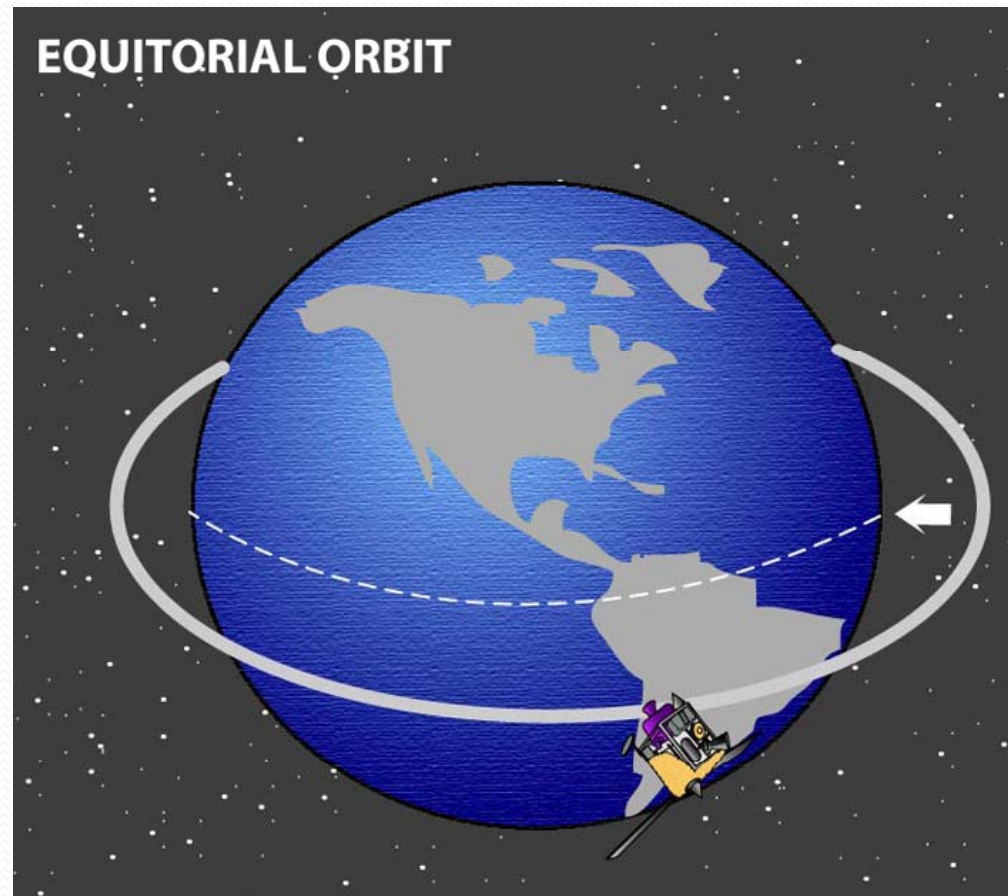




SATELLITE ORBITS

ORBIT

- The satellite revolve around the earth in specified orbit.
- The two forces acting on a satellite orbiting the earth are
 - Force of momentum
 - Force of gravity





