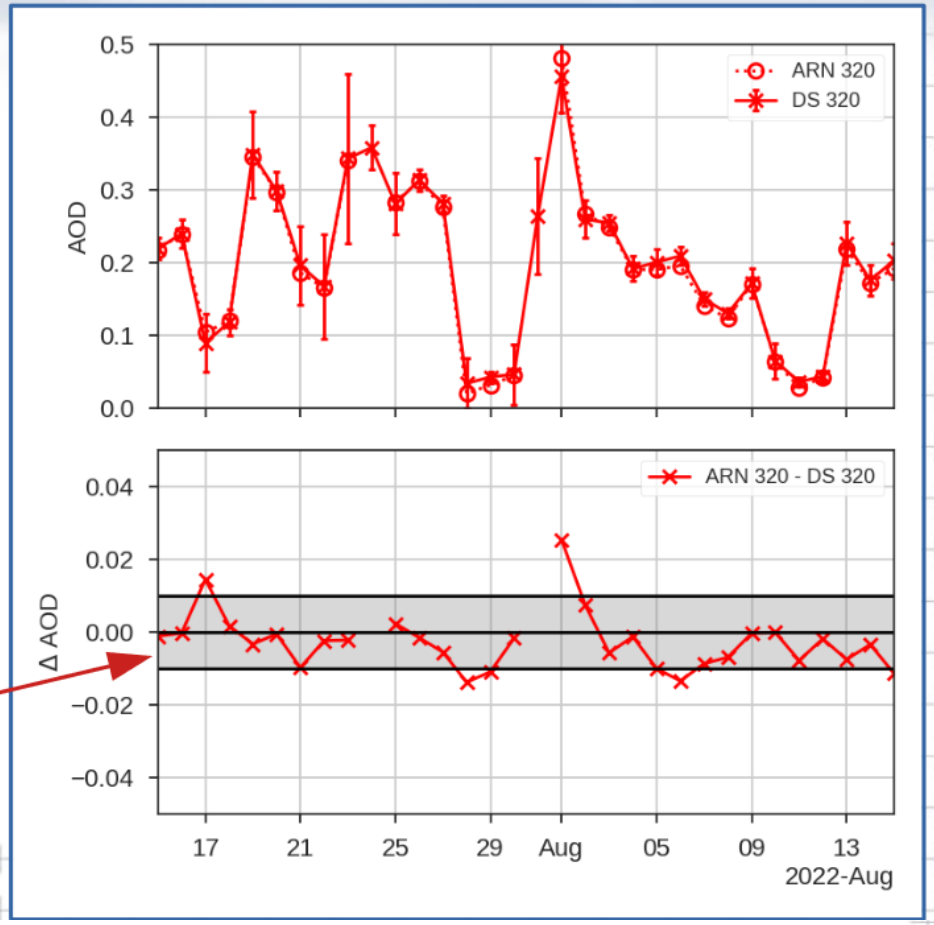


AOD: preliminary results

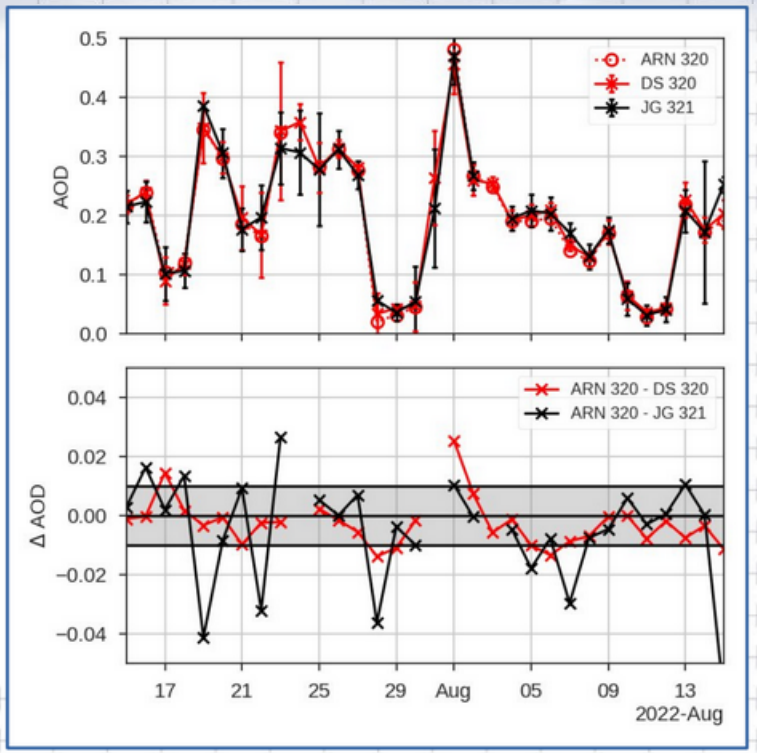
Comparison with AERONET (ARN) data (extrapolated from 340 nm using the 340-440 nm Ångström exponent where necessary), daily medians over July-August 2022 for B#185 at Izaña

