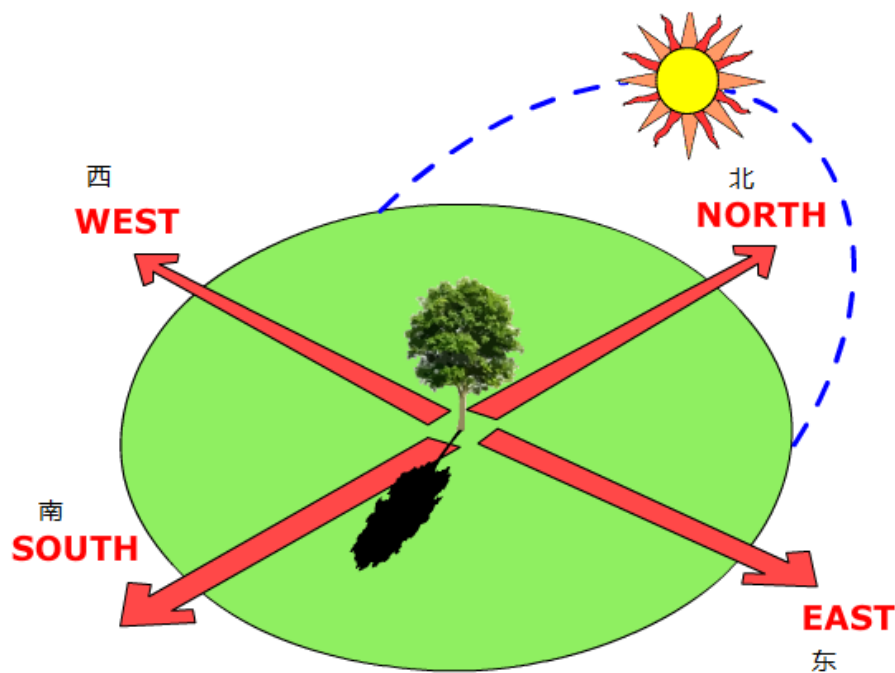## 2.13 Motion of the Sun

太阳运动

The apparent motion of the sun, caused by the rotation of the Earth about its axis, changes the angle at which the direct component of light will strike the Earth. From a fixed location on Earth, the sun appears to move throughout the sky. The position of the sun depends on the location of a point on Earth, the time of day and the time of year. This apparent motion of the sun is shown in the figure below.

由于地球的自转造成的太阳的视运动使得太阳光的直射分量的入射角度发生变化。从地球上的某一个固定点来看，太阳的运动是横跨整个天空的。太阳的位置取决于该点的位置，一天中的时刻和一年中的日期。太阳的视运动如下图所示。


Path of the sun in the southern hemisphere.

太阳在南半球的运动轨迹

This apparent motion of the sun has a major impact on the amount of power received by a solar collector. When the sun's rays are perpendicular to the absorbing surface, the power density on the surface is equal to the incident power density. However, as the angle between the sun and the absorbing surface changes, the intensity on the surface is reduced. When the module is parallel to the sun's rays (and the angle to the module normal = 90°) the intensity of light essentially falls to zero. For intermediate angles, the relative power density is $cos(\theta)$ where θ is the angle between the sun's rays and the module normal.

太阳的视运动对于太阳光接收器所收集的功率有很大的影响。当太阳光的方向与吸收面垂直时，吸收面的功率密度与入射功率密度相等。然而，当太阳光方向与吸收面间的夹角发生变化时，吸收面接收的辐射强度就会下降。当平面与太阳光方向平行时（太阳光方向与平面法线方向夹

角为 90 度），辐射强度基本就变为零。对于 0 度和 90 度之间的角度，相对的功率密度为夹角 θ 的余弦值 $cos(\theta)$。
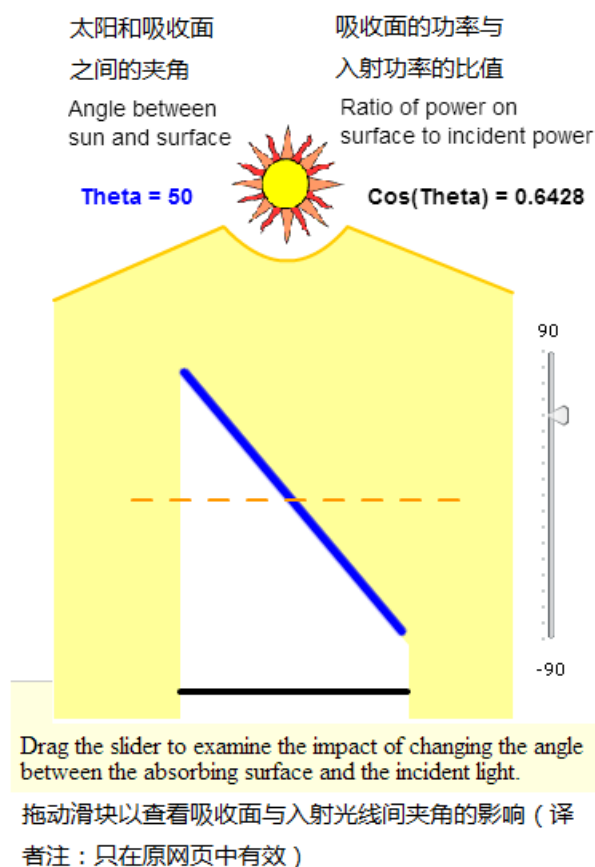
Click on the picture to adjust the module tilt and see the effect on the light intensity. In this picture, the module is being titled, but the same effects occur as the angle of the incident solar radiation changes.

改变图中平面的倾角来查看其对于太阳光强度的影响。在图中，平面的倾角在发生变化，这与入射的太阳光的角度发生变化产生的影响是相同的。

The angle between the sun and a fixed location on Earth depends on the particular location (the longitude of the location), the time of year and the time of day. In addition, the time at which the sun rises and sets depends on the longitude of the location. Therefore, complete modeling of the sun's angle to a fixed position on Earth requires the latitude, longitude, day of the year, and time of day. This is discussed in the following pages.

地球上某个定点与太阳的夹角取决于其所处的位置（该点的经度），一年中的日期及一天中的时刻。另外，某个定点的经度决定了太阳升起和落下的时间。因此，对于地球上某定点的太阳高度角的建模分析需要纬度、经度、一年中的日期和一天中的时刻等。这些内容将在后续内容中讨论。