Calibration Report
Brewers #157 and #033; Izaña, Spain; September 12-15, 2001

I. Overview and Instrument Status:

Brewer #157, a Mark III instrument was working well and been quite stable in past year. The instrument's constants were from 1999. Set at these values, the ozone readings were in good agreement with traveling standard instrument #017 (see graph of day 255). The sun scan results showed that the wavelength cal step should be adjusted to 290 from 285, which increased ozone slightly at low zenith angles. Standard Lamp ratios R6/R5 have been stable at 330/580 for the past year. Problems with communication errors were a problem for the first 2 days but after re-booting the computer the next 2 days were error free.

Brewer #033, a MKII instrument has been operated at sea level in Santa Cruz the past year and was re-located here for this calibration. It was still working well but its Standard Lamp ratios were up by 15/30 units from last year and consequently the ozone results were high by ~1%. The user corrects the data by adjusting ETC constants for this SL ratios change. The zenith prism gears had to be reset on arrival to allow proper operation.

II. Ozone Test Results:

This inter-comparison resulted in approximately 150 near simultaneous Direct Sun measurements of #157 with #017 over 3 days. The sun scan results showed (reference graph on next page) that the cal step should be 290 using a revised setting of average airmass of 1.4 times instead of 2.0. It is believed ~3 steps of this change is due to aging of mercury lamp and use of 302 nm. line for wavelength calibration. It was decided to change the software to the more stable 296.7 nm. line and therefore the cal step changed from 1027 steps and zero constant changed by same amount to 2229. The dispersion test results at step 1027 produced an ozone absorption coefficient of 0.3397, a change of 0.7 % and it was put into use. Below are the final daily mean results using new constants. Essentially the same results are obtained using the old constants for #157 and so no correction to past data is necessary.

The sun scan results for #033 showed no changes were necessary and the software and constants were changed to use the 296.7 nm. line for wavelength calibration.

Ozone final daily mean results all instruments:

day	#157 O_3	dev	SO_2	dev	# / tot	#033 O_3	dev	SO_2	dev	#017 O_3	dev.	SO_2	dev
25501	268.2	+1.1	-0.4	+0.2	54/ 68	267.5	+1.4	-0.5	+0.2	269.4	+1.2	-0.2	+.6
25601	275.8	+1.8	-0.3	+0.3	51/ 65	275.0	+1.8	0.2	+0.4	273.9	+2.9	-0.3	+.2
25801	285.8	+0.9	-0.2	+0.3	48/ 60	284.1	+1.2	0.2	+0.5	283.4	+1.0	0.0	+.3

III. Summary of results and changes:

	Brewer #157	Brewer #033
SL ratios 2000	325 / 580	2050 / 3895
SL ratios 2001	330 / 580	2065 / 3925
Change in SL	5 / 0	+ 15 / +30
Cal step 2000	285	138
Cal step 2001	290 - > 1027	138
ICF file to use	icf25801.157	icf25801.033
DT	32 ns	42 ns

	Brewer #157	Brewer #033
ETCs 2000	1565 / 210	3350 / 3525
ETCs 2001	1575 / 210	3370 / 3560
Change in ETCs	10 / 0	+20 / +35
Absorption 2000	0.342 / 1.15	0.3358 / 1.1194
Absorption 2001	0.3397 / 1.15	0.3365 / 1.1362
DCF file to use	dcf25601.157	dcf27900.033

IV. Dispersion and UV calibration results:

The dispersion test results improved wavelength accuracy on slit 1, reference difference file (dcf_diff.157) and so the new file (dcf25601.157) was put into use. It was also believed that the improved IOS software for dispersion processing helped make these results more accurate. A timed UA scan was completed with #017 and the irradiance agreement was very good, reference graph next page.

The dispersion test on #033 produced very similar results to last year and so no changes were made. However the new absorption coefficients were put into use since a slight improvement was achieved in ozone agreement. Scans of internal lamps were completed on each instrument and were very similar to last year results.

The INM portable 1000w UV calibration system with 3 local lamps were used for the UV calibration of each instrument. During the calibration of #157 using lamp #014, the system cooling fans were off by mistake and so those results were not used to produce response file. The new UV calibration response files agreed well with previous results.