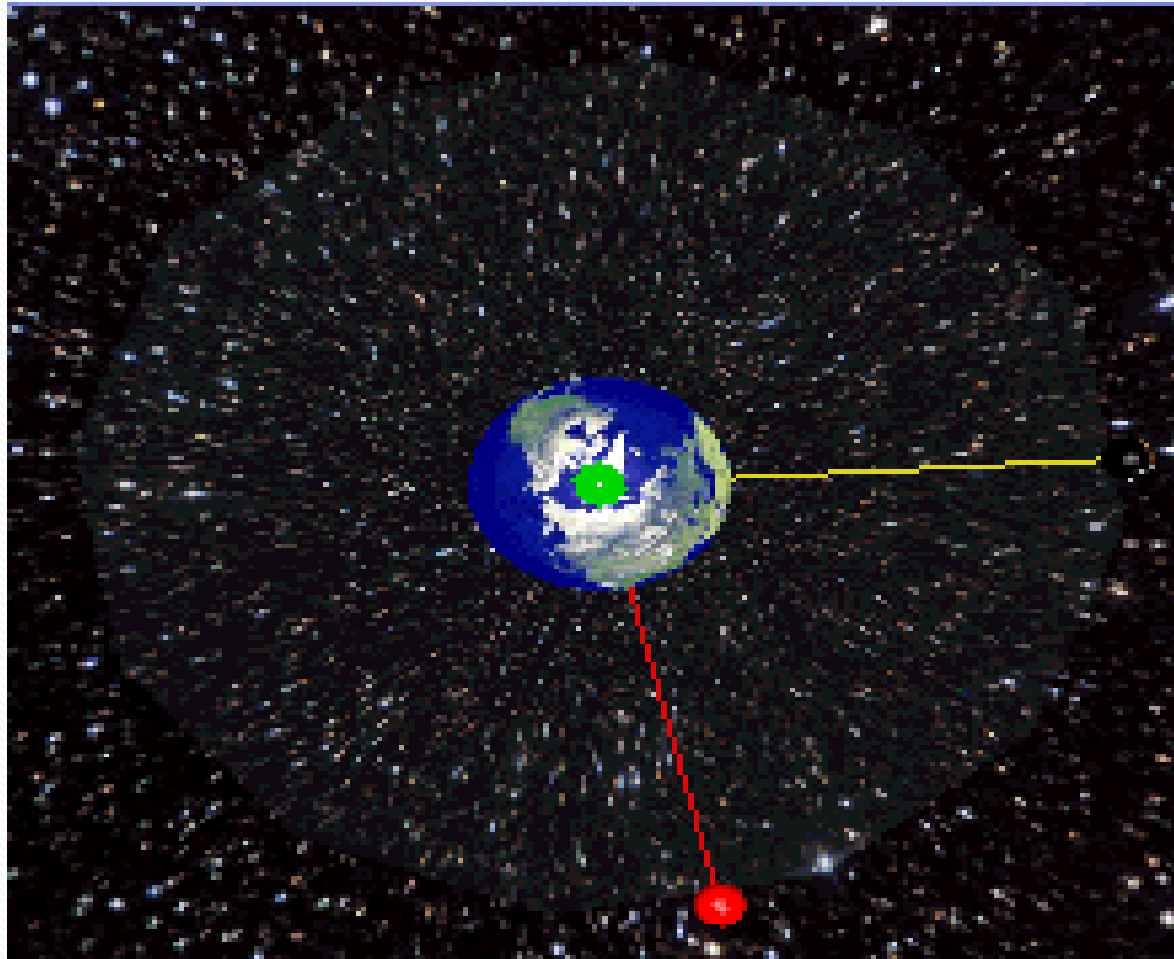
Types of satellite orbits

- Geosynchronous satellites(GEO)
- Low earth orbit satellites(LEO)
- Medium earth orbit satellites(MEO)

- Geostationary (geosynchronous) orbits:

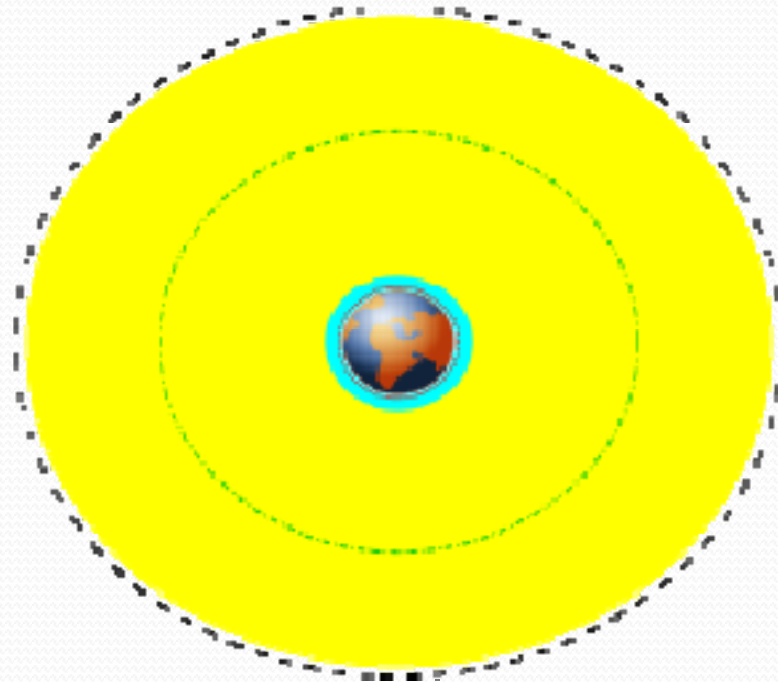
An orbit which places the satellite above the same location at all times

