Equatorial coordinate system pdf

The celestial equatorial coordination system is based on the concept of the celestial sphere. The celestial sphere is an imaginary sphere of infinite radius surrounding the Earth. The location of objects in the sky is given by projecting their location onto this infinite sphere. Although it is technically impossible to depict the perspective of looking down on the celestial sphere (being infinite in size), it is often convenient to depict the celestial sphere of the finsu ending radius - as it was done with the picture below. The celestial sphere is fixed in relation to the universe. His orientation does not change. However, as the Earth rotates from west to east (counterclockwise from the point of view of looking down at the north pole), the observer standing on the ground will see how the celestial sphere rotates from east to west (or clockwise when looking at the sky). Tap and drag the star to change the location As terrestrial coordinates (such as longitude and latitude), the two coordinates determine the point on the celestial sphere. The rotation of the Earth determines the direction in the universe, and it is convenient to base the coordinates from this rotation/direction. The celestial equator is a linear coplanar with the Earth's equator (and 90 degrees to the axis of rotation). The north celestial pole is directly above the north pole of the Earth and also for the south celestial pole. The coordinate indicating where the object is between these poles is a decrease. The decline is measured from the celestial equator. It extends from 0 at the celestial equator to 90 at the north celestial pole and from 0 at the celestial equator to -90 at the southern celestial pole. Although the decline does not use the designation N and S, latitude and decrease are nevertheless closely related coordinates. The decline is depicted by a red line in the picture on the right. The second coordinate in the celestial equatorial system is the right ascent. This is similar (but not the same as) longitude. Much has Greenwich is an arbitrary zero point for longitude, the right ascent also has a zero point of reference. This is the point of the vernal equinox. Why this point is a convenient choice is discussed in the next section of the module (Seasons and Ecliptic). As the Earth rotates from the Earth's point of view, the celestial sphere rotates once approximately every 24 (side) hours. Right ascent is therefore measured in (side) hours, from 0h to 24h east of Vernal Equinox Point. That is, the east is the direction of the increasingly right ascent. The semicircle with the right ascent of 0h is called a 0-hour circle. As circle 360, 1 hour of the right ascent and 15 is the preferred system of coordinates to identify objects on the celestial sphere. Unlike the horizontal system of coordinates, the equatorial coordinates do not depend on the location of the observer and the time of observation. This means that each object requires one set of coordinates, and the same coordinates can be used by observers at different locations and at different times. The equatorial system of coordinates is basically a projection of the latitude and longitude system that we use here on Earth into the celestial sphere. By a direct analogy, the lines of latitude become lines of decline (December; measured by degrees, arcs and arcs) and indicate how far north or south of the celestial equator (determined by the projection of the Earth's equator to the celestial sphere) the object lies. Longitude lines have the equivalent of right ascent lines (RA), but while longitude is measured in degrees, minutes and seconds in the east of the Greenwich meridian, RA is measured by hours, minutes and seconds east of where the celestial equator crosses the ecliptic (spring equinox). RA and Dec are basically longitude and latitude lines projected onto the celestial sphere. The equator becomes the celestial equator, and the north and south poles become the north and south celestial poles respectively. The position of the object is given to its RA (measured to the east of the vernal equinox) and December (measured to the north or south of the celestial equator). At first glance, this system of unambiguous positioning of the object through two coordinates seems easy to implement and maintain. However, the equatorial system of coordinates is associated with the orientation of the Earth into space, and this changes over 26,000 years due to the precession of the Earth's axis. Therefore, we must give additional information to our coordinates - the epoch. For example, Einstein's Cross (2237-0305) was located in RA No 22h 37m, December No 03o05' using the B1950.0 era. However, in the era of J2000.0 coordinates, this object is located on RA 22h 37m, December No 03o 21'. The object itself did not move - only the coordinate system. The Equatorial coordinate system is also known as the RA/Dec coordinate system after the general reductions of the two components involved. the celestial coordinate system used to indicate the position of celestial objects by the Equatorial System of Coordinates using spherical coordinates. The fundamental plane is formed by the projection of the Earth's equator into the celestial sphere, forming the celestial equator. The main direction is established by projecting the Earth's orbit into the celestial sphere, forming an ecliptic and creating an ascending ecliptic node at the celestial equator, forming the spring equinox. The right ascent is measured in an easterly direction along the celestial equator from the equinox, and the decline is