



MEAN DAILY GLOBAL SOLAR RADIATION

Notes and Definitions

Solar Radiation: Energy transmitted from the sun in the form of electromagnetic waves. Global solar radiation includes radiation received on the earth's surface by direct incidence and radiation received after scattering or other reflection by atmospheric gas molecules, water vapor, and dust particles. In addition to direct and diffuse radiation, global solar radiation on inclined surfaces includes the component of radiation reflected from ground surfaces.

Monthly Mean Daily Global Solar Radiation: The average of the daily global solar radiation values for the month. The months of June and December have been selected as the months with highest and lowest average for only values of global solar radiation incident on a horizontal surface.

The seasonal variation of solar radiation received at the earth's surface is influenced significantly by four factors: the declination of the sun, the length of day, cloudiness, and ground cover. In the northern hemisphere, the sun reaches its maximum declination of 23° 26' N (Tropic of Cancer) at the summer solstice (June 21), and minimum declination of 23° 26' S (Tropic of Capricorn) at the winter solstice (December 21). Solar radiation received on a horizontal surface varies accordingly, with values ranging from highest at the time of maximum declination to lowest at the time of minimum declination.

The change of declination of the sun is most apparent between the tropics of Cancer and Capricorn; also responsible for the variation in day length throughout the year. The length of day, however, governs the amount of time available for the receipt of incoming radiation. Considerable seasonal variation in day length occurs throughout Canada, particularly in arctic regions. Extremes are reached in the months of June and December when up to 24 hours of daylight or darkness occur. The mean limits of these extremes are indicated on the maps of June and December respectively.

As clouds absorb and reflect back to space a substantial proportion of incoming solar radiation, cloud cover and thickness are additional controls on the amount of radiation that reaches the earth's surface. Solar radiation on inclined surfaces is further modified by the reflectivity of the ground surface. Snow, for example, reflects most radiation back to the sky. The amount of radiation received on inclined surfaces is therefore augmented by this reflected component, and it is possible for inclined surfaces to receive more global solar radiation in winter and spring than in summer.

Monthly Mean Daily Global Solar Radiation Variability: The standard deviation of the monthly mean daily global solar radiation—a measure of the inter-month variation of monthly mean daily global solar radiation values.

Inclined Surfaces: Data for solar radiation incident on inclined surfaces have been derived from measured and simulated horizontal radiation data using a horizontal model. Inclined surfaces of 60° and 90° with a south orientation were simulated. The model is based on the solar energy applications. 60° data are applicable to active solar energy collectors that convert solar radiation into other energy forms. 90° data are relevant to passive energy systems that use solar radiation directly.