- Must be orbiting approximately 36,000 km above the Earth



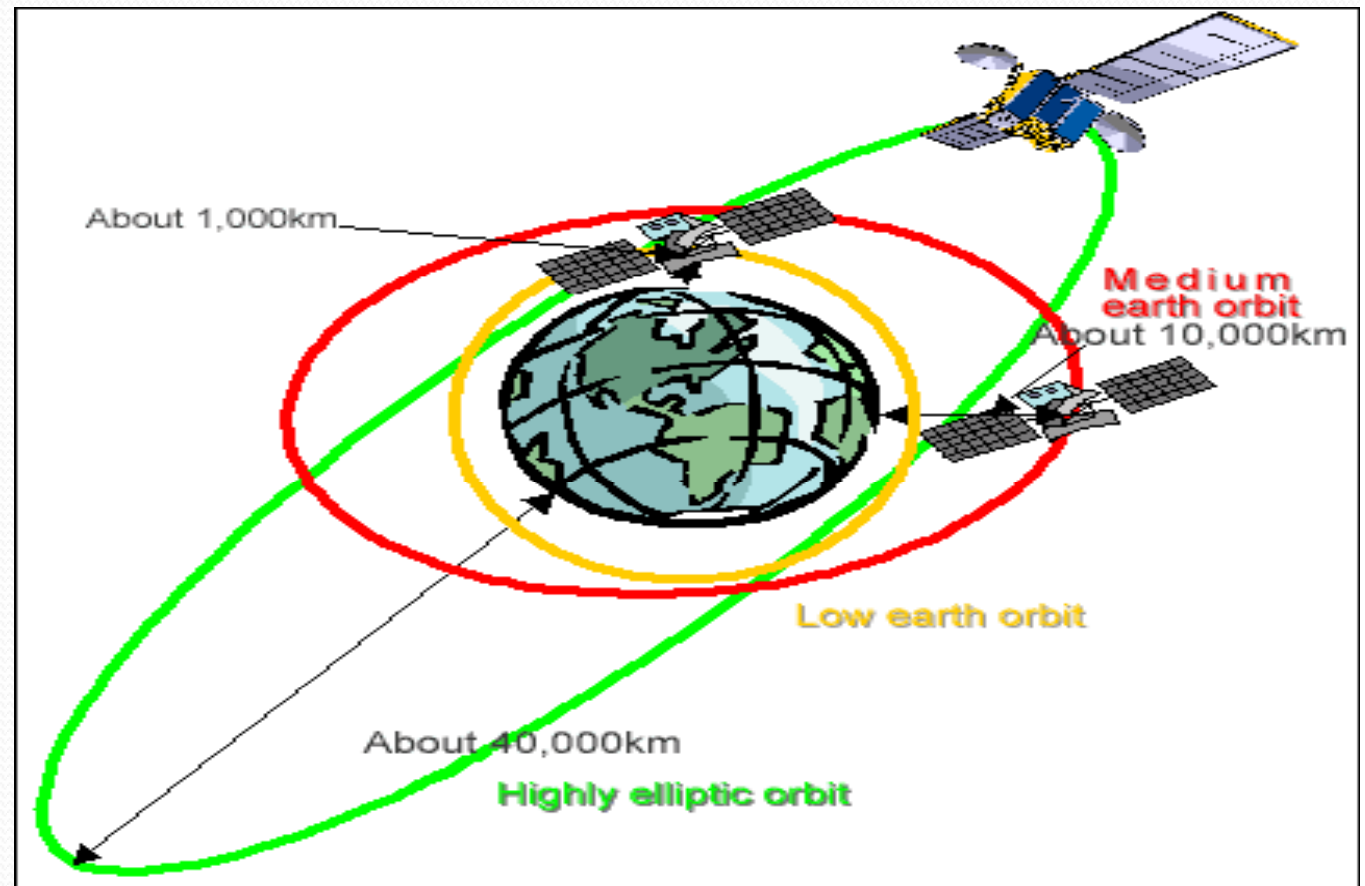
Low earth orbit satellites (LEO) :

