

performed in certain places. Liu and Jordan were, in fact, very clever in selecting the clearness index (which they called the cloudiness index) to characterise the solar climate at a particular location, because the division by the extraterrestrial radiation eliminates the radiation variations due to the apparent motion of the sun. This way, the correlation between F_{Dm} and K_{Tm} becomes independent of latitude effects, and, in principle, tends to be of universal validity.

Various empirical formulae are available. Using data from ten locations situated between 40°N and 40°S , Page [20] recommended a liner equation that has been frequently identified as the one giving the best results.

$$F_{Dm} = 1 - 1.13K_{Tm} \quad (20.18)$$

Figure 20.11 plots equation (20.18) and a set of experimental points, obtained in Madrid, from 1977 to 1988.

Example: Determination of direct and diffuse components of the global radiation for the month of June in a location having a latitude $\phi = 30^\circ$ and a mean global horizontal daily irradiation $G_{dm}(0) = 6100 \text{ Wh/m}^2$. The solution is

$$\phi = 30 \text{ and June} \Rightarrow B_{0dm}(0) = 11\,420 \text{ Wh/m}^2 \text{ (See Table 20.1)}$$

$$G_{dm}(0) = 6100 \text{ Wh/m}^2 \Rightarrow K_{Tm} = 0.534 \Rightarrow F_{Dm} = 0.396 \Rightarrow D_{dm}(0) = 2418 \text{ Wh/m}^2 \\ \Rightarrow B_{dm}(0) = 3682 \text{ Wh/m}^2$$

Empirical correlations between the diffuse fraction of the horizontal irradiation and the clearness index can also be derived for an individual day (April 14 is, for example, an individual day, while generic April is a monthly mean day). They should be described here because they have been the object of extensive research in the general solar radiation community and, as a result they have received large attention in the available literature, and they are often employed in today's available PV engineering software tools. However, it should be advised that their advantage for PV design purposes is far from clear. As a matter of fact, the electrical behaviour of PV generators is mainly governed by the linear

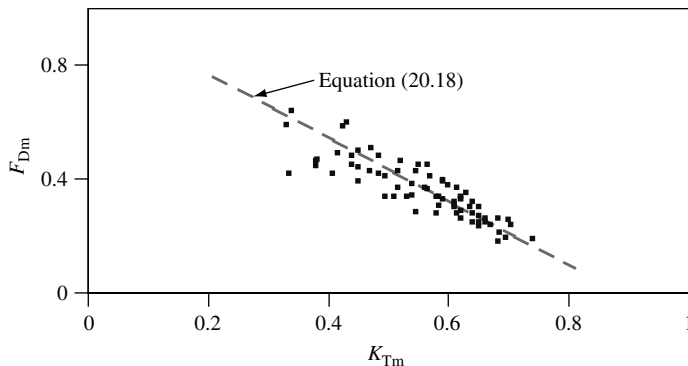


Figure 20.11 The diffuse fraction of the mean daily global irradiation F_{Dm} is plotted against the clearness index K_{Tm} . The cluster of points refers to measured values in Madrid from 1977 to 1988