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Actinic flux and O¹D photolysis frequencies retrieved from spectral measurements of irradiance at Thessaloniki, Greece

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Abstract. The results of two methods retrieving actinic flux and ozone photolysis frequencies (JO¹D), from measurements of irradiance with a Brewer MKIII spectroradiometer are investigated in this paper. The first method uses actinic flux retrieved from irradiance measurements by the use of known formulas while the second is an empirical method converting irradiance to JO¹D through polynomials extracted from a study of synchronous actinic flux and irradiance measurements. When examining the actinic fluxes derived from the first method to those measured by an actinic flux spectrometer data agree within ±10% for solar zenith angles lower than 75° for the UV-B and the UV-A wavelength band. Also, the actinic to global irradiance ratio derived, deviates within ±6% for solar zenith angles lower than 70° compared with cloudless sky calculations of the TUV model. For both cases the deviations are in the order of the magnitude of the measurement or model uncertainties. Values of JO¹D calculated by the second method show a mean ratio of 0.99±0.10 (1σ) and 0.98±0.06 for all data and for cloudless skies respectively when compared with values of JO¹D derived by a Bentham actinic flux spectroradiometer. Finally, the agreement of the two methods is within ±5% comparing two years' data of JO¹D retrieved from irradiance measurements at Thessaloniki, Greece. The use of such methods on extensive data sets of global irradiance can provide JO¹D values with acceptable uncertainty, a parameter of particular importance for chemical process studies.

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