- defined as an orbit below an altitude of approximately 2,000 kilometers.
- an orbit around Earth between the atmosphere
- it requires less energy to place a satellite into a LEO and the LEO satellite needs less powerful amplifiers for successful transmission



Medium earth orbit satellites (MEO):

- around the Earth above low Earth orbit (2,000 kilometres) and below geostationary orbit (35,786 kilometres)
- The most common use for satellites in this region is for navigation



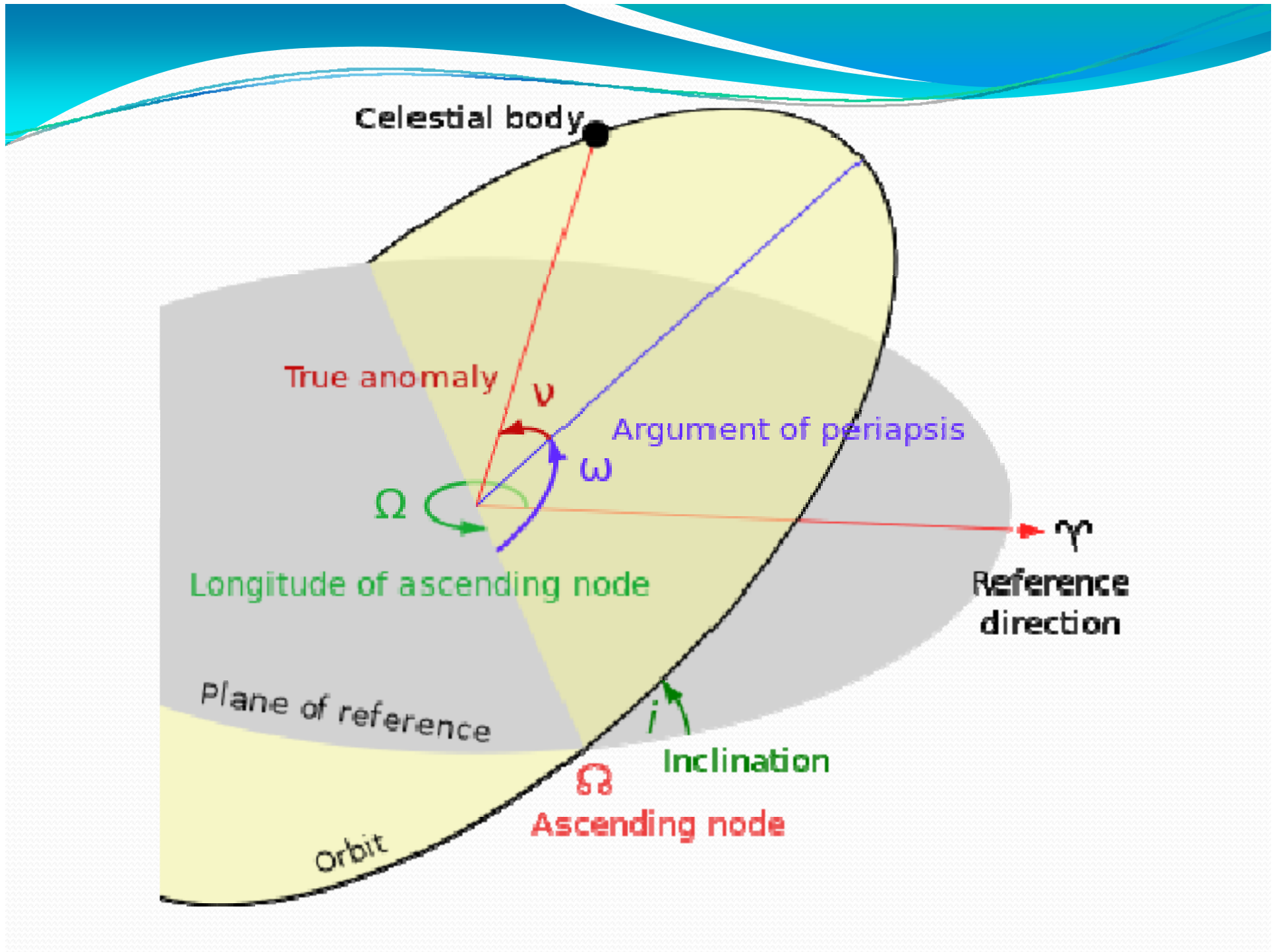
Synchronous orbits

- **An orbit in which the satellite passes every location at the same time each day**
 - **Noon satellites: pass over near noon and midnight**
 - **Morning satellites: pass over near dawn and dusk**
 - **Often referred to as “polar orbiters” because of the high latitudes they cross**
 - **Usually orbit within several hundred to a few thousand km from Earth**