320 nm from DS looks OK, as usual

Approx. area within the WMO traceability limits



321 nm from JG is worse than the DS, but it's quite close



AOD: preliminary results

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MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO
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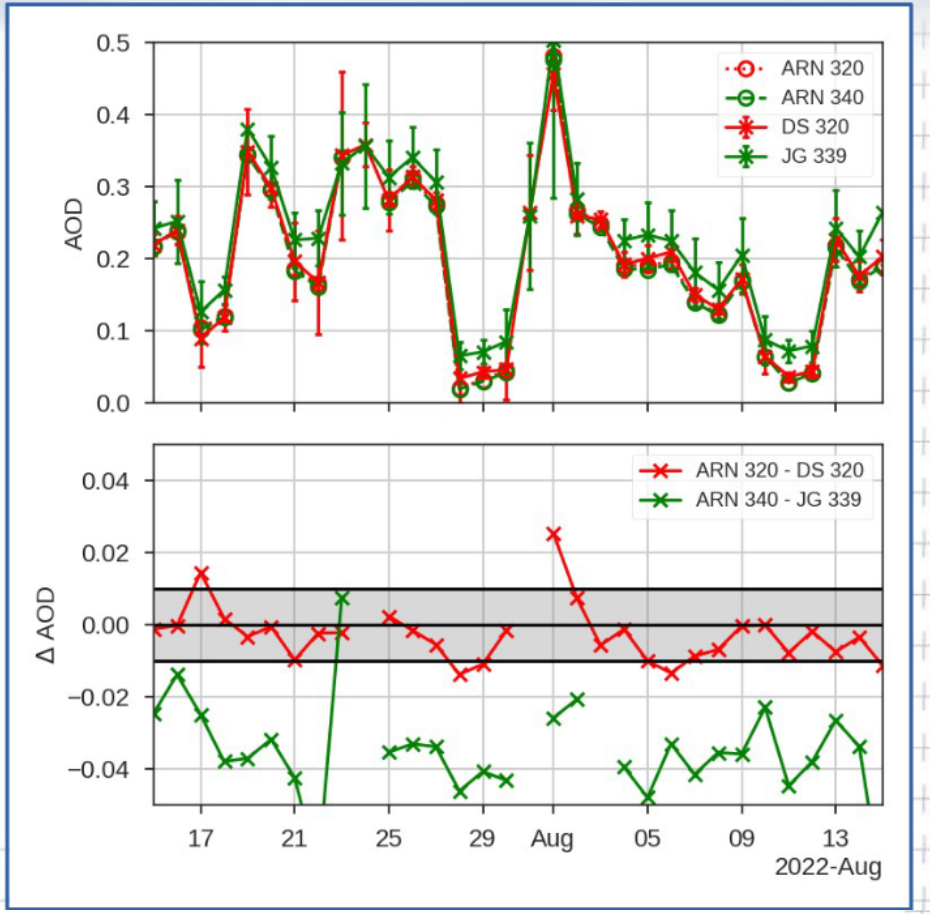
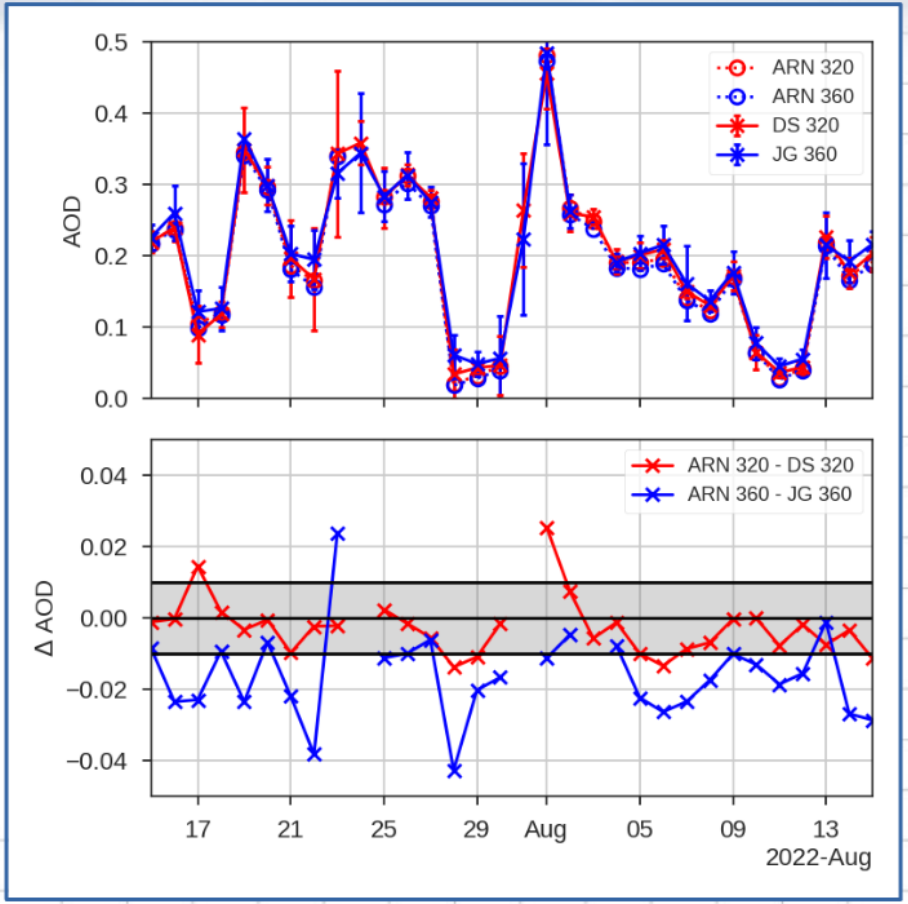
339 nm looks quite bad...