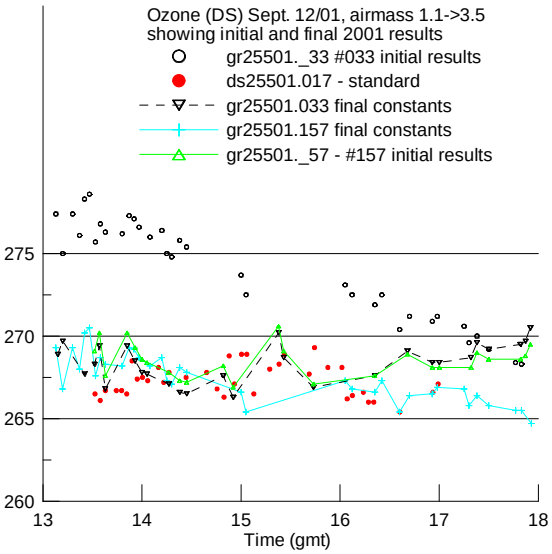
V. Servicing and Software changes:

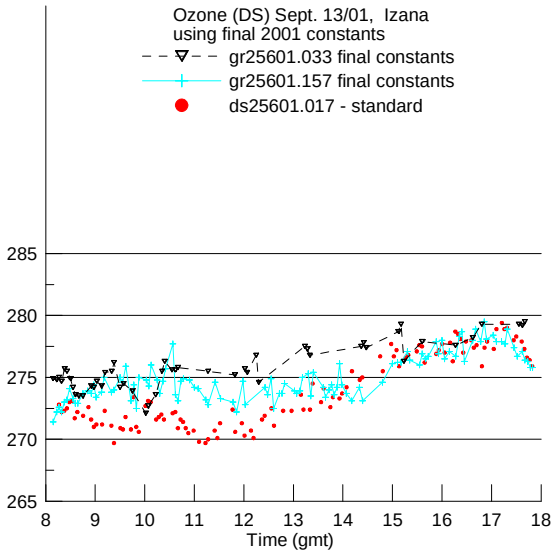
The micrometer gears were cleaned and the pushrod bearings lubricated on each. The tracker tension on #157 was tightened to reduce friction drive slippage. The rubber seals under the shock mounts were replaced on each Brewer which should reduce efforts to control humidity.

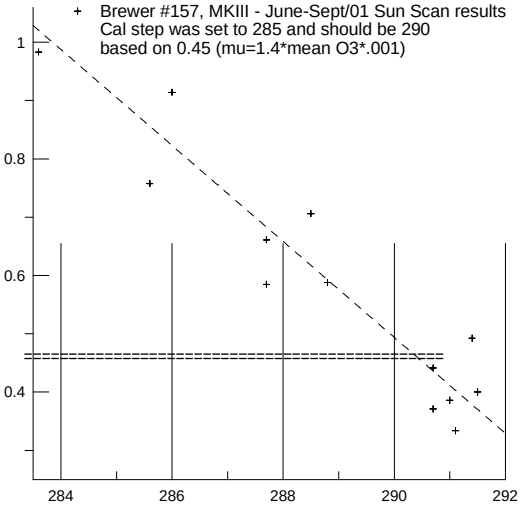
Software bug was corrected in main program at lines 7640-7650 to correct error in n.d. filter recording. Also in main program, lines 2715, 3437 and 3555 were changed to allow use of new UV calibration routine – quick lamp (QL). This routine speeds up and improves the calibration process for Brewers with extended UV scan capability. A new UV calibration-processing program (Lampspro.exe) was demonstrated and provided for evaluation. Improved Hg, SE and FR routines were provided.

