Coordinate systems are used to get around the sky, and to describe positions. There is no one best system; different systems may be superior for specific applications. Any basic astronomy textbook has a brief description of coordinate systems. See Lang's "Astrophysical Formulae", sections 5.1.2 and 5.1.5 for more details, including equations for coordinate conversions.

**Celestial** Based on the terrestrial globe. The Celestial equator and poles are projections of the terrestrial equator and poles. Celestial coordinates are measured in Right Ascension (RA; α), along the equator, and Declination (Dec; δ). Declination is analogous to latitude. The declination of the equator is 0°; that of the North Celestial Pole (NCP) is +90°. Right Ascension is measured in units of time. The Right Ascension of the meridian (the great circle passing through the poles and the zenith) is equal to the local sidereal time. Declination is measured in degrees (°), minutes of arc (′ or arcmin) and seconds of arc (″ or arcsec). There are 60 arcmin in one degree, and 60 arcsec in one arcmin.

The origin of this system is the first point of Aries (γ). This is the point where the ascending node of the apparent Solar orbit crosses the celestial equator. The Sun crosses the first point of Aries at the Vernal Equinox; The RA of γ is 0h 0m 0s. Due to the effects of precession, γ slides along the celestial equator, necessitating precessional corrections to the celestial coordinates of the "fixed" stars.

**Ecliptic** This coordinate system is based on the apparent Solar orbit, and is the natural system for Solar System studies. The equator (the ecliptic) is the plane of the terrestrial orbit, projected onto the celestial sphere. The poles are projections of the Earth's orbital poles. Coordinates λ,β are measured in degrees. The inclination of the ecliptic ε with respect to the celestial equator is 23°27′. The origin is the same as that of the celestial system. The north ecliptic pole is located at 12h +66°33′ in celestial coordinates. Conversion from ecliptic to celestial coordinates involves only a rotation of the sphere.

**Galactic** This system is based on our galaxy, and is the natural system for galactic and extragalactic studies. The equator is the plane of the galaxy, and the origin is the center of the galaxy. The original galactic coordinate system (l₀,b₀) was superseded by (lᵢ, bᵢ) after revision of the position of the galactic center. The origin of the (lᵢ, bᵢ) system
is at $\alpha=17^h42^m24^s, \delta=-28^\circ55'$. The north galactic pole is at $\alpha, \delta=12^h46^m+27^\circ24'$. The galactic equator is inclined to the celestial equator by 62.6'.

Alt-Az This system is natural for ground-based observing. Coordinates are measured with respect to the local zenith and the local horizon. The altitude is the distance above the horizon on the great circle passing through the zenith. The azimuth is the intersection of the great circle containing the object and the zenith with the horizon. Azimuth is measured in degrees East of North.