

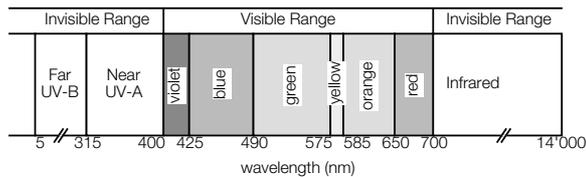
SUMMARY

Solar radiation reaching earth is composed of UV-B, UV-A, visible and infrared light. High radiation intensities are generally available in most developing countries, especially in those around the equator. UV-A is the most important spectrum for SODIS.

BACKGROUND INFORMATION

Solar radiation spectrum

The sun continuously radiates enormous amounts of solar energy at wavelengths that cover the ultraviolet,

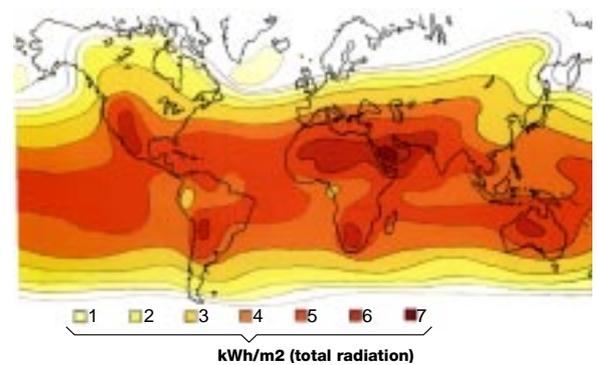


visible, and infrared bands. Not all of the solar radiation received at the periphery of the atmosphere reaches the surfaces of the earth. This is because the earth atmosphere plays an important role in selectively controlling the passage towards the earth's surface of the various components of solar radiation. Radiations with short wavelengths are selectively scattered much more extensively than those with longer wavelengths by atmospheric gases or particles that are smaller in dimension than the wavelength of a particular radiation. Most of the radiation with a range of wavelengths from 200 to 300 nm is absorbed by the ozone (O₃) layer in the upper atmosphere.

Global Solar Energy Distribution

Solar radiation is unevenly distributed and varies in intensity from one geographic location to another depending upon the latitude, season, and time of day.

The most favourable region for SODIS lies between latitudes 15°N and 35°N and embraces the regions that are naturally endowed with the most favourable conditions for solar energy applications. These semi-arid regions are characterized by having the greatest amount of solar radiation, more than 90% of which comes as direct radiation because of the limited cloud



coverage and rainfall (less than 250 mm per year and usually more than 3000 hours of sunshine per year).

The second most favourable region lies between the equator and latitude 15°N. Because humidity is high and cloud cover is frequent, the proportion of scattered radiation is quite high. There is a total of about 2500 hours of sunshine per year.

It is important to note that the majority of developing countries fall within the more favourable regions between latitudes 35°N and 35°S. For this reason they can count on solar radiation as a steadfast source of energy that can be readily exploited cheaply by both rural and urban households for a multitude of purposes, including solar disinfection of drinking water.

UV-A is important for SODIS

The inactivation rate of micro-organisms increases with decreasing wavelength: Visible light → UV-A → UV-B → UV-C (260 nm). The maximum DNA absorption corresponds to the wavelength of UV-C. Comparing UV-A radiation and with visible light for example, more than the double amount of light is needed when using visible light only for the inactivation of microorganisms.

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