

QOS2016-303, 2016

Quadrennial Ozone Symposium of the International Ozone Commission

© Author(s) 2016. CC Attribution 3.0 License.

Wavelength Characterization of Brewer Spectrophotometer with a tunable laser PTB facilities

A. Redondas (1), S.F. Nevas (2), A. Berjón (1,3), M. Sildoja (2), V. Carreño (1), D. Santana (1,3), B. Hernández-Cruz (1,3), S.F. León-Luis (1), J. López-Solano (1,3)

(1) Regional Brewer Calibration Center Europe, Izaña Atmospheric Research Center, Agencia Estatal de Meteorología, Tenerife, Spain (aredondasm@aemet.es), (2) Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany, (3) Departamento de Ingeniería Industrial, Universidad de La Laguna, Tenerife, Spain

In this work we present the wavelength calibration of the travelling reference brewer of the RBCC-E (<http://rbcce.aemet.es>) at PTB in Braunschweig, Germany. In this experiment we compare the operational wavelength calibration performed to Brewer instrument to the calibration obtained using tunable laser facilities.

The wavelength calibration calculates the ozone absorption coefficient used on the Brewer ozone algorithm. This procedure is performed analyzing the emission lines of the spectral lamps (usually Hg, Cd, and Zn) determining the central wavelengths, the corresponding FWHM and the relation between the position of the grating and the corresponding wavelength (dispersion relation) of the operational wavelengths used on the ozone determination. The Brewer spectrophotometer have two operating ones, the ozone mode, used for ozone measurement is performed with the diffraction grating at fixed position while the six operational wavelengths are measured by rotating slit mask. The scanning mode, used for the spectral uv measurements, the slit are fixed, and the scan is performed by moving the diffraction grating. To obtain the ozone absorption coefficient the instrumental slit function is convolved with the Bass & Paur ozone cross section.

The use of the tunable source allow two studies:

Calculate the dispersion relation based on an regularly spaced reference spectral lines provided by the tunable laser instead of the irregular distributed emission lines of the Hg, Cd and Zn spectral lamps.

Calculate the ozone absorption coefficient directly. The ozone absorption coefficient determination use the UV mode as the spectral lines are “scanned”, the dispersion relation is used to convert micrometer steps of the grating to wavelengths assuming a quadratic relation. Scanning with the laser around the ozone operational wavelengths we can determine the instrumental slit function and weight with the ozone cross section without the assumptions of the slit functions and the dispersion relations used in the operational procedure.