

File Revision Date:

December 8, 2004

Data Set Description:

PI: Geraint VAUGHAN
Instrument: SAOZ
Site: Lerwick (60N, 1W)
Measurement Quantities: Total Ozone, NO₂am, NO₂pm

Contact Information:

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Reference Articles:

Pommereau, J.P. and F. Goutail, Stratospheric O₃ and NO₂ Observations at the Southern Polar Circle in Summer and Fall 1988, Geophys. Res. Lett., 895, 1988.

Instrument Description:

The SAOZ consisted (at the time of the Lerwick campaign) of a commercial Jobin-Yvon UFS-200 flat field spectrometer equipped with a holographic 200 gr/mm grating and a Hamamatsu 512 diode array uncooled detector, with a 25 micron entrance slit allowing an average resolution of the order of 1 nm in the range 300-600 nm.

The spectrometer is housed in a dust- and water-proof container with a quartz window to enable measurements from the zenith sky.

The instrument was (at the time of the Lerwick campaign) driven by a Hewlett Packard 9000 computer which recorded and analysed the spectra in real time. Measurements are performed from sunrise to sunset until a Solar Zenith Angle (SZA) of 94. The exposure time is adjusted automatically between 0.1s to 60s in order to optimise the signal and the spectra are co-added in memory during a 60s duty cycle. The dark current is measured each time the duration of exposure changes and subtracted. Averages of ozone and NO₂ morning and evening vertical columns measured between 87 to 91 SZA.

Algorithm Description:

After a precise wavelength alignment with the use of the Fraunhofer solar absorption lines, actual spectra are divided by a reference spectrum recorded at high sun on a clear and unpolluted day. Monotonic large trends are then removed by subtracting the same spectrum smoothed at a broad bandpass (40 nm) resulting in an atmospheric differential spectrum, in to which narrow features corresponding to absorption by ozone, nitrogen dioxide, O₄ (oxygen dimer), water vapour and OCIO, are remaining.

Slant columns are then calculated by least squares fitting between the signal and the differential cross sections of each absorber in an iterative process in which the contributions of the various species are calculated and removed sequentially. Ozone is measured in the Chappuis visible bands (450-570 nm)

where the cross sections are independent of the temperature; nitrogen dioxide in 412-490 nm range; O₄ in two bands (465-484 nm and 556-584 nm); and H₂O in one band (440-600nm).

Expected Precision/Accuracy of Instrument:

Precision given in data files. For total column, precision approximately 2 DU for ozone and 1.5 E14 mol/cm² for NO₂.

Data Quality Notes:

Data pre May 1998 analysed using SPC analysis for Ozone, post May 1998 analysed using WinDOAS. All NO₂ data analysed using WinDOAS.

Instrument History:

Installed at Aberystwyth (52.41N, 4.06W) March 1991.

Was based at Lerwick (60N, 1W) from 2/11/91 - 9/5/92.

Original PCD 512 detector replaced in December 1992 with a NMOS 512 detector.

NMOS 512 detector replaced with NMOS 1024 detector in May 1998 at same time as changing from HP to PC control.