
Understanding Azimuth, Elevation, Zenith: Key Angles

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Introduction:

- Azimuth and Elevation are measures used to identify the position of a satellite flying overhead.
- Azimuth tells you what direction to face and Elevation tells you how high up in the sky to look.
- Zenith refers to the point directly overhead, right above the observer's position.
- All three angles are measured in degrees.

Azimuth Angle:

- Azimuth varies from 0° to 360° .
- It starts with North at 0° .
- As you turn to your right (in a clockwise direction) you'll face East (which is 90°), then South (which is 180°), then West (which is 270°), and then return to North (which is 360° and 0°).
- So, if the Azimuth for your satellite is, say, 45° , that means your satellite is northeast of you.

Forward and Back Azimuths:

Note: This information is taken from <https://teacherscollegesj.org/how-do-you-find-forward-and-backward-azimuth/>

- The forward azimuth is converted into backward azimuth by adding or subtracting 180 degrees.
 - A backward azimuth is a projection of the azimuth from the origin to the opposite side of the azimuth circle.
1. **Forward Azimuth < 180° :**
Backward azimuth is obtained by adding 180° to the forward azimuth angle.
 2. **Forward Azimuth > 180° :**
Backward azimuth is acquired by subtracting 180° from the forward azimuth angle.

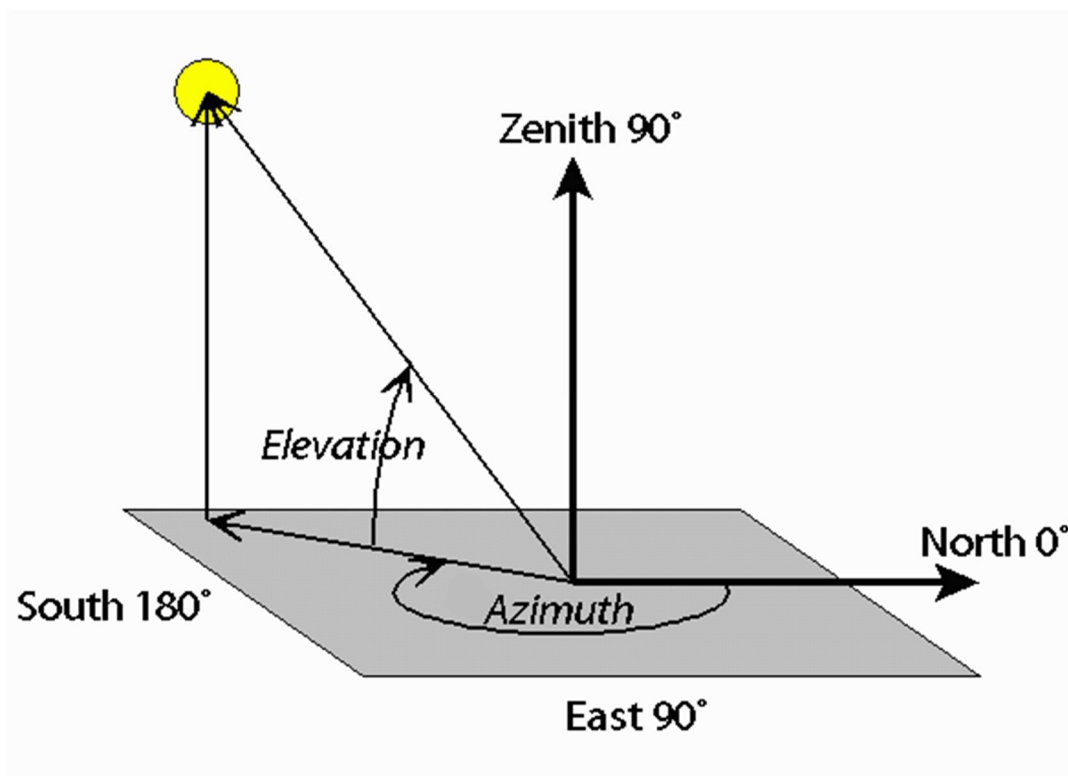
Elevation Angle:

- A satellite just barely rising over your horizon would be at 0° Elevation, and a satellite directly overhead would be at 90° Elevation (a.k.a., "the zenith").

Figure: REPRESENTATION OF AZIMUTH AND ELEVATION ANGLES OF SATELLITE

In the diagram below,

1. The yellow circle represents the *satellite*.
2. It has an *Azimuth* of about 200° (southwest of the observer) &
3. An *Elevation* of about 60° (about 2/3 of the way up in the sky).