measured positively north of the celestial equator. (Two such pairs of coordinates are shown here.) Forecasts of the Earth's northern and southern geographical poles form the northern and southern celestial poles, The Equatorial Coordinate System is a celestial coordinate system widely used to accurately view the positions of celestial objects. It can be implemented in spherical or rectangular coordinates, determined by the origin in the center of the Earth, a fundamental plane consisting of the projection of the Earth's equator to the celestial sphere (formation of the celestial equator), the main direction to the spring equinec and the right-handed convention. The origin in the center of the Earth means that the coordinates are geocentric, that is, as seen from the center of the Earth, as if they were transparent. The fundamental plane and the main direction mean that the coordinate system, aligned with the equator and the pole of the Earth, does not rotate with the Earth, but remains relatively fixed against the background of the stars. The right-handed convention means that the coordinates are increasing north and east around the fundamental plane. Primary direction See also: Axial precession and astronomical nut This description of the orientation of the reference frame is somewhat simplified; orientation is not quite fixed. The slow motion of the Earth's axis, precession, causes a slow, continuous rotation of the coordinate system to the west about the ecliptic poles, completing one circuit in about 26,000 years. Imposed on this smaller movement of the ecliptic, and a slight oscillation of the Earth's axis, the nut. In order to capture the exact main direction, these movements require the specification of the equinox of a certain date, known as the epoch, when giving a position. The three most commonly used are: The average equinox of the standard era (usually J2000.0, but can include B1950.0, B1900.0, etc.) is a fixed standard direction that allows positions set at different dates to be compared directly. The average equinox of the date is the intersection of the ecliptic date (i.e. ecliptic in its position on the date) with the average equator (i.e. the equator, turned precession to its position on the date but free from small periodic fluctuations of the nut). Usually used in calculating planetary orbit. The true equinox of the date is the intersection of the ecliptic date with the true equator (i.e. the average equator plus the gabbing). This is the actual intersection of the two planes at any given moment, with all movements accounted for. Thus, the equatorial coordinate system usually indicates the true equinox and the equator of the date, the average equinox and the equator J2000.0 or similar. Note that there is no average ecliptic, as the ecliptic is not subject to a slight periodic fluctuations. Spherical coordinates Use in astronomy spherical coordinates of a star are often expressed as steam, right ascent and slush, without the coordinates of the distance. The direction of sufficiently remote objects is the same for all observers, and to specify this direction with the same coordinates for everyone. In contrast, in the horizontal coordinate system, the position of the star differs from observer to observer depending on their position on the Earth's surface and constantly changes with the rotation of the Earth. Telescopes equipped with equatorial attachments and circles use an equatorial system of coordinates to find objects. Setting circles in conjunction with a star diagram or ephemera makes it easy to point the telescope at known objects in the celestial sphere. Slope Main article: Decline Symbol of Decline - (lower delta case, abbreviated DEC) measures the angular distance of the object perpendicular to the celestial equator, positive in the north, negative to the south. For example, the north celestial pole has a decrease of 90 degrees. The source of decline is the celestial equator, which is a projection of the Earth's equator into the celestial sphere. The decline is similar to earth's latitude. The right ascent as seen from the Earth's north pole, the local star angle (LHA) for the observer near New York City. Also depicted are the star's right ascent and the corner of the Greenwich Clock (GHA), the local average side time (LMST) and the average greenwich lateral time (GMST). The symbol ʏ direction of the vernal equinox. Main article: Right ascent The correct symbol of ascent - (bottom case alpha, abbreviated RA) measures the angular distance of the object to the east along the celestial equator from the vernal equinox to the hour circle passing through the object. The point of the vernal equinox is one of two where the ecliptic crosses the celestial equator. Similar to earth's longitude, right ascent is usually measured in lateral hours, minutes and seconds rather than degrees, resulting in a method of measuring the right ascent by the time of passing objects through the meridian as the Earth rotates. There are 360 /24h and 15 in one hour of right ascent, and 24h of right ascent around the entire celestial equator. When shared, right ascent and tilt are usually the abbreviated angle of the RA/Dec. Hour Main article: Hour angle Alternatively to right ascension, hour angle (reduced HA or LHA, local hour angle), left-handed, measures the angular distance of the object west along the celestial equator from the meridian observer to the hour circle passing through the object. Unlike the right ascent, the hour-angle always increases with the rotation of the Earth. The angle of the hour can be seen as a means of