File Revision Date:
September 24, 2019

Data Set Description:

PI:	Nis Jepsen
Instrument:	Brewer #202
Site(s):	Sondre Stromfjord
Measurement Quantities:	Total Ozone Column (TOC)

Contact Information:

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Reference Articles:

Instrument Description:
Brewer MK-III (double monocromator)

The Brewer spectrophotometer was developed in Canada during the 1970s, and a commercial, automated version became available in the early 1980s. The Brewer spectrophotometer performs measurements of the direct spectral UV irradiances which, through a well-defined process, are used to calculate the TOC value. The Brewer spectrophotometer measures the direct spectral irradiance in six channels in the UV (303.2, 306.3, 310.1, 313.5, 316.8, and 320.14 nm), each with approximately a 0.5 nm bandwidth (resolving power $\lambda/\Delta\lambda \approx 600$), although that of the shortest wavelength varies with the Brewer model. The spectral analysis is achieved by a holographic grating in combination with a slit mask which selects the channel to be analyzed by a photomultiplier. There are three types of Brewer instruments: the Mk II and Mk IV models are single monochromators, and the Mk III model is a double monochromator, a characteristic that reduces stray light in its measurements. (6)

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 SO2 spectral absorption. A differential absorption coefficient, α,

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

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

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

Expected Precision/Accuracy of Instrument:

Instrument History:
2010-02-11 "Installation of instrument"