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Study of suitability of AvaSpec array spectrometer for solar UV field measurements

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Abstract. A system to record the ultraviolet (UV) spectra of atmospheric global irradiance with the miniature fiber optic spectrometer AvaSpec-256 was developed for continuous computer-aided spectrometry at Tartu Observatory in 2005. As a result, the database of spectra recorded with 15-min-interval round 24 h over 300–400 nm, has been developed. The quantities retrieved from the spectra have been compared with those measured by the Scintec erythematous UV-SET sensor and the Kipp & Zonen narrowband 306 nm sensor. Almost clear and overcast days were selected for comparison. Reliable results on the spectral distribution of the UV global irradiance as well as the integrated daily spectral doses could be obtained at least during the bright half-year. The results were compared with the calculations performed by means of the LibRadtran package. The biases in irradiance were significant at SZA above 70–75°. At dominating larger SZA the recorded values need sophisticated corrections and remain less reliable. At lower latitudes than that of the study site (58.3°), the reliability of the spectrometer is expected to increase due to a smaller contribution of data measured at large SZA.

The variations of the ratio of UV-A/UV-B irradiance, retrieved from the spectra, were investigated. Also the covariation of the narrowband 306 nm irradiance and the irradiance integrated over the whole UV-B range was studied. The biases between the UV-A/UV-B irradiances calculated by means of the LibRadtran package and measured with the AvaSpec were small at SZA below 70°. At larger SZA the values of the ratio as well as the biases increased, significantly depending on total ozone.

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