measuring time from the upper climax, the moment when the object comes into contact with the meridian above the head. The climax star on the meridian observer is said to be the zero angle of the hour (0h). One side hour (approximately 0.9973 hours of sunshine) The earth's rotation will carry the star west of the meridian, and its hour angle will be 1h. In calculating topocentric phenomena, the right ascent can be transformed into an hour-long angle as an intermediate step. The rectangular coordinates of the Geocentric Equatorial Coordinates of geocentric equatorial coordinates. Origin is the center of the Earth. The fundamental plane is the plane of the Earth's equator. The main direction (axis x) is the spring equinox. The right-handed convention defines at axis 90 in the east in a fundamental plane; z axis of the northern polar axis. The reference frame does not rotate with the Earth, rather, the Earth revolves around the axis z. There are several rectangular variants of equatorial coordinates. They all have: Origin in the center of the Earth. A fundamental plane in the plane of the Earth's equator. The primary direction (axis x) to the spring equino, that is, the place where the Sun crosses the celestial equator in a northerly direction in its annual visible chain around the ecliptic. Right-handed convention, pointing y axis 90 to the east in the fundamental plane and z axis along the northern polar axis. Reference frames do not rotate together with the Earth (unlike earthly, fixed frames on Earth), remaining always directed towards the equinox, and drift over time with the movements of precession and nuts. In astronomy: The position of the Sun is often indicated in the geocentric equatorial rectangular coordinates X, Y, and the fourth distance coordinates, R (X2 and Y2) in the units of the astronomical unit. The position of planets and other bodies of the solar system is often indicated in the ζ2 ξ2 geocentric equatorial rectangular coordinates ξ, No, ζ and fourth distance coordinates, in units of the astronomical unit. These rectangular coordinates are associated with the respective spherical coordinates X R and ξ cos cos Y R and cos s sin -R- ζ y sin display style beginning aligned frac X R frac frac Delta yo-kos delta (kos) alpha frak (JASRY) frak frak (this) mathetite (Delta) sin alpha frak (R.R.) Frak zeta Matith Matit Delta Sin delta delta in the astrodynamics of the position of artificial satellites of the Earth in the geocentric equatorial coordinates also known as geocentric equatorial inertia (GEI), an Earth-centered inertial system (ECI) and a traditional inertial system (CIS), all of which are equivalent by definition to the astronomical geocentric equatorial frames above. In the geocentric equatorial frame of the axis x, y and z are often denoted I, J and K respectively, or the base of the frame is determined by the vectors of the unit - Ĵ and K̂. Geocentric celestial reference frame (GCRF) geocentric equivalent of the International Celestial Reference System (ICRF). Its main focus is the Equinox J2000.0, and does not move with precession and nut, but otherwise equivalent to the above systems. Summary of notation for astronomical equatorial coordinates (Spherical Rectangular Right Ascension Declination Distance General Special-purpose Geo ξcentric) The question ζ X, Y, q (Sun) Heliocentric x, y, z Heliocentric equatorial coordinates In astronomy, there is also a heliocentric rectangular version of the equatorial coordinates, designated x, z, which is A fundamental plane in the plane of the Earth's equator. The main direction (axis x) to the spring equins. Right-handed convention, pointing y axis 90 to the east in the fundamental plane and z axis along the northern polar axis of the Earth. This frame is in every respect equivalent to ξ, No. ζ, above, except that the origin is removed to the center of the Sun. It is widely used in the calculation of the planetary orbit. Three astronomical rectangular coordinate systems are linked ζ by the ξЭта yo-Yayez zeta (z'z'end) See. Also Celestial Coordinate System Polar distance Spherical astronomy Star Position Links - Marine Almanac Office, USA. Naval Observatory; H.M. Marine Almanac Office; Royal Greenwich Observatory (1961). An explanatory addition to the astronomical ephemeris and American ephemeris and the marine almanac. H.M. Office of Stationery, London (reissue 1974). 24, 26. Vallado, David A. (2001). The basics of astrodynamics and application. Microcosm Press, El Segundo, California, p. 157. ISBN 1-881883-12-4. - Office of the U.S. Naval Almanac; Hydrographic Authority of Great Britain; Office of the H.M. Marine Almanac (2008). Astronomical almanac 2010. U.S. government office. P. M2, the obvious place. ISBN 978-0-7077-4082-9. - Explanatory Supplement (1961), page 20, 28 and Meeus, Jean (1991). Astronomical algorithms. Willmann-Bell, Inc., Richmond, Va. page 137. ISBN 0-943396-35-2. a b Peter Duffett-Smith. Practical astronomy with calculator, third edition. Cambridge University Press. 28-29. 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Kahler, University of Illinois Heavenly Equatorial Coordination System of the University of Nebraska-Lincoln Celestial Equatorial Coordinates Researchers at the University of Nebraska-Lincoln extracted from the equatorial coordinate system calculator. equatorial coordinate system pdf. equatorial coordinate system definition. equatorial coordinate system to horizontal. equatorial coordinate system exercise. equatorial coordinate system example. equatorial coordinate system sphere. equatorial coordinate system celestial equator