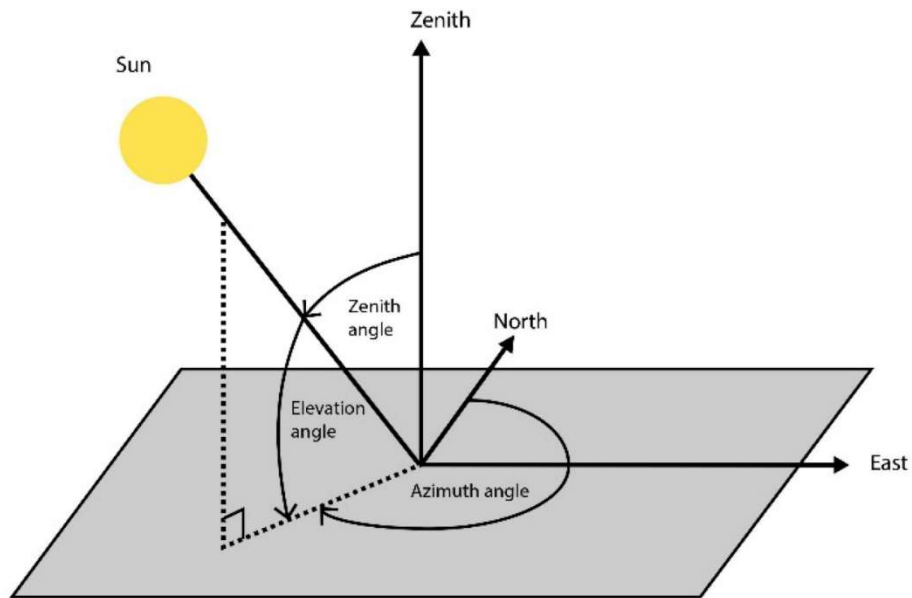


Note: This information is taken from <https://www.celestis.com/resources/faq/what-are-the-azimuth-and-elevation-of-a-satellite/>

Zenith Angle:

- The zenith angle is considered as the angle between the direction of the Sun and the zenith (directly above).

Figure: REPRESENTATION OF AZIMUTH & ZENITH ANGLES OF THE SUN

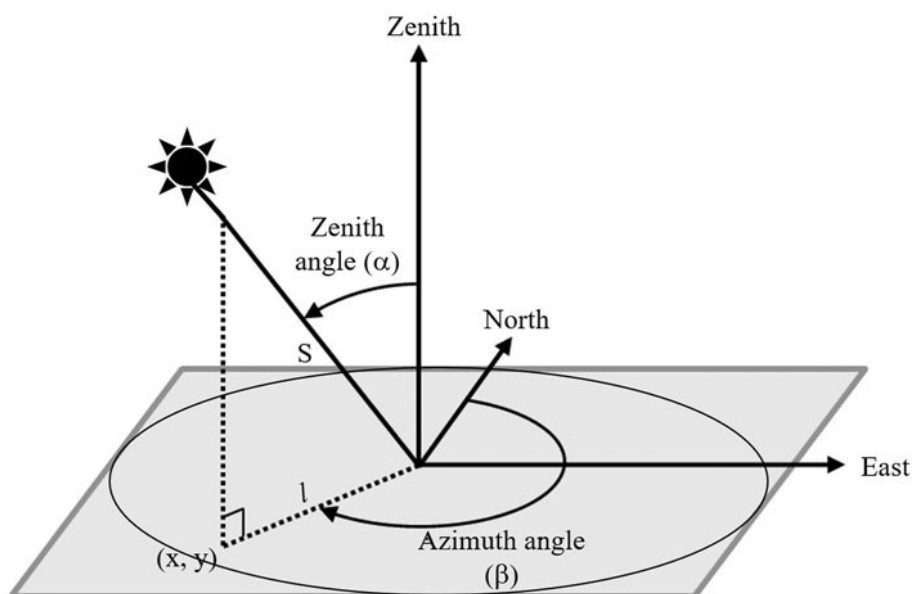


Note: This information is taken from <https://www.mdpi.com/1660-4601/20/1/114>

Coordinate Points:

- Represent specific sun positions in standardized systems like (x, y).

Figure: REPRESENTATION OF COORDINATES (x,y) OF THE SUN



Note: This information is taken from <https://www.frontiersin.org/articles/10.3389/fenrg.2021.722212/full>