File Revision Date:
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Data set description:
PI: C. Brogniez
Instrument: UV SPECTRORADIOMETER (BENTHAM DTMc300, in replacement of Jobin-Yvon HD10)
Site: Villeneuve d'Ascq, France (50.61N, 3.14E, 70m), January 2009
Local horizon: totally free, very flat country.
Local environment: urban (close to a large town), and with vegetation on the University campus.
Measurement Quantity :
Global spectral irradiance on a horizontal surface (cosine weighted) in the 280-450 nm range, wavelength step = 0.5 nm. Scans taken each half hour from sunrise to sunset.
The data summaries on the NDACC database include the following :
1. 290-450 nm integral
2. UVA, 315-400 nm
3. UVB, 290-315 nm
4. Erythemal UV
5. Derived total Ozone column
6. Relative uncertainty of retrieved Ozone
7. Erythemal UV Broadband sensor (YES)

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Few reference articles:
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Houet, M., Spectroradiometrie du rayonnement solaire UV au sol: Ameliorations apportees a l'instrumentation et au traitement des mesures. Analyse pour lÕevaluation du contenu atmospherique en ozone et en aerosol, PhD dissertation, Universite des Sciences et Technologies de Lille, France, 2003.

Houet, M. and C. Brogniez, Ozone column retrieval from solar UV irradiance measurements at ground level: sensitivity tests and uncertainty estimation, J. Geophys. Res., 109, D15302, doi: 10.1029/2004JD004703, 2004.

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Buchard, V., C. Brogniez, F. Auriol, B. Bonnel, J. Lenoble, A. Tanskanen, B. Bojkov, and P. Veefkind, Comparison of OMI ozone and UV irradiance data with ground-based measurements at two French sites, Atmos. Chem. Phys., 8, 4517-4528, 2008.

Jegou F., Godin-Beekmann S., Correa M.P., Brogniez C., Auriol F., Peuch V.H., Haeffelin M., Pazmino A., Saiag P., Goutail F. et al, Validity of satellite measurements used for the monitoring of UV radiation risk on health, Atmos. Chem. Phys., 11, 24, 13377-13394, 2011.

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Instrument description:

Double monochromator Bentham DTMc300 - 2400 gr/mm
Cosine response error: < 5% for angles < 75¡
Wavelength range: 280-450 nm
Resolution: 0.5nm
Wavelength alignment: After correction the shift is generally less than 0.02 nm, and up to 0.05 nm towards 300 nm (according to QASUME 2010)
Slit function: 2. 10-4 at 1.25 nm from line center and 2. 10-5 at 3 nm
Sampling step: 0.5 nm
Saturation threshold: 1.5 W/m2/nm
Detection threshold: 1. 10-6 W/m2/nm
Scan duration: 5-6 min
Overall calibration accuracy: Expanded relative uncertainty:
For two solar zenith angles and for a coverage factor k=2:
SZA = 30¡: 4.8% at 310 nm and 4.4% at 400 nm
SZA = 60¡: 5.9% at 310 nm and 4.8% at 400 nm
Stray light: 10-6 W/m2/nm
Stabilized temperature: 20¡C in cold months, 24¡C in warm months (+/- 2¡C)
Scan date and time: time recorded at each wavelength
Global irradiance scan frequency: 30 min (every hour and half hour)
Diffuse irradiance scan frequency: 30 min (fifteen minutes after and before each full hour)

Daily cleaning of the dome.

Algorithm description:
Calibration: every three months with a 150 W lamp. Twice a year calibration also performed with two or three 1000 W standard lamps traceable to NIST, for checking the 150 W calibration and possibly carrying out a re-calibration, and also scans of a mercury lamp.
The three 1000 W lamps have been re-calibrated at WRC, DAVOS, in July 2012.
A NDACC inter comparison campaign held in July 2014 in Hannover, confirmed this new calibration. All the data have been reprocessed.
Wavelength calibration: alignment against Fraunhofer lines performed with an algorithm developed at LOA (Houet, 2003) and improved during a QASUME campaign held at OHP in September 2010.
Calibrations performed with two 1000W lamps purchased at NIST in 2017 and 2018 agree with the calibrations obtained with the previous lamps to within 2%.

Spectra are corrected for the instrument's cosine error.

Consistency tests with two broadband instruments (YES UV-B1 and K&Z UV-S-AE-T).

Ozone retrieval:

Mean of total ozone values from various irradiance ratios of two wavelengths (Houet, M. and C. Brogniez, 2004, Stamnes et al., 1991).
The dispersion around the mean gives an estimate of the uncertainty.

Only ozone values with a relative dispersion lower than 3% are reported since a larger relative dispersion indicates a variable cloudiness during the scan and thus, possibly, a less reliable ozone value (Brogniez et al. 2005).

Instrument history:

The Bentham spectroradiometer working at LOA began routine measurements in 2009 (interruption for a measurement campaign between February and July 2009).
The angular response of the entrance comes from Bentham company.
Slit function was measured during QASUME 2010 (HeCd laser line).
NDACC intercomparison campaign held in July 2014, Hannover.
Problems with the temperature regulation (see data quality flags):
- instrument too warm in April, May, September and October 2018 and in July and August 2019.
- instrument too cold in January, February, March and December 2018 and in January, February and March 2019