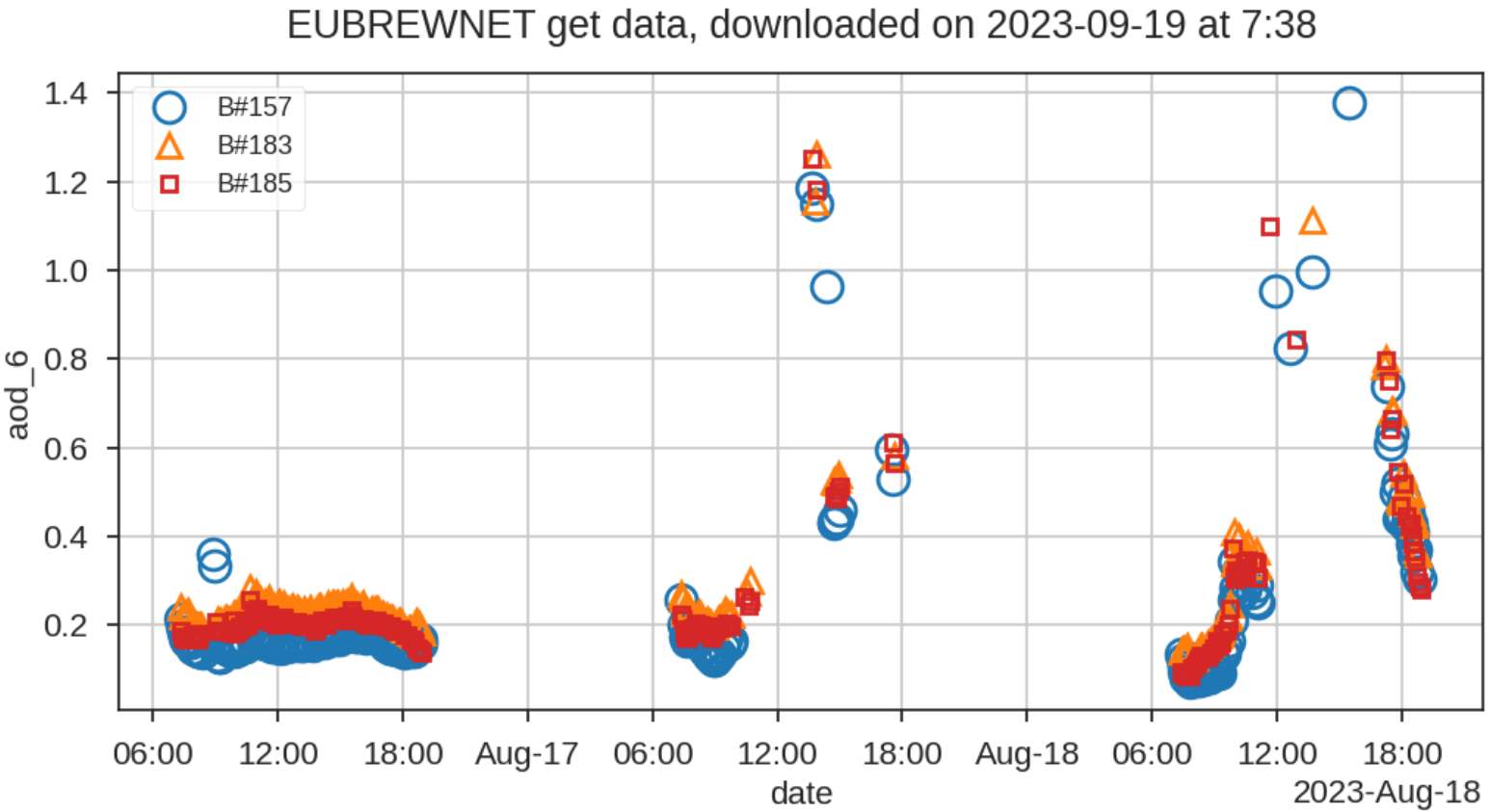


AOD: preliminary results

… but 360 nm gets better!

Lots of work pending in the AOD calibrations!




EUBREWNET get data, downloaded on 2023-09-19 at 7:38
B#157
B#183
B#185
aod_6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
06:00
12:00
18:00
Aug-17
06:00
12:00
18:00
Aug-18
06:00
12:00
18:00
date
2023-Aug-18

s data (inc. rejected), downloaded on 2023-09-19 at 7:40
1
0
06:00
12:00
18:00
Aug-17
06:00
12:00
18:00
Aug-18
06:00
12:00
18:00
date
2023-Aug-18

RBCC-E 20 years 2003-2023

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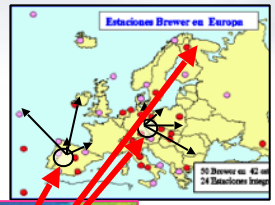
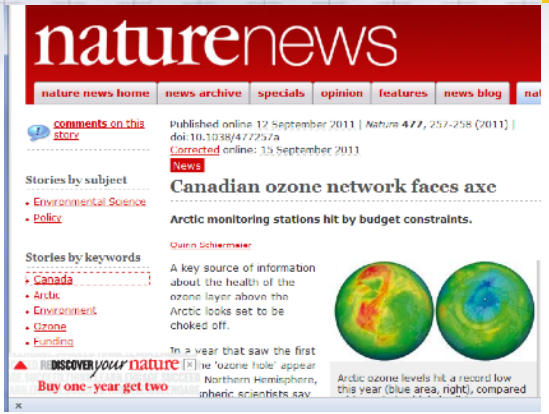


RBCC-E



2003

2005

2006

2011

2022
CCI

RBCC-E Campaigns

2021- Summer Europe intercomparisons

5-15 July 2021: Davos intercomparison (PMOD)

