

## 1 Introduction

The Royal Meteorological Institute at Uccle (Belgium, 50°48'N, 4°21'E) has a long tradition in observations with the Brewer spectrophotometers. Column ozone observation Brewer MkII #016 instrument are performed since 1983. The single Brewer #016 was automated in 1989, and at the same time equipped with a UVB port. Since 2001, a double MkIII Brewer #178 was installed for ozone and UVB measurements. A method to retrieve Aerosol Optical Depth (AOD) in the UV-B from the routine ozone observations with the Brewer instruments has been developed.

## 2 Summary of calibration records

### • Ozone calibrations

Brewer #016, in use since 1983, was calibrated relative to Dobson #40 in 1984, but kept independent afterwards [De Backer and De Muer, 1991]. The calibration level was checked and confirmed in 1989 and 1994 with the travelling Brewer standard #017. ZS values are calculated using coefficients from simultaneous observations [De Backer, 1998]. In 2003 a new calibration level was established by comparison with the travelling reference instrument #017 during a calibration visit of IOS. This calibration was used backward from July 2001, when an important shift in standard lamp readings was noted after a breakdown caused by a thunderstorm. In 2006 another calibration was performed by IOS.

The double Brewer #178 used the ozone calibration delivered by the factory until an intervention in 2002. At that time a problem with the polarising filter for ZS observations was detected, and the filter-wheel was replaced. From then onwards, the calibration values obtained during a calibration visit of IOS with standard instrument #017 in 2003 is used. Also this instrument was recalibrated in 2006. Zenith polynomial coefficients for this instrument were calculated using the same algorithm as for Brewer #016.

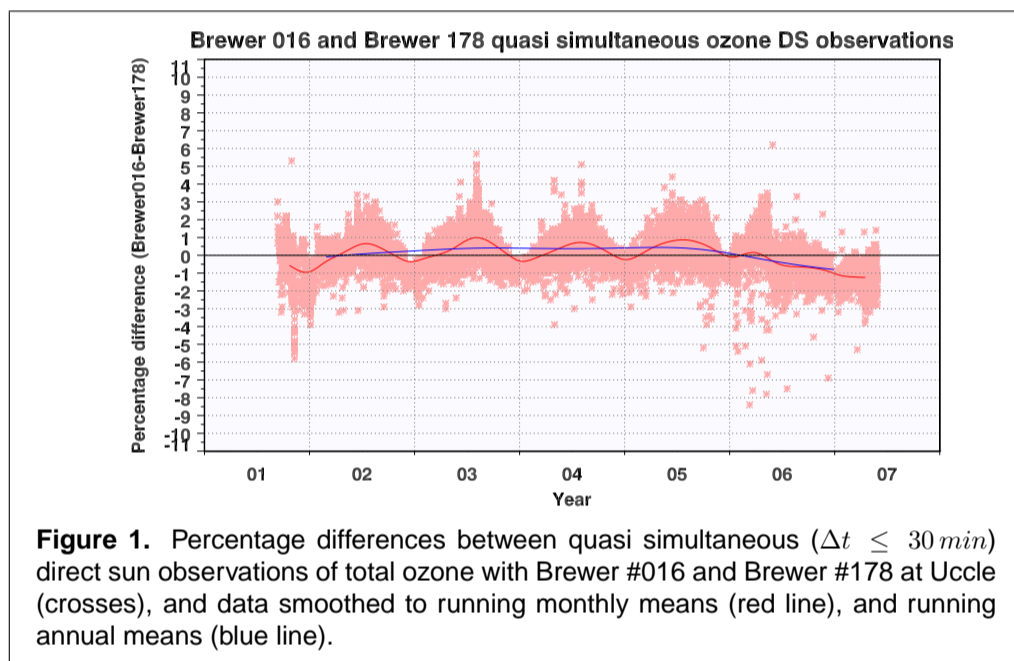
### • The UV calibrations

For both instruments they are based on regular measurements with several 50W lamps and 1000W lamp calibrations during calibration visits.

### • AOD calibrations

The algorithm used for AOD calculations is based on the Langley plot method, described by Cheymol and De Backer [2003].

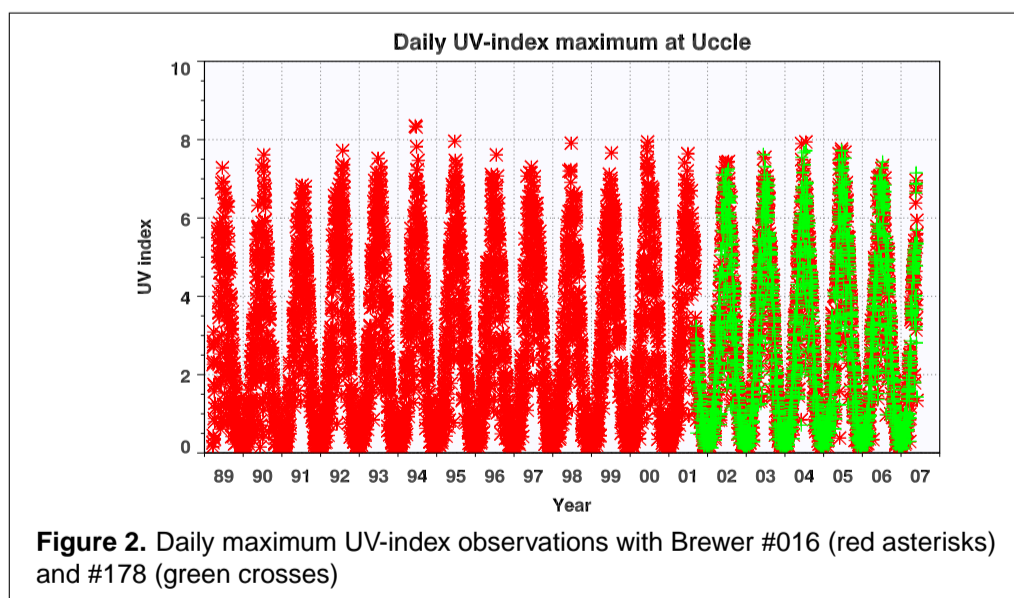
## 3 Ozone time series



**Figure 1.** Percentage differences between quasi simultaneous ( $\Delta t \leq 30 \text{ min}$ ) direct sun observations of total ozone with Brewer #016 and Brewer #178 at Uccle (crosses), and data smoothed to running monthly means (red line), and running annual means (blue line).

