

57.3: Orbit Reference Frames

In order to describe the orientation of an orbit in space, we need to have a reference frame with respect to which the orbit will be described. Such a reference system is defined by a reference plane, and a reference direction that lies in that plane. The two common choices are the equatorial and ecliptic reference frames.

In the equatorial reference frame, the reference plane is the plane of the Earth's equator, and the reference direction is the direction of the vernal equinox. The vernal equinox is the direction from the Earth to the Sun on the first day of spring (around March 21). This equatorial frame is commonly used for bodies orbiting the Earth, such as artificial satellites.

In the ecliptic reference frame, the reference plane is the plane of the ecliptic (i.e. the plane of the Earth's orbit around the Sun), and the reference direction is again in the direction of the vernal equinox. The ecliptic frame is used for most astronomical bodies: planets, comets, etc.

The plane of the equator and the plane of the ecliptic intersect along a line, and the direction of the vernal equinox lies along that line of intersection. The two planes are separated by a dihedral angle of about 23.5° (the tilt angle of the Earth's axis); this angle is called the obliquity of the ecliptic (ϵ).

57.3: Orbit Reference Frames is shared under a [CC BY-NC-SA 4.0](https://creativecommons.org/licenses/by-nc-sa/4.0/) license and was authored, remixed, and/or curated by LibreTexts.