Calibration Report: Brewer #116 – Bandung, Indonesia September 5-9, 2006

This calibration was completed at LAPAN site in Bandung, Indonesia by Ken Lamb, (IOS) with support from the World Meteorological Organization (WMO). The instrument was installed in early 1995 and last visited in 2001, but has been out of service for the past 4-5 years. The instrument was found to need a new power supply, micro-board and UV filter in front of photomultiplier tube to get it back into service.

The support of Mr. Saipul Hamdi from the Indonesian National Institute of Aeronautics and Space (LAPAN) was appreciated in completing this work.

Ozone/SO_2 Calibration Results:

There were ~75 good direct sun observations taken with each instrument over two days. The initial ETC constants obtained without change to any other constants were 3143/3430. However the agreement to #017 was poor over the airmass range and it was found that changing the dead time (DT) constant is 26ns (actual measured value) along with revised the absorption coefficients and ETC constants, resulted in better agreement. An aerosol optical depth (AOD) calibration was transferred from #017 to #116, reference file (etc.116).

The final ETC constants are **3160/3510** and new absorption coefficients are **0.325/1.09**. These were installed into file **icf25206.116** and the new dispersion constants are in file **dcf25006.116.** The final standard lamp (SL) ratios R6/R5 were **1930/3655.**

#116 results using final constants:									#017 standard:			
day	O_3	dev	SO_2	dev	#	tot	mu	hr	O_3	dev	SO_2	dev
251	258.8	+2.9	0.9	+0.6	24	73	122	4	261.8	+1.6	1.1	+0.8
252	261.8	+2.0	0.6	+0.7	52	82	148	3	261.8	+2.1	0.1	+0.4

UV Calibration:

The calibration was completed with IOS small lamps #67, #848 and the resulting response file **UVR25206.116** was ~200% larger than the last file UVR10001 due to the new pmt filter throughput. Some simultaneous UV (ua) scans with #017 were completed, reference graph of one at noon attached. The difference is due to #116 being on tracker and #017 at lower location.

Local lamps were also measured at this time with the QL routine, which was recommended, for future monitoring of UV stability. Scans of HG line 2967A and standard lamp were taken as well as measurements of the neutral density filters.

Mechanical and Optical Performance:

The direct sun scan test (SC) results indicated that the wavelength cal step setting of 285 was proper. A dispersion test (DSP), scanning a series of mercury and cadmium lamp spectral lines, was completed. The wavelength to step differences were up to 6.5 steps and so the new file DCF25006.116 was installed for future use.

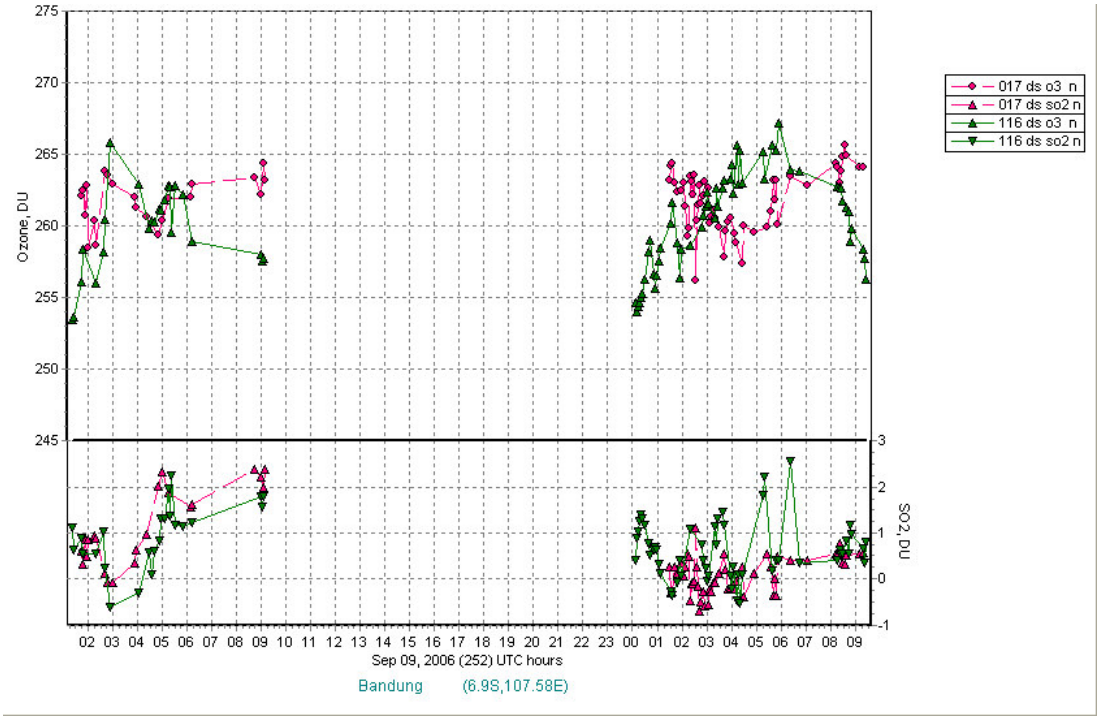
Servicing and software:

