

Uncertainties in Total Ozone Retrievals from Dobson Zenith Sky Observations

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The Dobson Ozone Spectrophotometer is used for measurements of total column ozone between the instrument and the outer edge of the atmosphere. The retrieval of ozone from measurements on the direct solar beam is based on the physics of transmission of light in an absorbing media (Beer-Lambert Law). Measurements of the zenith skylight are converted to total column ozone based on a statistical relationship established by analysing zenith and direct sun measurements made close in time. The original method was based on a table look-up algorithm derived from charts made from Canadian measurement campaigns in the 1950s and 1960s. The new method is a polynomial fitting routine between the direct sun results and various parameters of the zenith measurement. There are several types of zenith sky measurements available from Dobson that differ in selection of wavelength pair (AD or CD) and in the amount of the cloudiness (ZB: zenith blue sky or ZC: zenith cloudy). The recent re-analyses of the long-term NOAA Dobson total column ozone data records provided opportunity to assess the reliability of the original method to derive total ozone. Zenith sky data for NOAA stations have been reprocessed using an updated statistical method and comparing the results to the previous version of zenith sky data processing. The new method improves results so that ~90% of the time a zenith sky determined total ozone (using ADZB) is within +/-2% of a co-incident direct sun ozone column (ADDS).

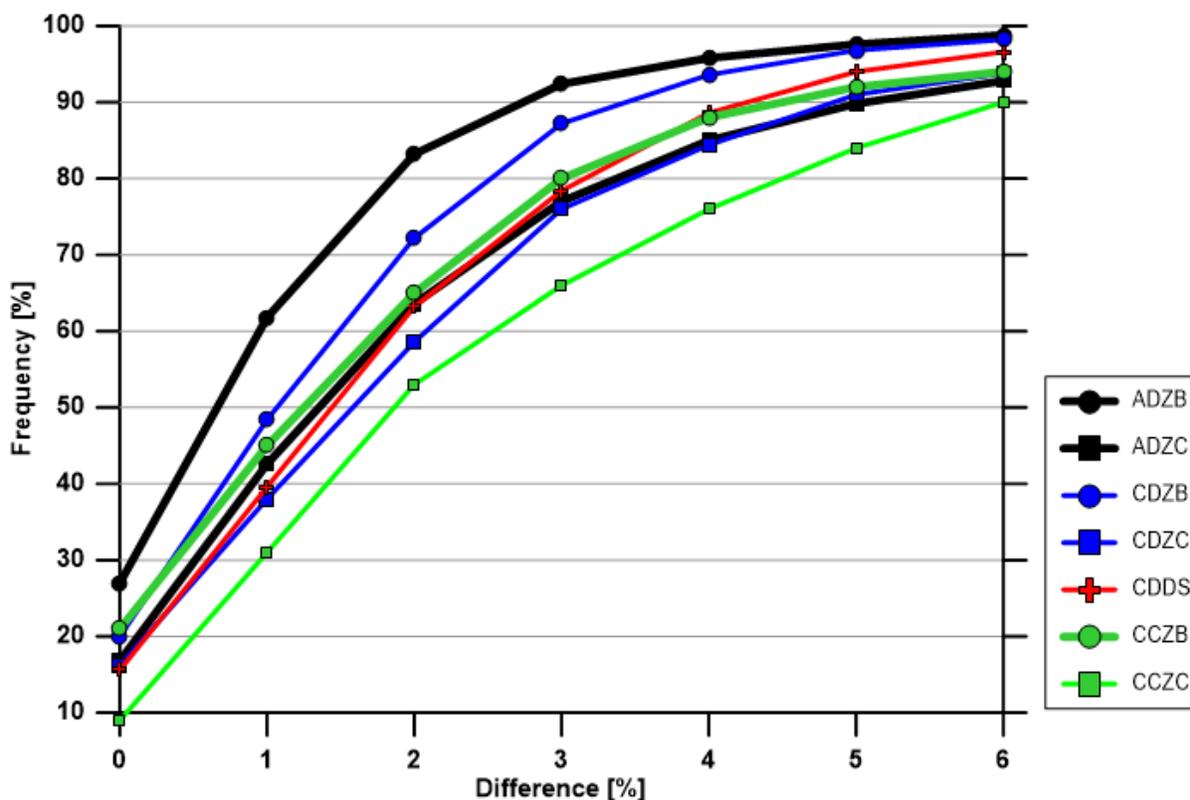


Figure 1. Distribution of differences between results from direct sun compared to zenith measurements on the same day. The frequency of compared Zenith and AD-DS (Direct Sun) total ozone (shown on y-axis) is accumulated between 1 to 6 % (shown on the X-axis). Results are shown for other types of zenith sky measurements denoted by colors in the legend.