ω°	r_D [h^{-1}]	r_G [h^{-1}]	$D(0)$ in [Wm^{-2}]	$G(0)$ in [Wm^{-2}]	$B(0)$ in [Wm^{-2}]
ω_s	0	0	0	0	0
±60	0.0618	0.0529	100.94	204.25	103.31
±30	0.1177	0.1211	192.24	467.58	275.34
0	0.1382	0.1508	225.73	582.24	356.51

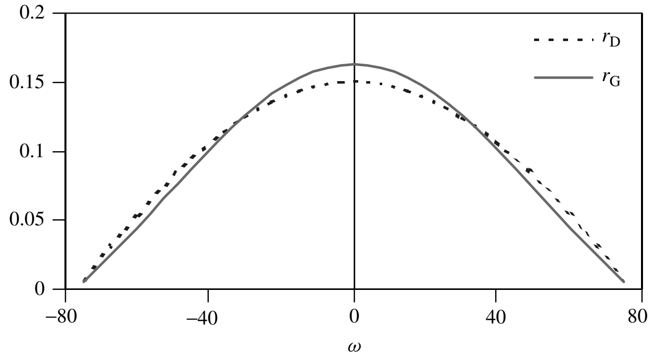

Figure 20.13 Plots of irradiance to daily irradiation ratios, for both diffuse and global radiation, r_D and r_G, along the day at a latitude $\phi = -30^\circ$ for 15 April

Figure 20.13 plots r_D and r_G versus the solar time, along the day. It is interesting to observe that r_G is slightly more sharp-pointed than r_D. This is because, due to air mass variations, beam transmittance is higher at noon that at any other moment of the day. Obviously, integrating the areas below both, r_D and r_G must be equal to one. As already mentioned, for this calculation it can be assumed that the irradiation over one hour (in Wh/m^2) is numerically equal to the mean irradiance during this hour and also equal to the irradiance at the instant half way through the hour. For example, the global irradiance at noon, $G(0) = 580.4$ W/m^2 can be identified with the hourly irradiation from 11:30 to 12:30, $G_h(0) = 580.4$ Wh/m^2. This assumption does not introduce significant errors and it greatly simplifies the calculations by eliminating the need to evaluate integrals with respect to time, which, otherwise, can be quite tedious.

From these equations, it can be deduced that, on any day of the year and anywhere in the world, 90% of the total global horizontal irradiation is received during a period centred around midday and of length equal to two-thirds the total sunlight day length. Consequently, a stationary receiver tilted to the equator ($\alpha = 0$) captures all the useful energy in this period. The same need not be true, however, of receivers that track the sun.

20.5.3 Estimation of the Radiation on Surfaces on Arbitrary Orientation, Given the Components Falling on a Horizontal Surface

The most obvious procedure for calculating the global irradiance on an inclined surface, $G(\beta, \alpha)$, is to obtain separately the direct, diffuse and albedo components, $B(\beta, \alpha)$,