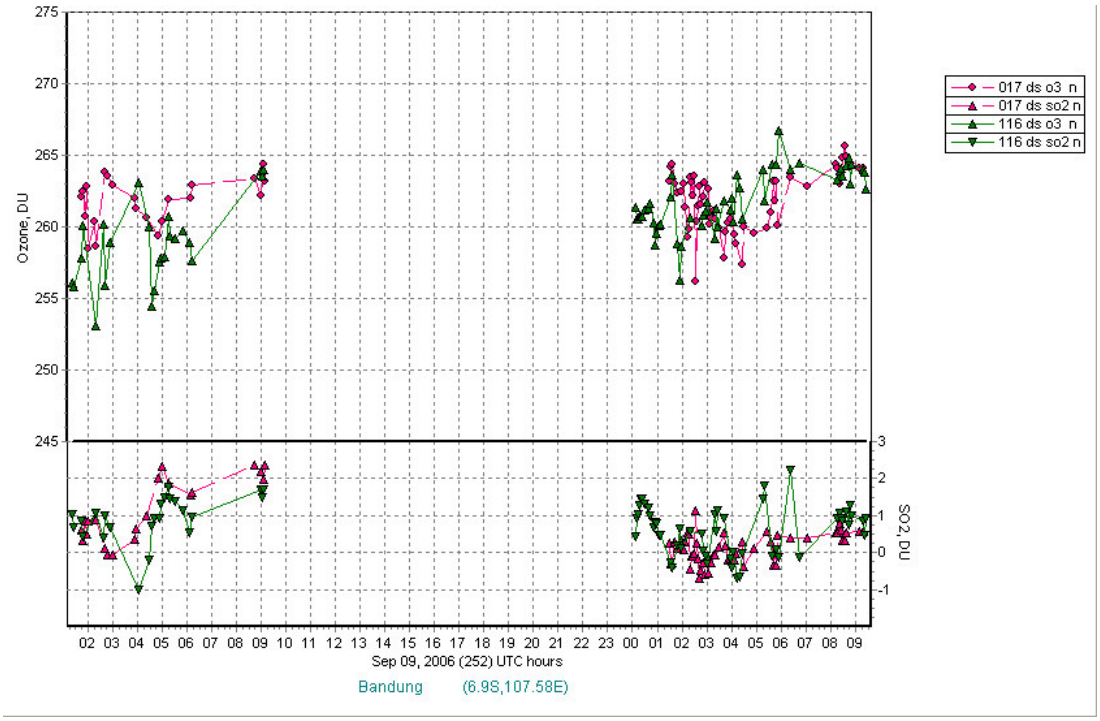
Servicing included replacement of main power supply, microprocessor board, viewing window and pmt UV filter initially. Also the rubber seals under shock mounts were replaced and the micrometer pushrod bearing and end pivot were lubricated. A paper humidity indicator was installed under the viewing window and desiccant was replaced. The tracker drive wheels were cleaned and leveling improved by a small adjustment to one leg.

V375F control software was installed for use and the O3brewer data processing program from M. Stanek was demonstrated and recommended for use to help with the submission of data to the WOUDC. The IOS program Reportpro was also provided to make graphs of average files and other data.

