

Temperature dependence of the Brewer spectral UV and total ozone column measurements

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Brewer spectrophotometers perform spectral measurements of direct, zenith scattered and global solar spectral UV irradiance. The first two are commonly used to derive the total ozone column (TOC) and aerosol optical depth. Brewer measurements can be affected significantly by the instrument-specific optical and mechanical features, thus proper corrections are needed in order to reduce the uncertainties in the final products and keep them within the desired levels. The present study aims to contribute to the reduction of the uncertainties in the Brewer data originating from the changes in the Brewer's internal temperature.

Changes in the Brewer internal temperature affect the performance of the optical and electronic parts, and subsequently the sensitivity response of the instrument. In the present study, different methodologies used to characterize the instruments' temperature dependence have been assessed. External 50 and 1000 Watt tungsten-halogen lamps were used for the characterization of the global UV measurements while external 50 Watt lamps and the internal 20 Watt standard lamp were used for the characterization of the direct sun measurements. The temperature characterization of global port of measurements using 50 Watt lamps was found to result in errors since the lamp warms the Teflon diffuser which changes its transmissivity, and subsequently affects the response of the instrument. The temperature correction results from the characterization of the direct irradiance port with internal and external lamps differed substantially. However, for the investigated cases, the resulting difference in the derived TOC when these temperature correction factors are applied was found to be small in both cases.