QOS2016-219-1, 2016
Quadrennial Ozone Symposium of the International Ozone Commission


# Validation of the long term ESA Ozone-CCI GODFIT_v3 Total Ozone Record using three different ground-based instruments at a Northern mid-latitude station

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For the validation of new, as well as existing, total ozone columns [TOCs] sensed by satellite instruments, daily total ozone columns reported by Brewer and Dobson spectrophotometers are usually employed. As a result, it is not possible to accurately determine the daily variability of the column. In the Laboratory of Atmospheric Physics of the Aristotle University of Thessaloniki, Greece (40.63°E, 22.96°N), three different instruments and algorithms are currently providing instantaneous TOC measurements throughout the day. A single monochromator Brewer spectrophotometer performs direct Sun observation of the UV radiation at five selected wavelengths, nominally 306.3, 310, 315.5, 316.8 and 320nm, and is providing TOCs operationally since 1982. In addition, NILU-UV irradiances at central wavelengths of 302, 312, 320, 340 and 380 nm have been used as inputs to a neural network model and have been used to extract 1-minute TOCs from 2005 onwards. And thirdly, direct Sun spectrally resolved measurements in the UV-visible region between 300 and 450nm, performed by a miniature CCD spectrometer system, have been analyzed with the DOAS technique to deliver TOCs since late 2013. Each of the three instruments has its own strengths and restrictions, however put together they are providing a unique opportunity to assess the satellite TOCs using a full statistical consideration of the comparisons, focusing on the inter-consistency of the different instrumentations and methodologies.
In this work, satellite total ozone from the GOME/ERS-2, SCIAMACHY/Envisat, OMI/Aura, and GOME2/Metop-A & GOME2/Metop-B at each overpass time are compared against the Brewer, the NILU-UV and the CCD-extracted TOCs over Thessaloniki. The satellite TOCs have been retrieved using the ESA Ozone-cci baseline algorithm GODFIT_v3 at BIRA/IASB. Time series, correlation statistics and investigations of possible systematic dependencies will characterize the strengths and weaknesses of the different instruments and algorithms. Atmospheric, algorithm-related as well as technical factors responsible for sources of discrepancy among the TOC retrievals will be investigated.