

File Revision Date:

September 25, 2019

Data Set Description:

PI: Dr. Rigel Kivi
Instrument: Brewer #037
Site(s): Sodankylä
Measurement Quantities: Total Ozone Column (TOC)

Contact Information:

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Reference Articles:

1. Rimmer, J. S., Redondas, A. & Karppinen, T. EuBrewNet – A European Brewer network (COST Action ES1207), an overview. *Atmospheric Chemistry and Physics* 18, 10347–10353 (2018).
2. León-Luis, S. F. et al. Internal consistency of the Regional Brewer Calibration Centre for Europe triad during the period 2005–2016. *Atmospheric Measurement Techniques* 11, 4059–4072 (2018).
3. Redondas, A. et al. EUBREWNET RBCC-E Huelva 2015 Ozone Brewer Intercomparison. *Atmospheric Chemistry and Physics* 18, 9441–9455 (2018).
4. Grobner, J. Traceability for atmospheric total column ozone Short Name: ATMOZ, Project Number: ENV59 Final Publishable Report Traceability for atmospheric total column ozone (ENV59).
5. Redondas, A., Evans, R., Stuebi, R., Köhler, U. & Weber, M. Evaluation of the use of five laboratory determined ozone absorption cross sections in brewer and dobson retrieval algorithms. *Atmospheric Chemistry and Physics Discussions* 13, 22979–23021 (2013).
6. Kerr, J. B. The Brewer Spectrophotometer. in *UV Radiation in Global Climate Change* (eds. Gao, W., Slusser, J. R. & Schmoldt, D. L.) 160–191 (Springer Berlin Heidelberg, 2010).
7. Karppinen, T., Lakkala, K., Karhu, J. M., Heikkinen, P., Kivi, R., and Kyrö, E.: Brewer spectrometer total ozone column measurements in Sodankylä, *Geosci. Instrum. Method. Data Syst.*, 5, 229-239, <https://doi.org/10.5194/gi-5-229-2016>, 2016.

Instrument Description:

The total ozone column over Sodankylä has been measured with Brewer spectrophotometer, serial number 037, since May 1988. The wavelength resolution is roughly 0.6 nm (full width at half maximum of the instrument function). The wavelength range is 290– 325 nm.

Algorithm Description:

Brewer Standard algorithm:

For each ozone value five quasi-simultaneous observations are made. Each observation consists of 20 cycles of quasi-simultaneous measurements of intensity at five of the six UV-wavelengths by fast switching of the spectrometer exit slit mask.

The algorithm to retrieve TOC from individual observations is based on differential absorption of ozone at the measured wavelengths. A weighted double ratio, $R6(O3)$, of the measured intensities is calculated and compared to the similar extraterrestrial double ratio, $ETC0$, determined by the Langley-plot method (2) or by transfer from a travelling reference instrument (3). The weighting coefficients are designed to minimize the effects of aerosols and SO_2 spectral absorption. A differential absorption coefficient, β , corresponding to this ratio, is calculated from ozone absorption cross sections (5) convoluted with the slit functions at the measurement wavelengths, and is used to transform the $R6(O3)$ - $ETC0$ difference into total ozone in the light's path (slant column). To get the vertical total ozone column, $O30$, the value is further divided by the air mass factor μ

$$O3 = (R6(O3) - ETC0) / \beta \mu$$

See more details in (1) and <http://rbcce.aemet.es/dokuwiki/doku.php?id=codes:ozonproduct>

Expected Precision/Accuracy of the Instrument:

In development, see (4)

Instrument History:

For details, see (7)