

First announcement: full moon tonight at 12:18 AM



“the Moon makes its closest approach to Earth for 2010: 221,600 miles or 356,600 km, 7 % less than its average distance. This will make the full Moon appear slightly larger than usual. “

If you have tendencies like this, stay in your dorm room tonight!



Patterns in the Sky (cont)

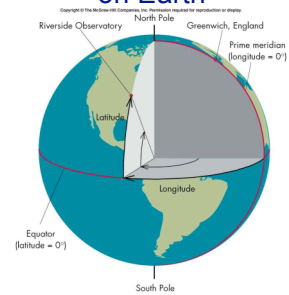


What motions do we see in the sky, and how can we explain them?

The horizon coordinate system gives us a system for describing astronomical objects relative to where we are standing, but we want a coordinate system fixed with respect to the celestial sphere (the stars).

➡ The equatorial coordinate system

Coordinates to determine a location on Earth



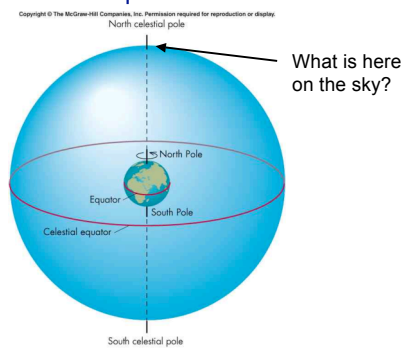
Outside looking at the surface of a sphere

New system: the *equatorial coordinate system*. Coordinates fixed with respect to the stars

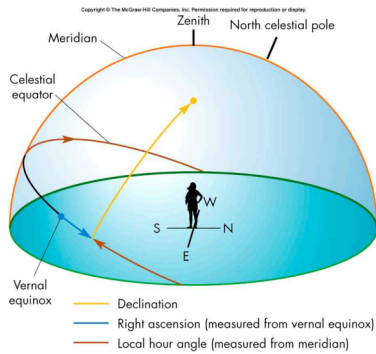
From inside looking out at the surface of a sphere

How do we define things like the equator, the north pole, and the prime meridian (line of longitude through London) in the case of the sky?

The north celestial pole and the celestial equator



The equatorial coordinate system: right ascension and declination



Correspondence between coordinate systems

latitude → declination

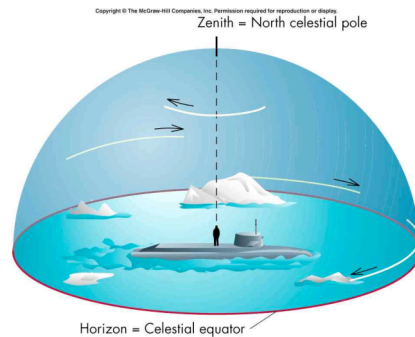
longitude → Right ascension

The units of right ascension are hours, minutes, and seconds, instead of degrees, arcminutes, and arcseconds. Why?

Where is the celestial equator on the sky?
 Answer: it depends on your latitude

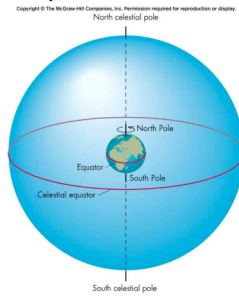
A way of seeing this: the horizon we see corresponds to a tangent plane to the Earth at the point we are standing.

Motion of the celestial sphere at the north pole



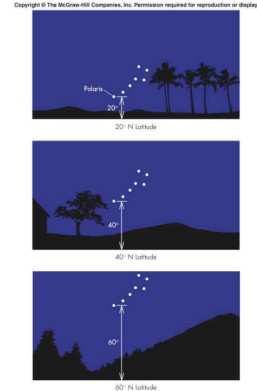
Now think about what a person on the equator sees.
How do the stars change as the night goes on. Where
is the celestial equator on the sky?

→ demo



The changing
appearance of the
sky at different
latitudes

→ Demo



What does a map of the sky look like
in the equatorial coordinate system?

→ The SC1 constellation chart

Let's use the SC1 to find some stars which
are visible in the early evening sky.

- (1) The "belt stars" in the constellation of Orion. RA=5h30m, dec=-2d
- (2) Sirius, brightest star in the sky, main star in Canis Majoris, RA=6h45m, dec=-16d
- (3) Mars right now: RA=8h52m, dec=22d
- (4) Saturn right now: RA=12h19m, dec=0d

Question: why did I say "right now" for the
positions of Mars and Saturn, but not for Orion
and Sirius?



Let's return to a concept from last time

How do we understand these changes during the year?

We've done this, so what did it do for us? →

- Method 1: introduce a second coordinate system for use on the sky
- Method 2: understand the physics of the solar system (later)
- New coordinate system is like defining your location on Earth (what are the coordinates for locating a position on Earth?)

Measuring the position of the Sun against the background stars

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The path of the Sun through the stars

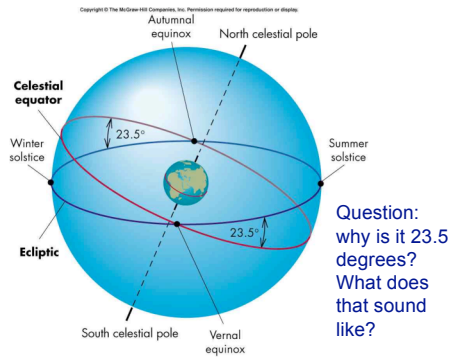
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An important astronomical fact:

During the course of the year, the Sun moves against the background stars just like the planets

→ Find the **ecliptic** on the SC1 chart

Another great circle on the sky...the ecliptic



Important terms and concepts in the equatorial coordinate system

- Celestial equator
- North and south celestial pole
- Right ascension (coordinate like longitude, only units are hours, minutes)
- Declination (coordinate like latitude)
- Ecliptic
- Vernal equinox (sometimes called “the first point of Aries”)