= Ecliptic =

The ecliptic is the apparent path of the Sun on the celestial sphere , and is the basis for the ecliptic coordinate system . It also refers to the plane of this path , which is coplanar with the orbit of Earth around the Sun (and hence the apparent orbit of the Sun around Earth) . The path of the Sun is not normally noticeable from Earth 's surface because Earth rotates , carrying the observer through the cycles of sunrise and sunset , obscuring the apparent motion of the Sun with respect to the stars .

= = Sun 's apparent motion = =

The motions as described above are simplifications . Due to the movement of Earth around the Earth ? Moon center of mass , the apparent path of the Sun wobbles slightly , with a period of about one month . Due to further perturbations by the other planets of the Solar System , the Earth ? Moon barycenter wobbles slightly around a mean position in a complex fashion . The ecliptic is actually the apparent path of the Sun throughout the course of a year .

Because Earth takes one year to orbit the Sun , the apparent position of the Sun also takes the same length of time to make a complete circuit of the ecliptic . With slightly more than 365 days in one year , the Sun moves a little less than 1 ° eastward every day . This small difference in the Sun 's position against the stars causes any particular spot on Earth 's surface to catch up with (and stand directly north or south of) the Sun about four minutes later each day than it would if Earth would not orbit ; a day on Earth is therefore 24 hours long rather than the approximately 23 @-@ hour 56 @-@ minute sidereal day . Again , this is a simplification , based on a hypothetical Earth that orbits at uniform speed around the Sun . The actual speed with which Earth orbits the Sun varies slightly during the year , so the speed with which the Sun seems to move along the ecliptic also varies . For example , the Sun is north of the celestial equator for about 185 days of each year , and south of it for about 180 days . The variation of orbital speed accounts for part of the equation of time .

= = Relationship to the celestial equator = =

Because Earth 's rotational axis is not perpendicular to its orbital plane , Earth 's equatorial plane is not coplanar with the ecliptic plane , but is inclined to it by an angle of about 23 @.@ 4 ° , which is known as the obliquity of the ecliptic . If the equator is projected outward to the celestial sphere , forming the celestial equator , it crosses the ecliptic at two points known as the equinoxes . The Sun , in its apparent motion along the ecliptic , crosses the celestial equator at these points , one from south to north , the other from north to south . The crossing from south to north is known as the vernal equinox , also known as the first point of Aries and the ascending node of the ecliptic on the celestial equator . The crossing from north to south is the autumnal equinox or descending node .

The orientation of Earth 's axis and equator are not fixed in space , but rotate about the poles of the ecliptic with a period of about 26 @,@ 000 years , a process known as lunisolar precession , as it is due mostly to the gravitational effect of the Moon and Sun on Earth 's equatorial bulge . Likewise , the ecliptic itself is not fixed . The gravitational perturbations of the other bodies of the Solar System cause a much smaller motion of the plane of Earth 's orbit , and hence of the ecliptic , known as planetary precession . The combined action of these two motions is called general precession , and changes the position of the equinoxes by about 50 arc seconds (about 0 ° .014) per year .

Once again , this is a simplification . Periodic motions of the Moon and apparent periodic motions of the Sun (actually of Earth in its orbit) cause short @-@ term small @-@ amplitude periodic oscillations of Earth 's axis , and hence the celestial equator , known as nutation . This adds a periodic component to the position of the equinoxes ; the positions of the celestial equator and (vernal) equinox with fully updated precession and nutation are called the true equator and equinox ; the positions without nutation are the mean equator and equinox .

= = Obliquity of the ecliptic = =

Obliquity of the ecliptic is the term used by astronomers for the inclination of Earth 's equator with respect to the ecliptic , or of Earth 's rotation axis to a perpendicular to the ecliptic . It is about 23 @.@ 4 ° and is currently decreasing 0 @.@ 013 degrees (47 arcseconds) per hundred years due to planetary perturbations .

The angular value of the obliquity is found by observation of the motions of Earth and other planets over many years . Astronomers produce new fundamental ephemerides as the accuracy of observation improves and as the understanding of the dynamics increases , and from these ephemerides various astronomical values , including the obliquity , are derived .

Until 1983 the obliquity for any date was calculated from work of Newcomb , who analyzed positions of the planets until about 1895 :