Note than k_1 is just the ratio between a pyrheliometer's reading and the solar constant, once corrected by the eccentricity due to the ecliptic orbit of the Earth around the sun. This way, k_1 can be understood as a measure of the instantaneous atmospheric transmittance for direct irradiance. When the sky is completely clouded over, $k_1 = 0$ and the above equation becomes the same as that for the simple isotropic model. This anisotropic model is an excellent compromise between simplicity and precision. It has been well-validated against measurements performed at different worldwide locations, and has been extensively used, for example, for the elaboration of the European Atlas of the Solar Radiation [9].

Also, very commonly employed, in particular with digital machines, is the model that has been put forward by Perez [29, 30]. It divides the sky into three zones acting as diffuse radiation sources: a circumsolar region, a horizontal band and the rest of the celestial hemisphere. The relative contributions of each component is modulated by means of empirical factors determined from the study of data from 18 measurement stations at 15 sites in North America and Europe. The Perez model used to perform slightly better than others [31], because the larger number of modulating factors allows for the consideration of a larger number of different sky conditions.

20.5.3.3 Albedo irradiance

The reflectivity of most types of ground is rather low. Consequently, the contribution of the albedo irradiance falling on a receiver is generally small. (An exception occurs in the case of snow.) There is therefore no point in developing very sophisticated models for albedo. It is usual to assume that the ground is horizontal and of infinite extent and that it reflects isotropically. On this basis, the albedo irradiance on an inclined surface is given by

$$R(\beta, \alpha) = \rho G(0) \frac{1 - \cos \beta}{2} \tag{20.38}$$

where ρ is the reflectivity of the ground and depends on the composition of the ground. When the value of ρ is unknown, it is common to take $\rho = 0.2$

It is now opportune to go forward with the example of the previous section, by calculating the irradiance components over a surface tilted to the latitude, the 15 April in Portoalegre-Brazil. Using equations (20.34) to (20.37) to deal with diffuse radiation and $\rho = 0.2$, the results, expressed in W/m^2, are as follows:

ω	k_1	$D^{\mathrm{I}}(\phi)$	$D^{\mathrm{C}}(\phi)$	$B(\phi)$	$R(\phi)$	$G(\phi)$
ω_s	0	0	0	0	0	0
$\pm 60^\circ$	0.2205	73.40	31.80	147.56	2.73	255.49
$\pm 30^\circ$	0.3082	124.14	76.94	357.14	6.26	564.48
0°	0.3403	138.97	98.09	455.31	7.80	700.18

It becomes clear that the albedo can be generally neglected in PV calculations.