ORBITAL ELEMENTS

- Ω Right Ascension of the Ascending Node
- i Inclination of the orbit
- ω Argument of Perigee
- M mean anomaly (epoch)
- e Eccentricity of the elliptical orbit
- a Semi-major axis of the orbit ellipse



KEPLER'S THREE LAWS

- Orbit is an ellipse with the larger body (earth) at one focus
- The satellite sweeps out equal arcs (area) in equal time (**NOTE**: for an ellipse, this means that the orbital velocity varies around the orbit)
- The square of the period of revolution is proportional to the cube of the mean distance between the two bodies.

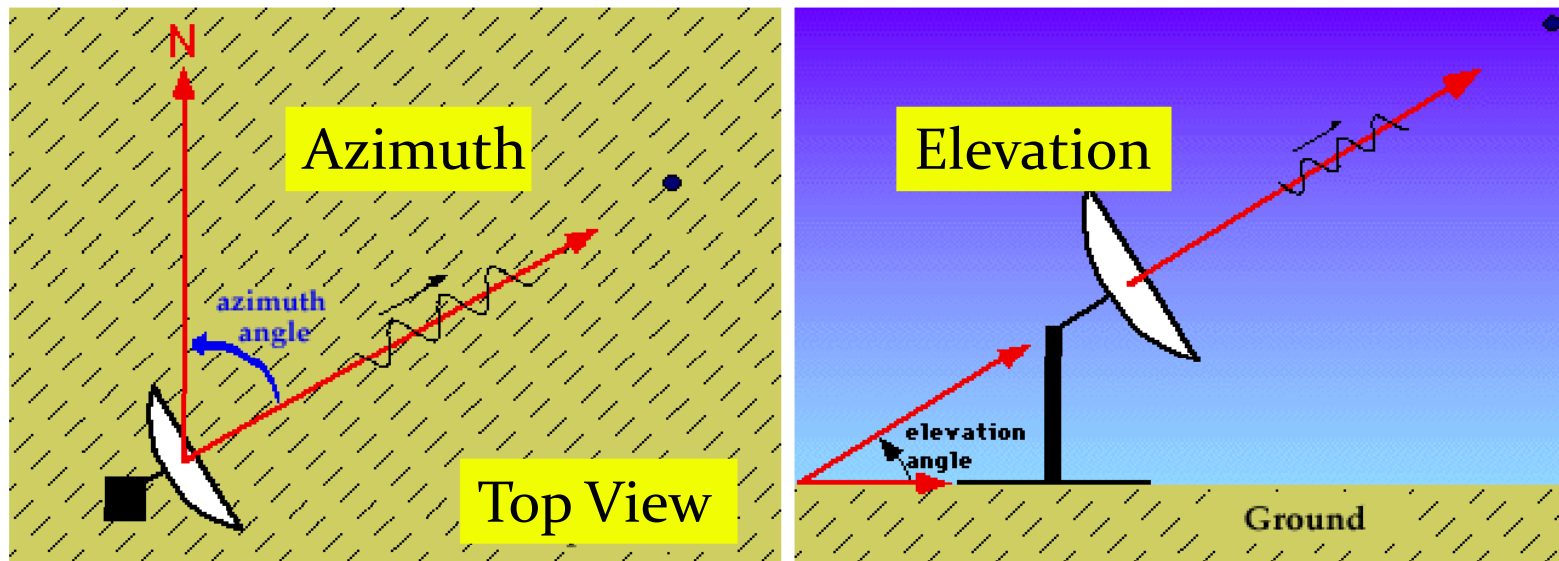
A photograph of Earth from space, showing the curvature of the planet and a bright star in the upper right corner. The text "LOOK ANGLE" is overlaid in white, serif font.