The monthly and yearly mean percentage differences between both instruments (Figure 1) are generally smaller than 1%. There was, however, an annual cycle seen until 2006, which disappeared after the last calibration.

## 4 UV time series



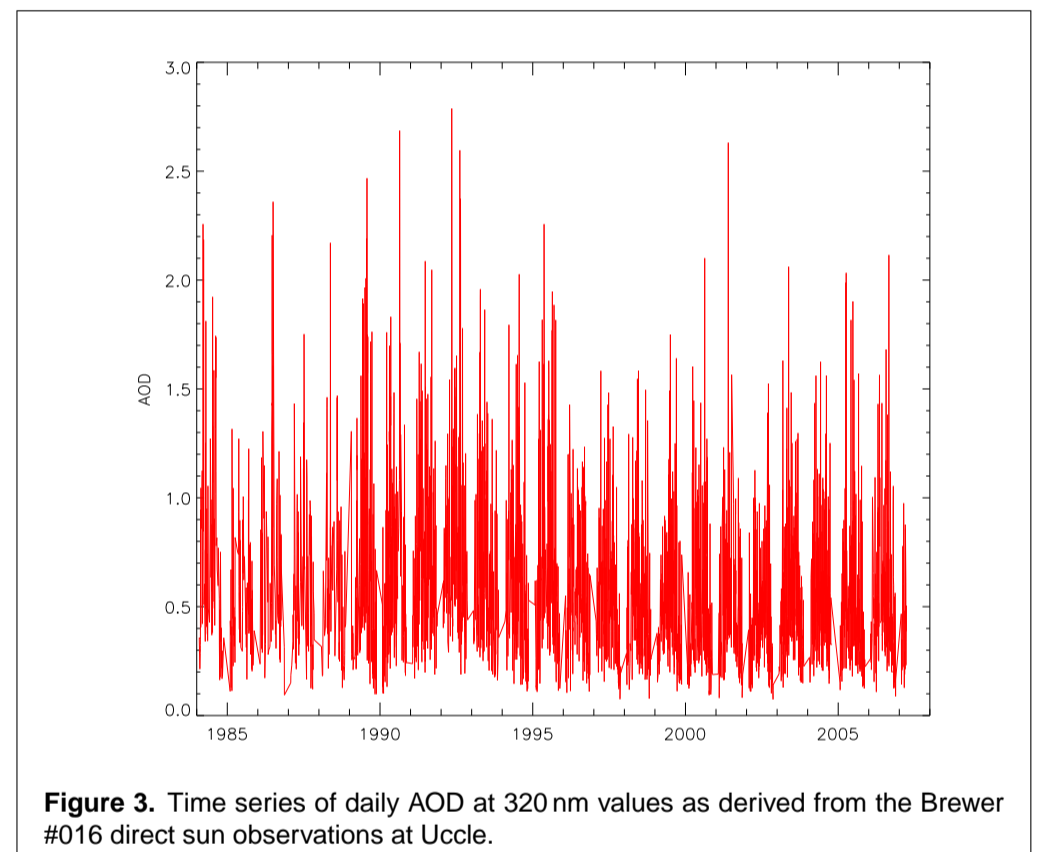
**Figure 2.** Daily maximum UV-index observations with Brewer #016 (red asterisks) and #178 (green crosses)

Figure 2 displays the time series of measured daily maxima of UV index at Uccle. A more detailed comparison showed that the differences between the UV indices of both instruments are generally very low.

## References

- Cheymol, A. and H. De Backer, Retrieval of the Aerosol Optical depth in the UV-B at Uccle from Brewer ozone measurements over a long time period 1984-2002, *J. Geophys. Res.*, 108 (D24), 4800, doi:10.1029/2003JD003758, 2003.
- De Backer, Hugo and D. De Muer, Intercomparison of total ozone data measured with Dobson and Brewer ozone spectrophotometers at Uccle (Belgium) from January 1984 to March 1991, including zenith sky observations, *J. Geophys. Res.*, 96, 20711-20719, 1991.
- De Backer, Hugo, Zenith observations of total ozone in Uccle, *Wetenschappelijke en technische publicatie van het Koninklijk Meteorologisch Instituut van België*, n° 006, ISSN n° D1998/0224/006, Brussel, also available on ftp://ftp.kmi-irm.be/dist/meteo/hugo/publ/1999/zszc.ps, 1998.

## 5 Aerosol time series



**Figure 3.** Time series of daily AOD at 320 nm values as derived from the Brewer #016 direct sun observations at Uccle.

Figure 3 show the daily values of AOD as derived with the algorithm developed by Cheymol and De Backer [2003]. Results of comparisons of AOD measurement with different instruments are discussed on a related poster.

## 6 Conclusions

The Brewer instruments proved to be reliable instruments to collect on a routine basis data of the ozone column, UV and AOD in the UV-B.

The results of the measurements with the single and the double instrument are consistent.