

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 in the earth's surface by direct incidence and radiation received after scattering or diffuse reflection by atmospheric gas molecules, water vapour 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 April and October have been selected as representative of spring and autumn respectively.

The seasonal variation of solar radiation received at the earth's surface is influenced significantly by four factors: the inclination of the sun, the height of day, cloudiness, and ground cover. In the northern hemisphere, the sun reaches its maximum inclination of $23^{\circ}26'30''$ N (Tropic of Cancer) at the summer solstice (June 21/22) and minimum inclination of $23^{\circ}26'30''$ S (Tropic of Capricorn) at the winter solstice (December 21/22). Solar radiation received on a horizontal surface varies accordingly, with values ranging from highest at the time of maximum inclination to lowest at the time of minimum inclination.

The changing inclination of the sun in its annual apparent path between the tropics of Cancer and Capricorn is also responsible for the variation of daylength throughout the year. The height of day in turn 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.

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 more solar radiation than most natural surfaces. The total amount of radiation received on inclined surfaces is therefore augmented by this reflected component, and it is possible to collect surfaces to receive more global solar radiation in winter and in spring than in summer. The influence of this factor is apparent in the particularly high values on the April inclined surface maps.

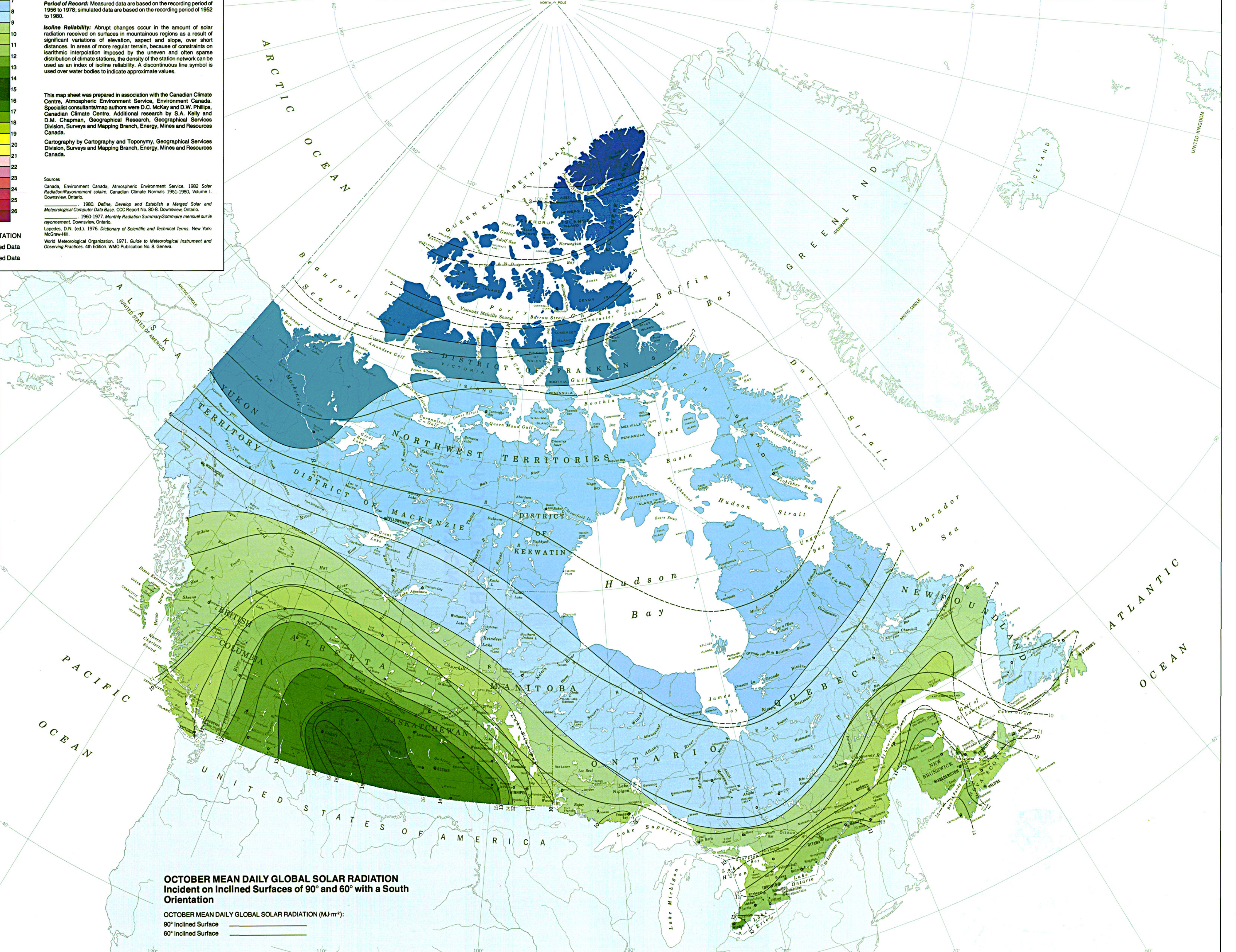
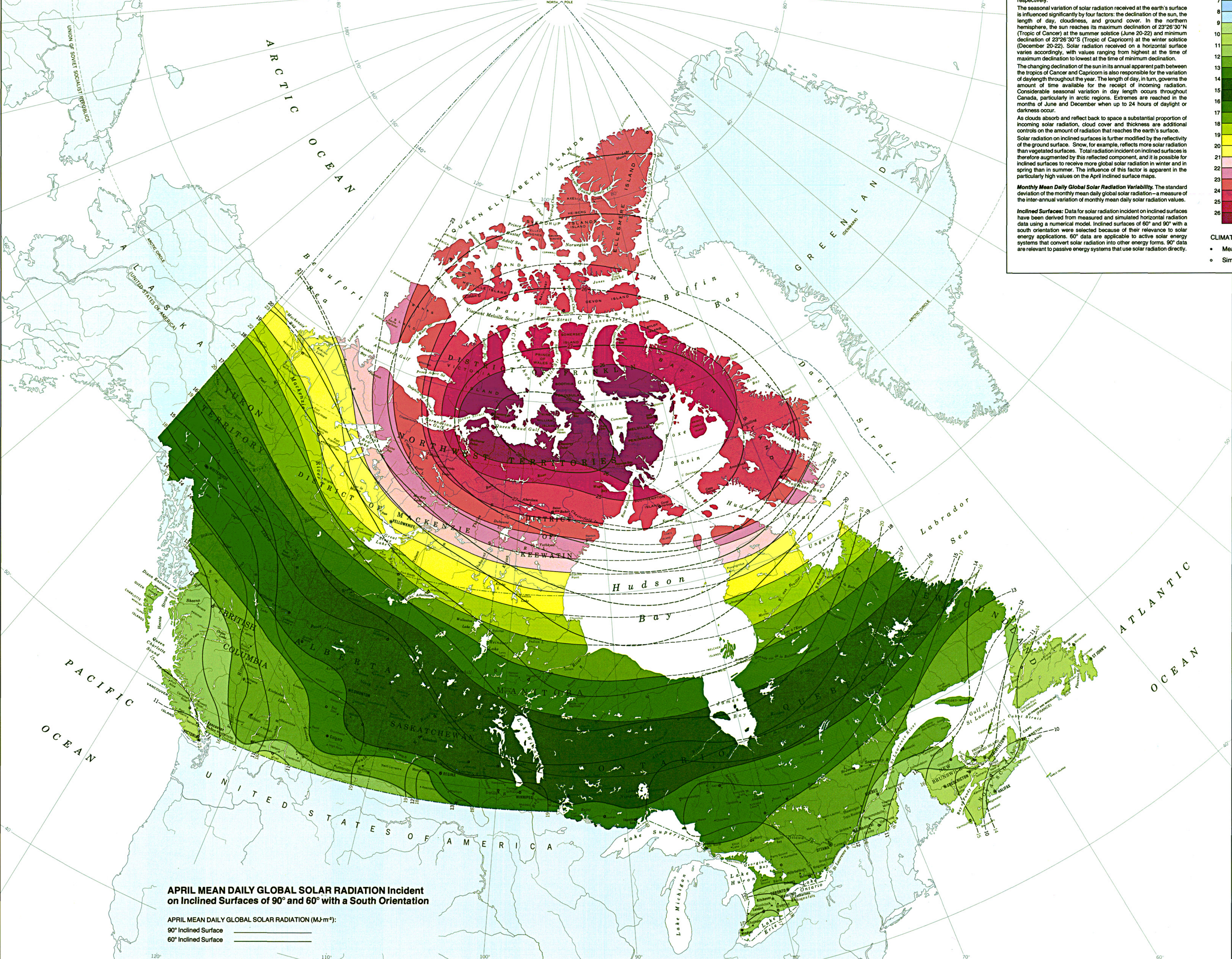
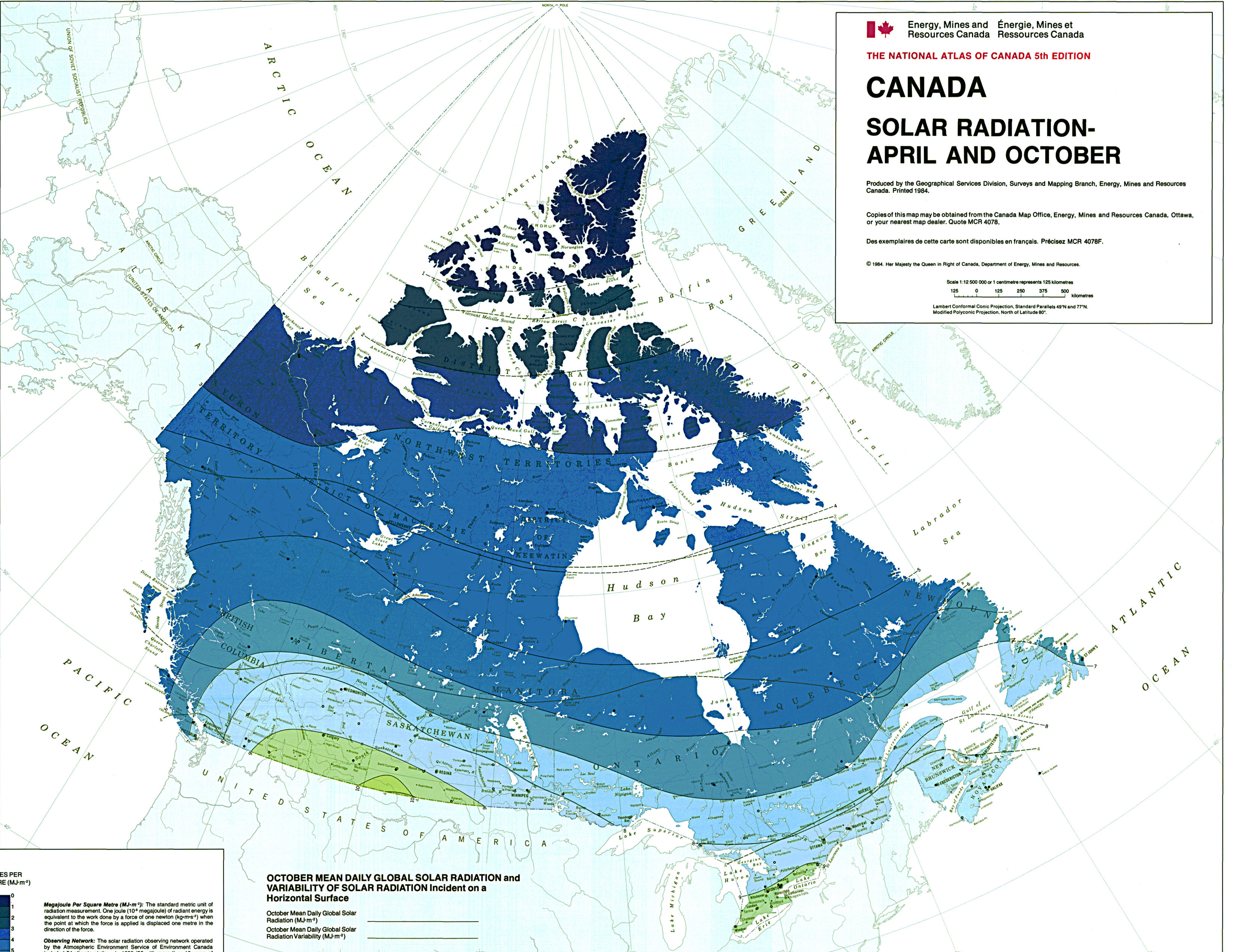
Monthly Mean Daily Global Solar Radiation Variability: The standard deviation of the monthly mean daily global solar radiation – a measure of the inter-annual variation of monthly mean daily solar radiation values.


Inclined Surface Data: Data for solar radiation incident on inclined surfaces have been derived from measured and simulated global radiation data using the method of Liu and Jordan (1962). The surfaces of interest are inclined at 90° and 60° with a south orientation. The surfaces were selected because of their relevance to solar energy applications. 90° data are applicable to active solar energy systems that convert solar radiation into other energy forms. 60° data are relevant to passive energy systems that use solar radiation directly.

MEGAJOULES PER SQUARE METRE (MJ m^{-2})

CLIMATE STATION

- Measured Data
- Simulated Data



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CANADA

SOLAR RADIATION- APRIL AND OCTOBER

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Scale 1:15 000 000 or 1 centimetre represents 120 kilometres
125 0 125 250 375 500 Kilometres
125 0 125 250 375 500 Miles
Lambert Conformal Conic Projection, Standard Parallels 49° N and 77° N
Modified Polyconic Projection, North at Latitude 50° N