

〈教育セミナー〉

紫外線環境と計測

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The UV Radiation Environment and Its Measurement

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Abstract

Ultraviolet radiation (UV) has the potential risk of causing photochemical and photobiological damage in biological systems including plants, animals, and humans. In the past decade, studies on UV effects and quantitative UV measurements of not only solar UV radiation, but also artificial UV radiation, have been made in many countries in association with ozone depletion. This paper presents characteristics of daily and seasonal variations of solar UV-B (290–320 nm) and UV-A (320–400 nm) irradiance comparing with solar TOTAL (300–3,000 nm) irradiance. Results were obtained at Tokai University in Hiratsuka (35° N, 139° E) using band-spectral radiometers since 1990. The UV-B (285–315 nm) irradiance contour map in Japan made by the Japan Meteorological Agency is also described. The correlation between UV-B irradiance and effective ozone thickness (total ozone amount weighted by air mass) is discussed. Moreover, the global solar UV-B and UV-A irradiance measured at 150 cm height in five different types of outdoor environments such as concrete, grass, sand, clay, and snow are presented as a function of solar elevation and direction to the sun. Artificial UV environments are also described with UV emission spectra of typical artificial lamps such as germicidal, blacklight, high-pressure mercury, and xenon. UV radiation measurement methods including physical (optical) radiometry, chemical actinometry, and biological dosimetry are explained.

Key words: ultraviolet radiation, UV, solar UV, UV-A, UV-B, UV environment.