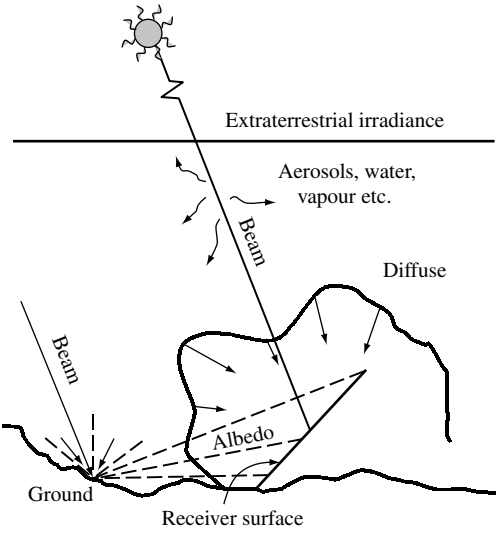

Figure 20.8 Different components of solar radiation

The radiation falling on a receiver situated beyond the Earth' atmosphere, that is, *extraterrestrial radiation*, consists almost exclusively of radiation travelling along a straight line from the sun. Since the intermediate space is almost devoid of material that might scatter or reflect the light, it appears virtually black, apart from the sun and faint points of light corresponding to the stars.

As the solar radiation passes through the Earth's atmosphere, it is modified by interaction with components present there. Some of these, such as clouds, reflect radiation. Others, for example, ozone, oxygen, carbon dioxide and water vapour, have significant absorption at several specific spectral bands. Water droplets and suspended dust also cause scattering. The result of all these processes is the decomposition of the solar radiation incident on a receiver at the Earth's surface into clearly differentiated components. *Direct or Beam radiation*, made up of beams of light that are not reflected or scattered, reaches the surface in a straight line from the sun. *Diffuse radiation*, coming from the whole sky apart from the sun's disc, is the radiation scattered towards the receiver. *Albedo radiation* is radiation reflected from the ground. The total radiation falling on a surface is the sum of these (direct + diffuse + albedo) and is termed *global radiation*.

It is intuitively obvious that the directional properties of the diffuse radiation depend to a large extent on the position, form and composition of the water vapor and dust responsible for scattering. The angular distribution of the diffuse radiation is therefore a complex function that varies with time. Diffuse radiation is essentially anisotropic. The amount of albedo radiation is greatly affected by the nature of the ground, and a wide range of features (snow, vegetation, water etc.) occur in practice.

In the following discussion, the word *radiation* will be used as a general term. To distinguish between power and energy, more specific terminology will be used. *Irradiance* means density of power falling on a surface, and is measured in W/m^2 (or similar); whereas *irradiation* is the density of the energy that falls on the surface over some