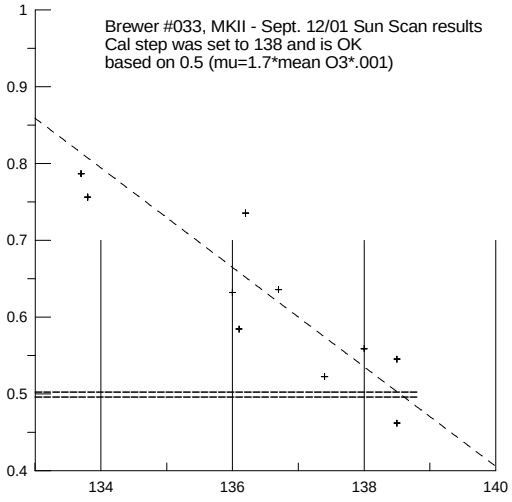
VI. Recommendations:

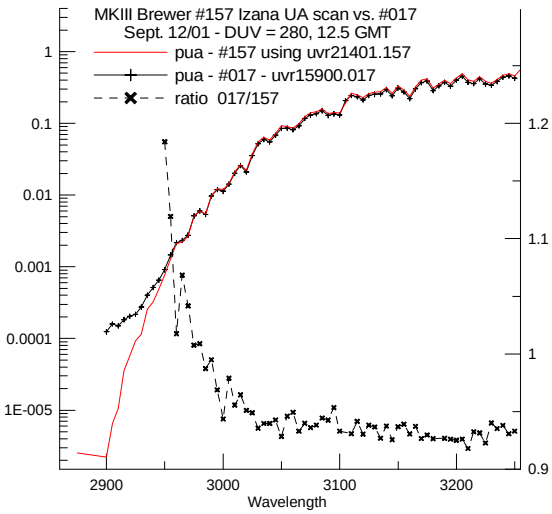
The Brewer control computers should be re-booted each evening to reduce the communication errors, which corrupt data.

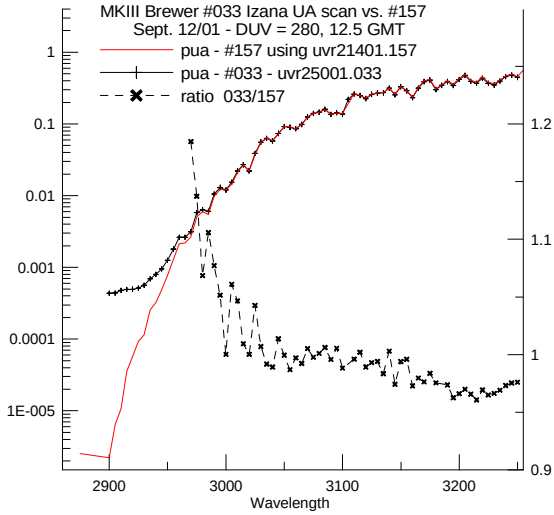

Ozone (DS) Sept. 12/01, airmass 1.1->3.5
showing initial and final 2001 results
gr25501._33 #033 initial results
ds25501.017 - standard
gr25501.033 final constants
gr25501.157 final constants
gr25501._57 - #157 initial results
275
270
265
260
13
14
15
16
17
18
Time (gmt)


Ozone (DS) Sept. 13/01, Izana
using final 2001 constants
gr25601.033 final constants
gr25601.157 final constants
ds25601.017 - standard
285
280
275
270
265
8
9
10
11
12
13
14
15
16
17
18
Time (gmt)


Brewer #157, MKIII - June-Sept/01 Sun Scan results
Cal step was set to 285 and should be 290
based on 0.45 (mu=1.4*mean O3*.001)
1
0.8
0.6
0.4
284
286
288
290
292


Brewer #033, MKII - Sept. 12/01 Sun Scan results
Cal step was set to 138 and is OK
based on 0.5 (mu=1.7*mean O3*.001)
1
0.9
0.8
0.7
0.6
0.5
0.4
134
136
138
140


MKIII Brewer #157 Izana UA scan vs. #017
Sept. 12/01 - DUV = 280, 12.5 GMT
pua - #157 using uvr21401.157
pua - #017 - uvr15900.017
ratio 017/157
1
0.1
0.01
0.001
0.0001
1E-005
1.2
1.1
1
0.9
2900
3000
3100
3200
Wavelength


MKIII Brewer #033 Izana UA scan vs. #157
Sept. 12/01 - DUV = 280, 12.5 GMT
pua - #157 using uvr21401.157
pua - #033 - uvr25001.033
ratio 033/157
1
0.1
0.01
0.001
0.0001
1E-005
1.2
1.1
1
0.9
2900
3000
3100
3200
Wavelength