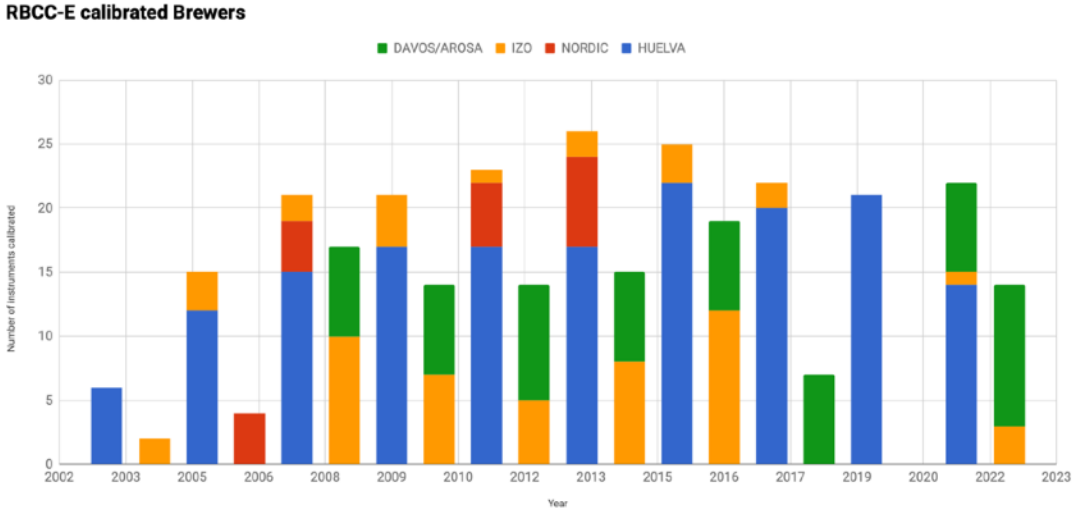
5-15 September 2021: Huelva intercomparison

2022 - Chile – Chajnantor setup

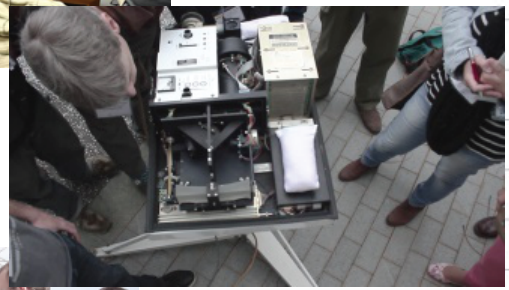
Davos July 2022

2023 – September 2023

2024 - WMO Brasil January 2024



- Operator training Courses.
  - Tenerife, March 2014
  - Huelva , June 2015
  - Edinburgh, Sept 2016
  - Sydney, Sept 2017
  - Huelva, June 2019
  - Huelva, Sep 2023 ?
  - South America 2024?

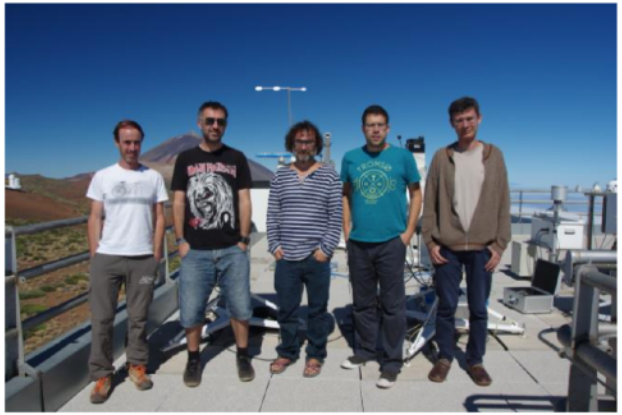


The End

Thanks for your attention!
Questions and suggestions are always welcome!
eubrewnet@aemet.es