Graphs of test results:

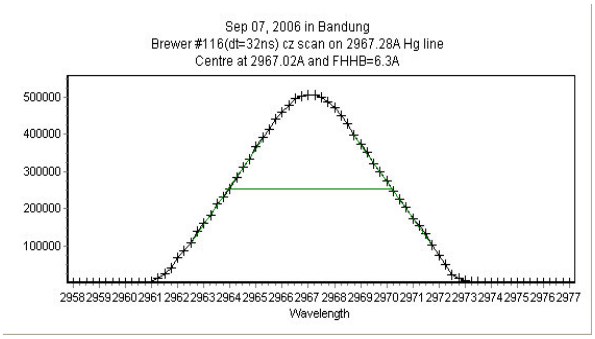
Below are the initial and final ozone/SO_2 results from the direct sun (DS) measurements taken during this calibration period from the two instruments. Note especially on the second day that the ozone from #116 was lower initially and then higher near mid-day compared to #017. This was the reason for the lowering of absorption coefficients and adjusting the ETC constants to obtain improved agreement over the airmass range as shown in the second graph below.

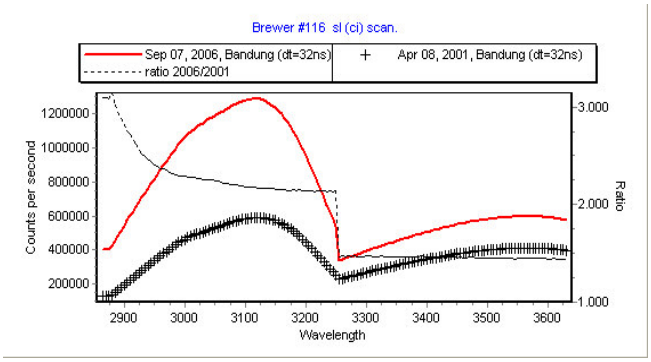




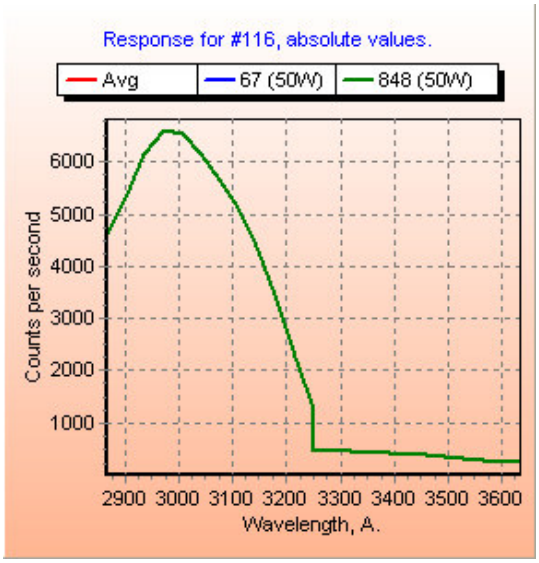
Below is a graph of the sun scan test results show the cal step constant of 285 is still the proper setting. Then the graph of a CZ scan of the 2967A line using internal Hg lamp, which is normal. Next is a graph of two standard lamp CI scans from now and in 2001 which shows the large increase in sensitivity due to the new pmt filter. Before changing the filter the transmission was near zero and the filter was found to be very corroded.

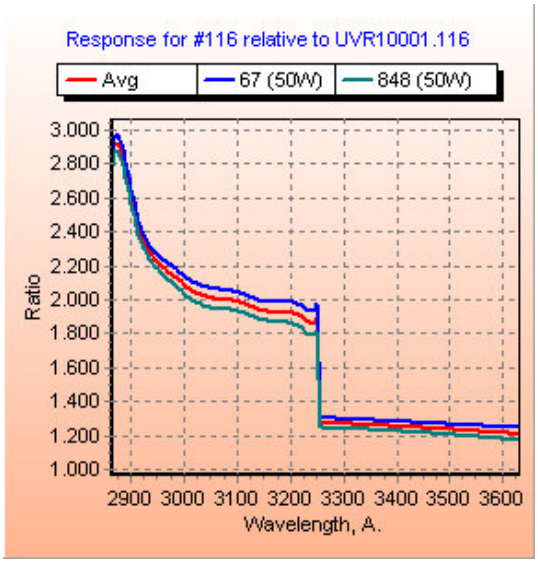






Below graph of new UV response file (uvr25206.116) and next a graph of the difference of this new file to the last calibration file in 2001.





Below is graph of the irradiance results from one simultaneous UV scan (ua) from the two instruments. Note #017 was physically located at lower position than #116 and this is reason for the lower results. Next are the DUV results from four UA scans on the last day. Then a picture of the two instruments and Mr. Saipul Hamdi from LAPAN.

