

Remote sensing of the atmosphere

Lab(1)

Calculation of the distance between the earth and the sun and the angle of azimuth of the sun for different cities of Iraq

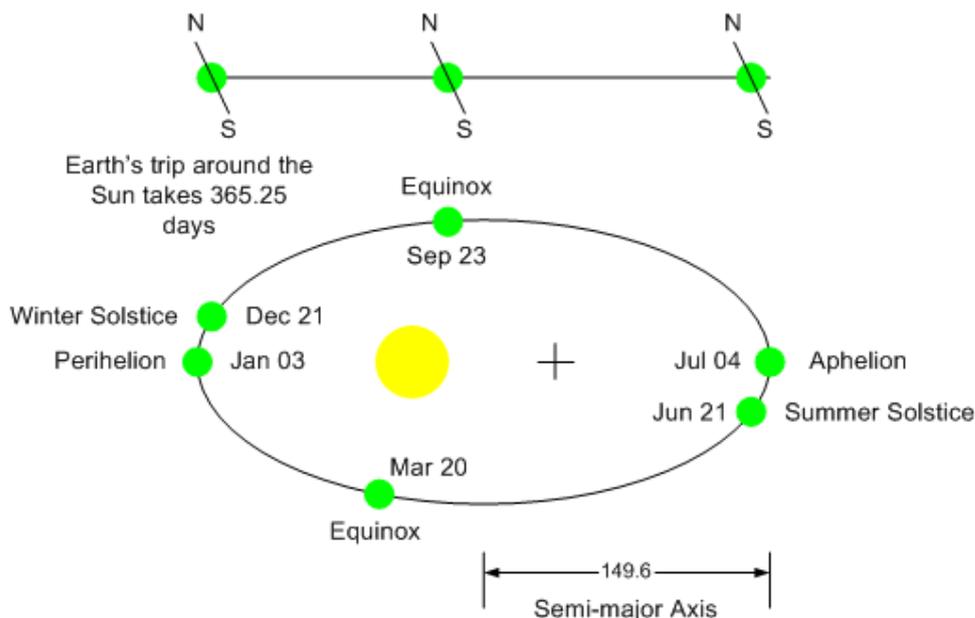
The aim of the experiment;

Calculation of the distance between the earth and the sun and the angle of the azimuth of the sun for different cities of Iraq and for all days of the year.

Experience theory:

The sun's rotation around the earth.

The Earth is moving around the Sun in an elliptical orbit, as shown in the figure below:

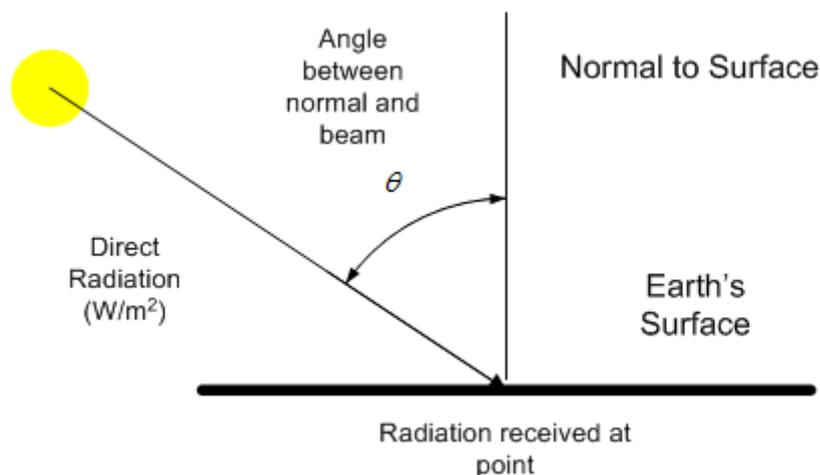


**And that the closest distance between the earth and the sun
On the 3rd of December Approximately, The furthest
distance occurs on the 3rd of July Approximately The
distance between the earth and the sun can be calculated
from the equation:**

$$r = \frac{r_0}{\sqrt{1 + 0.033\cos\left(\frac{2\pi dn}{365}\right)}}$$

Where(r_0) is the mean distance between the Earth and the sun equal to one astronomical unit (AU) and (dn) represents the sequence of the day in the year (1 January = 1).

The azimuth angle for an observer on the Earth's surface is defined as the angle between the solar ray and the column on the Earth's surface, as shown in the figure below.



This angle can be calculated from the equation:

$$\cos z = \sin\phi\sin\delta + \cos\phi\cos\delta\cos\omega$$

and ϕ represents latitude (in degrees) and δ Sun tilt angle (degrees)

and ω is the hour angle (in degrees).

δ and ω can be calculated from the following equations:

$$\delta = 23.45 \sin \left[\left(\frac{2\pi}{365} \right) (dn + 284) \right]$$

$$\omega = 15(t - 12)$$

where t is the time in solar time in hours.