The RBCC-E Team

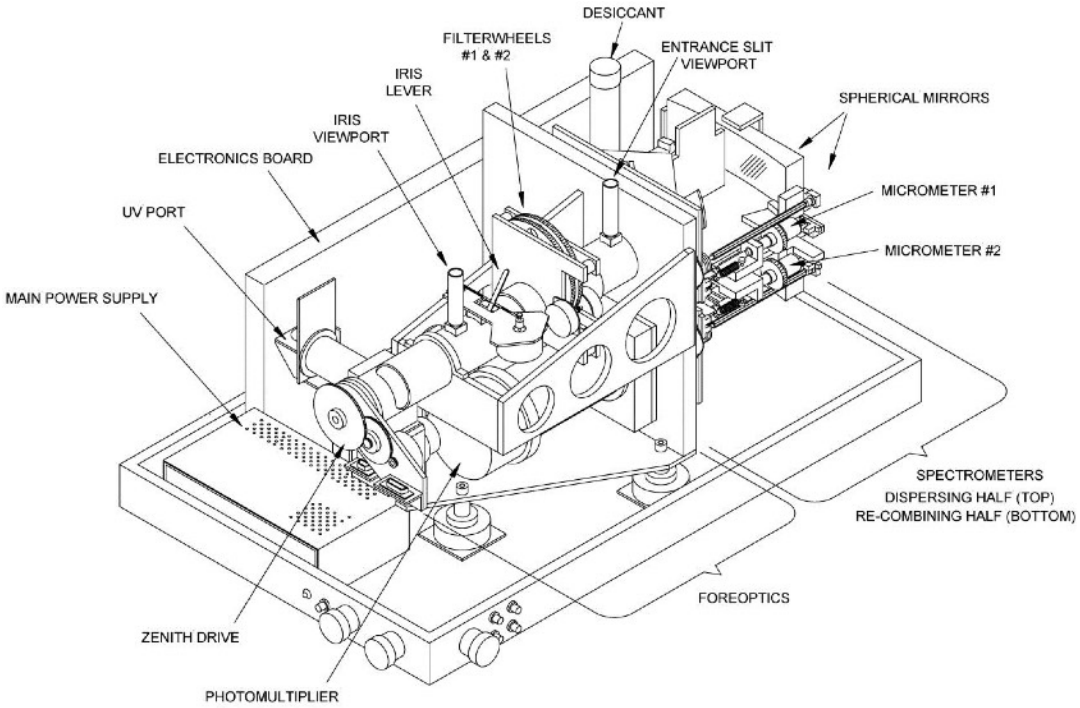
Back to front, left to right: Alberto Redondas (AEMET), Alberto Berjón (TRAGSATEC), Javier López Solano (TRAGSATEC), Bentorey Hernandez (ECMWF), Virgilio Carreño (AEMET), Manuel Rodriguez Valido (ULL), Daniel Santana(Lüftblick), Sergio Fabián León Luis (AEMET)



Left to right: Virgilio Carreño (AEMET), Francisco Parra-Rojas (AEMET), Alberto Redondas (AEMET), Sergio Fabián León Luis (AEMET), Javier López Solano (TRAGSATEC)

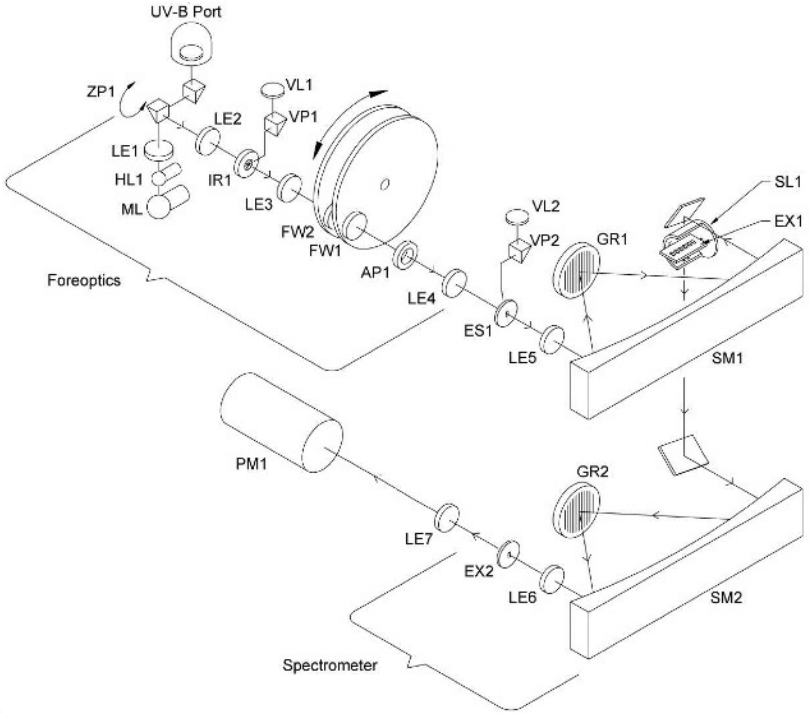
Summary

Inside a Brewer



Picture: Kipp & Zonen

Simpler view



Picture: Kipp & Zonen