LOOK ANGLE

Azimuth & Elevation Angles

Azimuth is the axis of angular rotation

Elevation is the Angle with respect to the horizon -



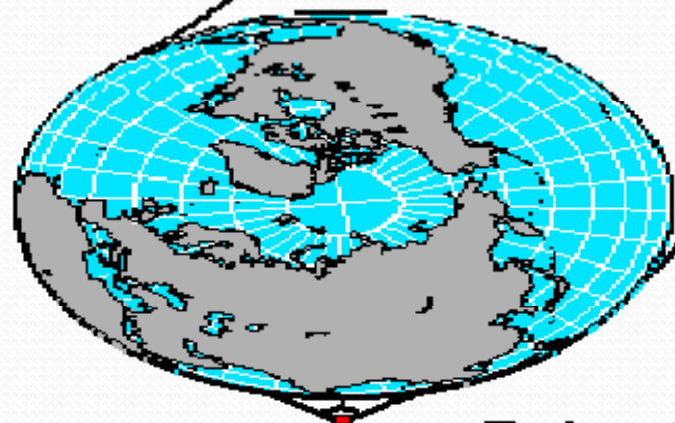


Earth Coverage and slant range

**Geostationary Satellite
35,800 km altitude**

mean distance to moon = 384,400 km

17.4°



earth radius = 6,370 km

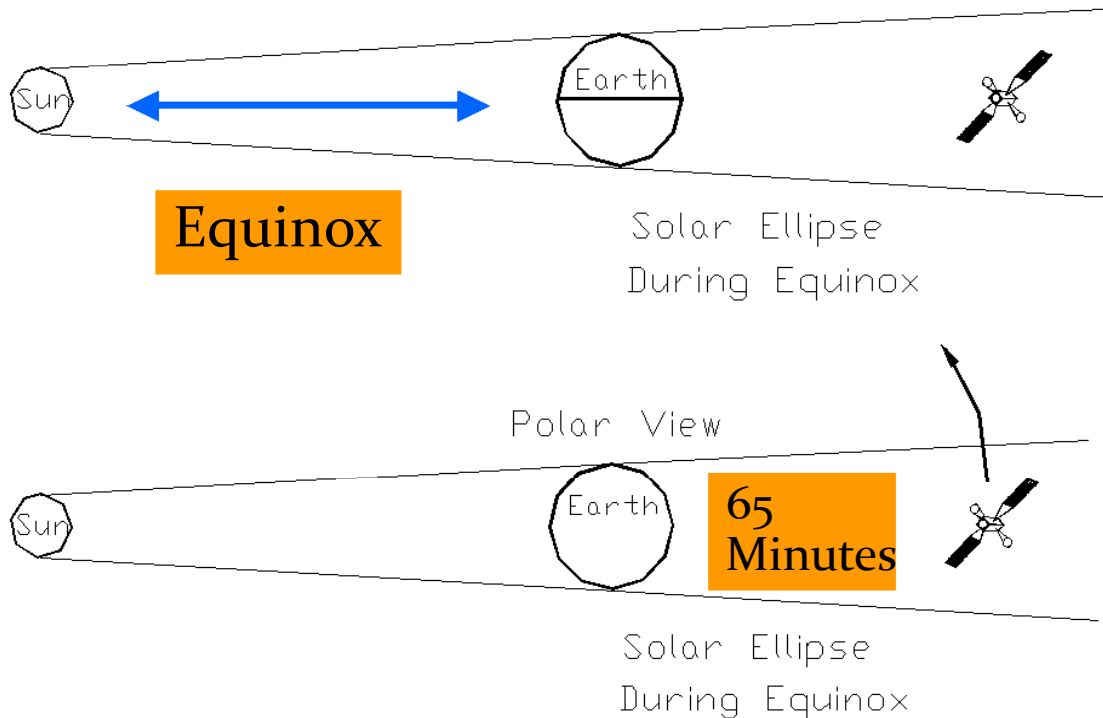
typical shuttle orbit = 225 – 250 km

Hubble Space Telescope = 600 km

110.8° **Polar Orbiting Satellite
850 km altitude**

Solar Eclipse

Satellites experience a solar eclipse two times a year
Vernal & Autumnal equinoxes for about 6 weeks each year.
Satellites are in the earth's shadow for a few minutes to as
much as 65 minutes on the day of the equinox.



During Eclipse

- No Solarpower
- need battery power
- No Solarwarming
- Requires heaters.

